Abstracts
of the Psychonomic Society

Volume 21 • November 2016

57TH ANNUAL MEETING

Sheraton Boston Hotel
Boston, Massachusetts
Thursday, November 17-Sunday, November 20, 2016

REGISTRATION

Grand Ballroom Foyer, Sheraton Boston Hotel
Thursday, November 17..... 10:00 a.m.-8:00 p.m.
Friday, November 18..... 7:30 a.m.-6:00 p.m.
Saturday, November 19..... 7:30 a.m.-5:00 p.m.

OPENING SESSION/KEYNOTE ADDRESS

Grand Ballroom, Sheraton Boston Hotel
Thursday, November 17..... 8:00 p.m.-9:30 p.m.

- **Psychonomic Society 2016 Early Career Awards**
- **Psychonomic Society/Women in Cognitive Science Travel and Networking Award for Junior Scientists**
- **Perception and Action in the Wild**
  Roberta Klatzky, Carnegie Mellon University

SYMPOSIA

Grand Ballroom, Sheraton Boston
Friday, November 18..... 10:00 a.m.-12:05 p.m.
Model-Based Cognitive Neuroscience

Friday, November 18..... 1:30 p.m.-3:30 p.m.
Motivated Memory: Considering the Functional Role of Memory

Saturday, November 19... 10:00 a.m.-12:00 noon
Language by Mouth and by Hand

Saturday, November 19..... 1:30 p.m.-3:30 p.m.
The Evolutionary and Psychological Significance of Play
From the Psychonomic Society's Leading Edge Workshop initiative
In honor of Stanley J. Kuczaj, II

POSTER SESSIONS

Hynes Ballroom B, Hynes Convention Center
Session I
Thursday, November 17..... 6:00 p.m.-7:30 p.m.
Session II
Friday, November 18..... 12:00 noon-1:30 p.m.
Session III
Friday, November 18..... 6:00 p.m.-7:30 p.m.
Session IV
Saturday, November 19..... 12:00 noon-1:30 p.m.
Session V
Saturday, November 19..... 6:00 p.m.-7:30 p.m.

BUSINESS MEETING

Liberty Ballroom B, Sheraton Boston Hotel
Saturday, November 19..... 5:10 p.m.-6:00 p.m.

- **Presentation of the Psychonomic Society 2016 Clifford T. Morgan Best Article Awards**
- **Business of the Psychonomic Society**

FUTURE MEETINGS

2017 – Vancouver, BC – November 9-12
2018 – New Orleans, LA – November 15-18
2019 – Montréal, QC – November 14-17
2020 – Austin, TX – November 19-22
2021 – San Diego, CA – November 18-21
2022 – Washington, DC – November 17-20

PSYCHONOMIC SOCIETY®

A PSYCHONOMIC SOCIETY PUBLICATION
www.psychonomic.org

OPENING SESSION/KEYNOTE ADDRESS

Perception and Action in the Wild
Roberta Klatzky, *Carnegie Mellon University*
Thursday, November 17, 8:00 p.m., Grand Ballroom

2016 EARLY CAREER AWARDS

Bharath Chandrasekaran, *University of Texas at Austin*
Christopher Donkin, *University of New South Wales*
Kimberly Fenn, *Michigan State University*
Jennifer Trueblood, *Vanderbilt University*

OPENING RECEPTION

Thursday, November 17, immediately following the Keynote Address, Grand Ballroom
Hosted by: Psychonomic Society Governing Board

TABLE OF CONTENTS

NOTICES

- *Designation of Psychonomic Society Early Career Award Winners:* An asterisk (*) preceding an author's name indicates that he/she is a recipient of the Psychonomic Society's Early Career Award for 2016.

HOTELS

The Sheraton Boston Hotel will serve as our headquarters hotel. All spoken sessions for the 2016 Psychonomic Society Annual Meeting will be held at the Sheraton with the exception of the poster sessions, which will be held in the nearby Hynes Convention Center.

To maintain the Society's practice of no registration fee for members, it is essential that all rooms reserved for the Annual Meeting be identified as such at the time of booking. To assure you receive the specially negotiated room rate of $209 + tax (single/double) per night, please make your reservations no later than October 21, 2016. There are a limited number of rooms available at the Sheraton, so please book early to secure your sleeping room reservations (rooms may be sold out well before this date). Visit the Psychonomic Society website (www.psychonomic.org) to make online reservations.

The Colonnade Hotel is open for reservations in case the Sheraton Boston sells out. The room rates are $249 + tax (single/double). Visit the Psychonomic Society website to secure online reservations.

REGISTRATION

Registration is free to members of the Psychonomic Society. Registration fees for non-member PhDs and graduate students are $75. There is no registration fee for undergraduate students. Membership in the Society is inexpensive and strongly encouraged.

Registration will be located in the Grand Ballroom Foyer on the second floor of the Sheraton during the following times:

Thursday, November 17 .....10:00 a.m. – 8:00 p.m.
Friday, November 18.....7:30 a.m. – 6:00 p.m.
Saturday, November 19 .....7:30 a.m. – 5:00 p.m.

To avoid lines on site, you are strongly encouraged to preregister through the Psychonomic Society website (www.psychonomic.org). Click on the "Annual Meeting" link, then "Registration" to access the online registration form. If you choose not to preregister, please visit our registration desk in the Grand Ballroom Foyer on the second floor of the Sheraton Hotel. All attendees must register.

ABSTRACT AND PROGRAM BOOK

Programs will be available in print at the registration desk and as a PDF at www.psychonomic.org. Additional or replacement copies of the printed program will be available for $20.

MOBILE APP

A free mobile app for this year's meeting will be available for download in the Apple App Store and Google Play Store a few weeks prior to the Annual Meeting. All versions include the full program and abstracts.

It is recommended that you download the mobile app before you come to the Annual Meeting. Internet service will not be available in the meeting space at the Sheraton Boston Hotel.

MEETING ROOMS

All meeting rooms for spoken papers are located in the Sheraton Boston Hotel:

- Back Bay (2nd floor)
- Independence Ballroom (2nd floor)
- Liberty Ballroom (2nd floor)
- Public Garden (5th floor)
- Republic Ballroom (2nd floor)
- Constitution Ballroom (2nd floor)
- Grand Ballroom (2nd floor)
- Commonwealth (3rd Floor)

Session chairs are encouraged to solicit papers from individuals in their sessions prior to the meeting and load presentations onto the laptop computer in the meeting room. This will save time during the session.

TRAVEL TO BOSTON

Airport
Logan International Airport (BOS) is located approximately 6 miles from the Sheraton Boston Hotel.

Parking
Valet parking at the Sheraton Boston Hotel is $53 daily. Self-parking is $42 daily. Self-parking ramps are available in the downtown area. Check out the Best Parking app (Apple App Store and Google Play), which will detail more parking opportunities and pricing.

Shuttle Service
GoBoston Shuttle

- Pickup locations: Logan Airport terminals and Sheraton Boston Hotel
- Hours: 24/7
- Cost: $17 per person, advance reservations required.
- You may schedule a pickup from the Sheraton Boston or from Boston Logan Airport online at http://ultimateshuttle.hudsonltd.net/res, or you may contact the GoBoston Shuttle directly at 888-437-4379.

Back Bay Logan Express offers transportation to and from Logan International airport. It drops off and loads by the front entrance to the Hynes Convention Center on Boylston Street. First departure: 6:00 a.m. Last departure: 10:00 p.m. Bus service costs approximately $5. You will need to pay on the bus with a credit card.

Taxis
Taxis are available at Logan International Airport and at the Sheraton Boston Hotel. The cost is approximately $40 one way. Rates vary based on rush hour traffic.

Subway
From outside the Logan Airport terminal, take any Silver Line bus to South Station. Change at South Station to the Red Line. Take an Alewife-bound Red Line train to Park Street. Change at Park Street to the Green Line. Take an "E-Heath Street" Green Line train to Prudential Station. Exit Prudential Station into Prudential Center mall. At center court, make a left into the Prudential Arcade, and the hotel will be just past Au Bon Pain. The fare is $2.65. For more information, visit: www.mbta.com.

POSTER SESSIONS

All poster sessions will take place at the Hynes Convention Center in Hynes Ballroom A-C.

The three evening sessions will be held in conjunction with a general reception. Authors of posters are asked to make their posters available for viewing on the following schedule:

Session	Viewing Time	Author Present
Thursday Evening	4:00 p.m.–7:30 p.m.	6:00 p.m.–7:30 p.m.
Friday Noon	11:00 a.m.–1:30 p.m.	12:00 noon–1:30 p.m.
Friday Evening	4:00 p.m.–7:30 p.m.	6:00 p.m.–7:30 p.m.
Saturday Noon	11:00 a.m.–1:30 p.m.	12:00 noon–1:30 p.m.
Saturday Evening	4:00 p.m.–7:30 p.m.	6:00 p.m.–7:30 p.m.

NOTE: The poster size has changed this year. **Each poster must fit on one side of a 4 feet high X 8 feet wide (with a 1 inch frame around the perimeter) poster board.** Visit www.psychonomic.org for suggestions on preparing your poster.

The extended viewing time will allow all interested persons to see posters of their choice and hopefully reduce the crowded conditions we have sometimes had at the poster sessions. Please do NOT leave your poster behind at the end of your session. All posters must be removed as soon as the poster session is concluded.

The numbering of posters this year uses the same system as last year. Abstract numbers assigned to posters are not in sequence with the numbers assigned to talks. Rather, each poster is assigned a four-digit abstract number. The first digit codes the session to which the poster has been assigned; the last three digits code the location of the poster within its session (i.e., 001-243).

EXHIBITORS

Attendees are encouraged to visit our exhibitors located in Grand Ballroom Foyer at the Sheraton Boston Hotel. Exhibit hours are:

Thursday, November 17 ..... 5:30 p.m. – 10:30 p.m.
Friday, November 18.....9:30 a.m. – 6:00 p.m.
Saturday, November 19 .....9:30 a.m. – 4:00 p.m.

RECEPTIONS

Opening Reception (Thursday, immediately following the Keynote Address); 9:30 p.m.-10:30 p.m.
Grand Ballroom Foyer and Constitution Ballroom

Diversity & Inclusion Reception; Friday, 4:30 p.m.-5:30 p.m.
Gardner Room

Friday Reception (Cash bar only); 5:30 p.m. -7:30 p.m.
Hynes Ballroom B, Hynes Convention Center

Saturday Reception (Cash bar only); 5:30 p.m. -7:30 p.m.
Hynes Ballroom B, Hynes Convention Center

COFFEE BREAKS

Complimentary coffee and tea will be available from 7:30 a.m. to 9:00 a.m. in the Grand Ballroom Foyer.

JOGONOMICS

Join your fellow Psychonomes on a 5K fun run/walk. The group will meet in the lobby of the Sheraton Boston Hotel at 6:00 a.m. on Saturday, November 19, and the run will leave promptly at 6:15 a.m. Again, this year we have added a low-key route that will run lower mileage at a more relaxed rate. Organizers: Jeff Zacks and Marianne Lloyd. There is no fee, but you will be required to sign a waiver.

PSYCHONOMIC TIME

Persons chairing sessions this year will be asked to keep the spoken papers schedule on times standardized against a clock at the Psychonomic Society registration desk. All attendees are asked to synchronize their watches to Psychonomic time.

AUDIOVISUAL EQUIPMENT FOR TALKS

LCD projectors (e.g., for PowerPoint presentations) and laptop computers (PC) will be provided in all rooms where spoken sessions are scheduled. Please bring your presentation on a USB drive and load it onto the laptop computer in your session room prior to the beginning of that session. Bring two copies of your presentation in case of media failure. Presenters are strongly encouraged to visit the speaker ready room in the MPO Back Bay (2nd floor, near Back Bay A), well in advance of their talks to review their presentations.

2016: THE PROGRAM

There were 1,520 total submissions and 1,514 valid submissions. Of the 1,511 papers that were placed on the program, 306 are spoken papers and 1,205 are posters. In addition, there were three invited symposia, and one symposium that resulted from the Psychonomic Society Leading Workshop program.

PROGRAM HISTORY

Year – Site	Valid Submissions
2016 - Boston	1,514
2015 – Chicago	1,306
2014 – Long Beach	1,300
2013 – Toronto	1,264
2012 – Minneapolis	1,054
2011 – Seattle	1,037
2010 – St. Louis	928
2009 – Boston	1,220
2008 – Chicago	950
2007 – Long Beach	928

2016 AFFILIATE MEETINGS

Auditory Perception, Cognition, and Action Meeting (APCAM)
Thursday, November 17, 2016
8:00 a.m.-5:00 p.m.
Back Bay C (2nd Floor)
Website: www.apcam.us

Comparative Cognition Society (CCS)
Thursday, November 17, 2016
8:00 a.m.-5:00 p.m.
Back Bay B (2nd Floor)
Website: www.comparativecognition.org

Configural Processing Consortium (CPC)
Wednesday, November 16, 2016
8:30 a.m.-5:30 p.m.
Back Bay D (2nd Floor)
Website: configural.org

International Association for Metacognition (IAM)
Thursday, November 17, 2016
12:00 noon-4:00 p.m.
Hampton (3rd Floor)
Website: http://iametacognition.wix.com/metacognition

Object Perception, Attention, and Memory (OPAM)
Thursday, November 17, 2016
7:00 a.m.-5:00 p.m.
Independence Ballroom (2nd Floor)
Website: www.opam.net

Society for Computers in Psychology (SCiP)
Thursday, November 17, 2016
8:00 a.m.-5:30 p.m.
Fairfax (3rd Floor)
Website: http://scip.ws

Society for Judgment and Decision-Making Annual Meeting (SJDM)
Friday, November 18-Monday, November 21
Website: www.sjdm.org

Society for Mathematical Psychology (SMP)
Computational Approaches to Cognition Symposium
Thursday, November 17, 2016
9:00 a.m.-4:30 p.m.
Back Bay A (2nd Floor)
Website: http://mathpsych.org/conferences/psychonomics2016/

Tactile Research Group (TRG)
Thursday, November 17, 2016
9:00 a.m.-6:00 p.m.
Gardner (3rd Floor)
Website: http://trg.objectis.net/

Women in Cognitive Science (WiCS)
Thursday, November 17, 2016
4:00 p.m.-7:00 p.m.
Commonwealth (3rd Floor)
Website: http://www.womenincogsci.org/

PHOTOGRAPHIC RELEASE

As part of your registration for the 2016 Annual Meeting, the Psychonomic Society reserves the right to use photographs and video taken during the meeting for future marketing purposes. If you do not wish to have your photograph or video used for such purposes, please contact us at the Psychonomic Society registration desk.

PROGRAM AND CONFERENCE ORGANIZATION

The Secretary/Treasurer, Ruth Maki, has the responsibility for organizing the program, the Program Committee reviews the schedule, and the Convention Manager, Andrew Conway, has the responsibility for arranging facilities at the meeting. They do so with the indispensable help of Lou Shomette, Executive Director; Valerie Ickes and Jane Shepard, Meeting Planners; Brian Weaver, Communications & Marketing Manager; Nan Knuteson, Membership Coordinator and Registrar; Kathy Kuehn, Production Director; Cynthia Coates, Graphic Artist; Erica Koconis, Accountant; Erika O'Leary, IT; and Bill Stoeffler, Account Director.

OFFICERS OF THE SOCIETY

Chair	Cathleen Moore, University of Iowa
Past Chair	Robert Logie, University of Edinburgh
Chair-Elect	Aaron Benjamin, University of Illinois
Secretary/Treasurer	Ruth Maki, University of Arizona

2016 GOVERNING BOARD

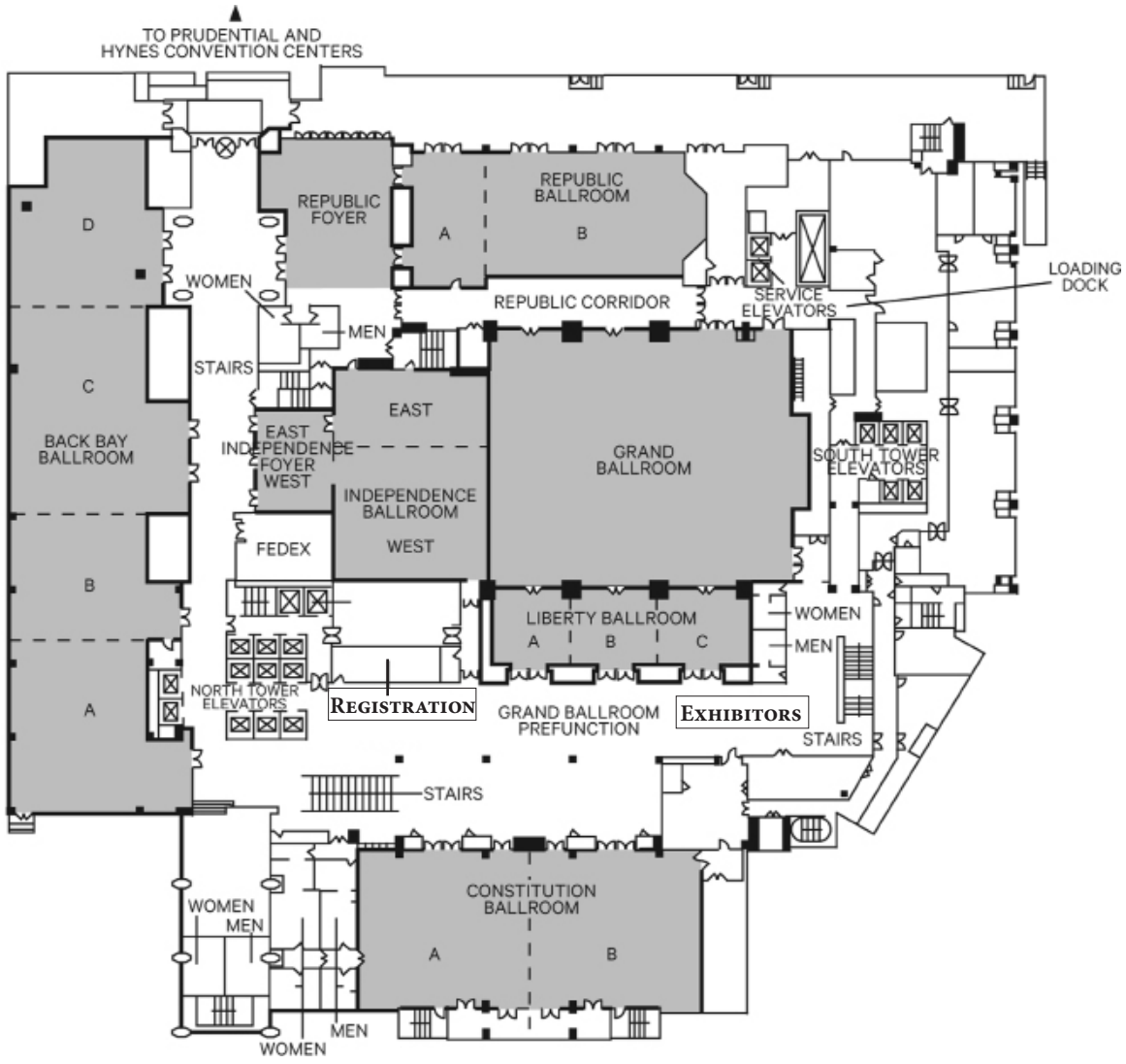
- Cathleen Moore, University of Iowa
- Edward Awh, University of Chicago
- Teresa Bajo, University of Granada
- Aaron Benjamin, University of Illinois
- Laura Carlson, University of Notre Dame
- John Dunlosky, Kent State University
- Fernanda Ferreira, University of California, Davis
- Robert Logie, University of Edinburgh
- Janet Metcalfe, Columbia University
- Lynne Reder, Carnegie Mellon University
- Patricia Reuter-Lorenz, University of Michigan
- Valerie Reyna, Cornell University
- Ruth H. Maki, University of Arizona, *ex officio*
- Louis Shomette, Executive Director, *ex officio*

2016 PROGRAM COMMITTEE

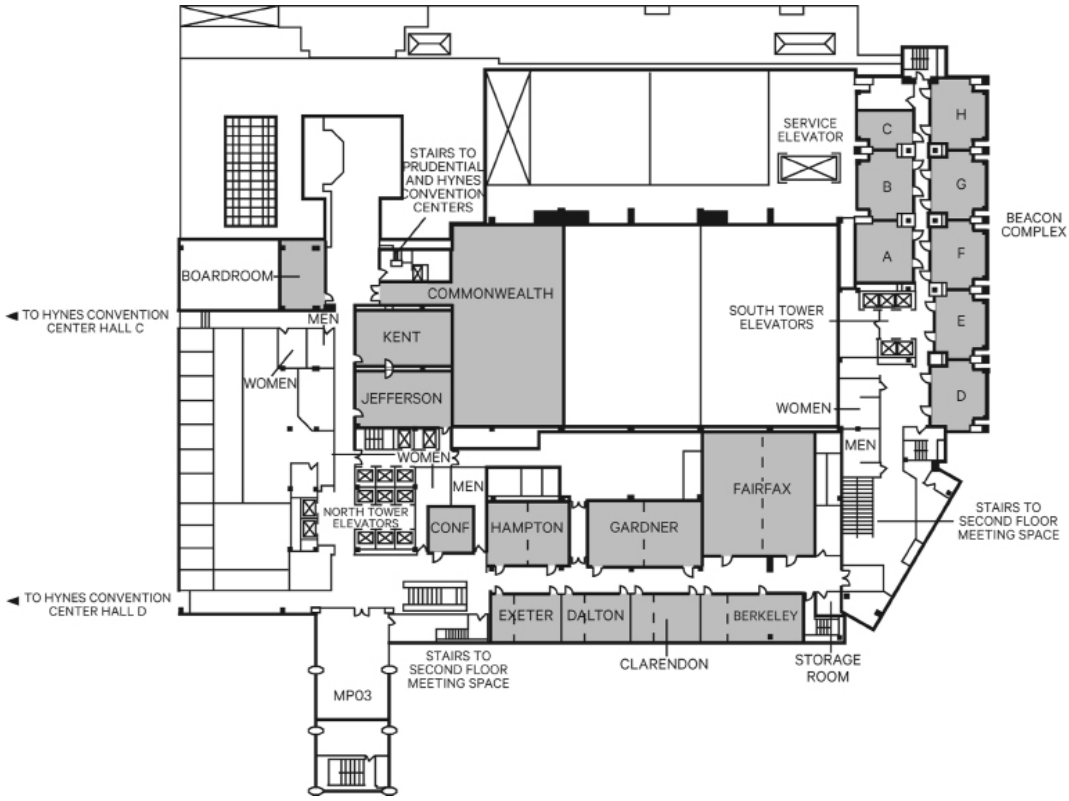
- John Dunlosky, Chair, Kent State University
- Edward Awh, University of Chicago
- Teresa Bajo, University of Granada
- Janet Metcalfe, Columbia University
- Kristi Multhaup, Davidson College
- Andrew Conway, Claremont Graduate University, *ex officio*
- Ruth Maki, University of Arizona, *ex officio*

Ruth Maki, Secretary/Treasurer
Adjunct Professor, University of Arizona
rmaki@email.arizona.edu

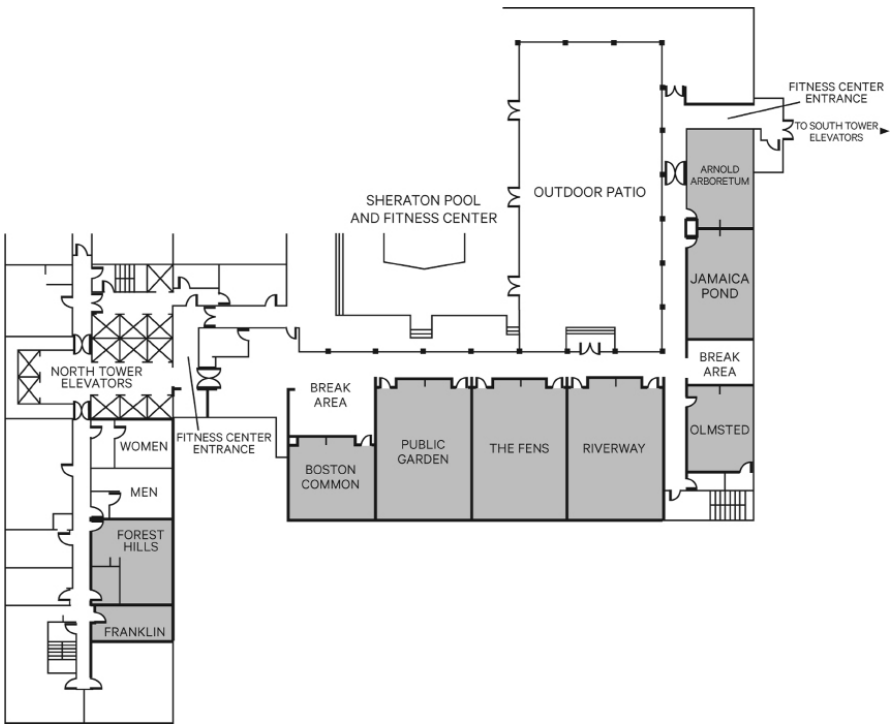
SHERATON BOSTON HOTEL - SECOND FLOOR



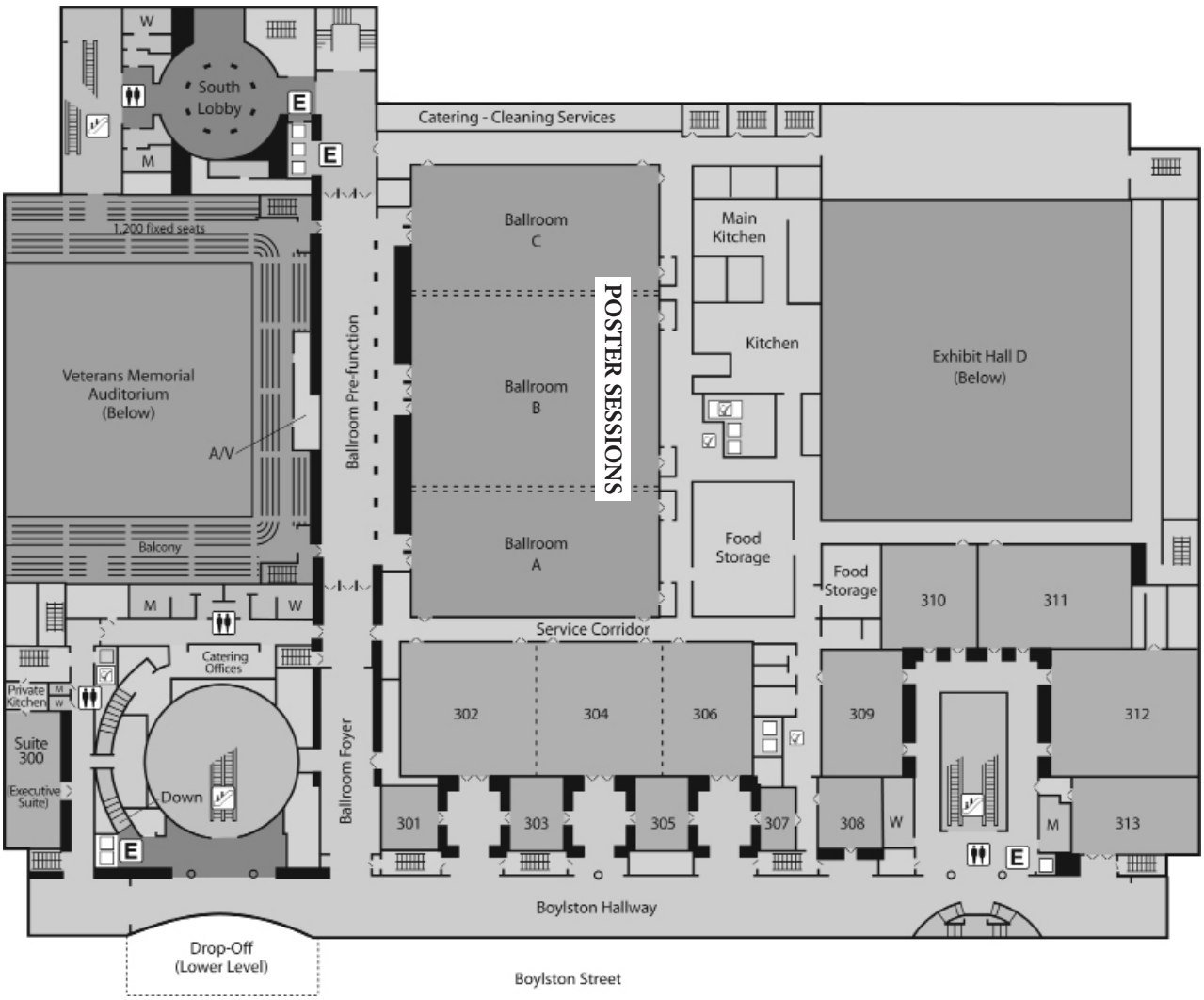
SHERATON BOSTON HOTEL - THIRD FLOOR



SHERATON BOSTON HOTEL - FIFTH FLOOR



HYNES CONVENTION CENTER - LEVEL THREE



POSTER SESSIONS WILL BE HELD IN BALLROOM A-C OF THE HYNES CONVENTION CENTER - LEVEL THREE

The Psychonomic Society Announces the Recipients of the

2016 EARLY CAREER AWARD

The Psychonomic Society Early Career Award recognizes exceptional research accomplishments among our members. Nominees must have completed their terminal degree (typically PhD) within the last 10 years and must be a Fellow or Member of the Society. Nominations are made by members of the Society, and each candidate must be endorsed by two members. Up to four awards can be made each year. One nominee, whose research is closest to the areas of perception and attention, will receive the Steven Yantis Early Career Award. Selection of the awards is made by a committee consisting of members of the Governing Board and other members of the Society. The 2016 committee consisted of Laura Carlson, chair; Jason Arndt, Teresa Bajo, John Henderson, Patricia Reuter-Lorenz and Lael Schooler.

Bharath Chandrasekaran

University of Texas at Austin
Speech Perception

Dr. Chandrasekaran's research examines the neurobiological computations that underlie speech perception and learning, using an interdisciplinary, computational, and lifespan approach. His current focus is on examining the neurocognitive sources of individual differences in speech processing. The ultimate goal of his work is to develop optimized and neurobiologically-informed training approaches for second language learning, learning impairments, and auditory processing deficits.

Christopher Donkin

University of New South Wales
Cognitive Models
THE STEVEN YANTIS EARLY CAREER AWARD

Dr. Donkin's research uses computational models to help understand human cognition. His work uses quantitative methods, preferably Bayesian, to develop, test, and compare theoretical accounts of working memory, category learning, perceptual identification, cognitive architecture, and both simple and complex decision-making. He is also interested in using cognitive models as ways of measuring behavior.

Kimberly M. Fenn

Michigan State University
Memory

Dr. Fenn's research focuses broadly on memory consolidation and skill acquisition. The ultimate goal of her work is to understand the factors that lead to successful memory retention. A primary line of research in her lab investigates the effect of sleep and sleep deprivation on memory stability and false memory formation. She also investigates the extent to which fitness impacts memory and the role of hand and acoustic gesture in mathematical learning and declarative memory.

Jennifer S. Trueblood

Vanderbilt University
Judgment and Decision Making

Dr. Trueblood's research takes a joint experimental and computational modeling approach to study human judgment, decision-making, and reasoning. Her work examines how people make decisions when faced with multiple alternatives and in changing environments. She is also interested in how people reason about causal events and how different perspectives, contexts, and frames can lead to interference effects in decision-making and memory.

The Psychonomic Society Announces the Recipients of the

2016 MEMBER SELECT-SPEAKER AWARD

The Member Select-Speaker Awards are designed to showcase exceptional research by Members. Each award winner will be given the unique opportunity to present his or her research in a spoken session during the conference and will be provided travel funds.

The Program Committee was responsible for the extremely difficult task of selecting the top abstracts submitted for a Member Select-Speaker Award. The main criteria for selection were overall quality of research, theoretical impact, and methodological rigor. This year's award winners more than satisfied these criteria and collectively represent an exciting and diverse range of research topics, including attention, memory, learning, judgment and decision making, and language processing.

The Member Select-Speaker Awards is an annual award program. All Members are encouraged to apply for the award next year!

Gregory Cox
Syracuse University
Area: Recognition
Abstract #58: Parallel Facilitatory Retrieval of Item and Associative Information From Event Memory

Nicholas Gaspelin
University of California, Davis
Area: Capture
Abstract #235: Converging Evidence for Suppression of Attentional Capture by Salient-but-Irrelevant Stimuli

Marieke van Heugten
University at Buffalo, State University of New York
Area: Psycholinguistics
Abstract #43: The Flexibility of Syntactic Processing Across Development

Janina Hoffmann
University of Konstanz, Germany
Area: Judgment
Abstract #87: Testing Learning Mechanisms of Rule-based Judgment

Oliver Kliegl
Regensburg University, Germany
Area: Testing Effects
Abstract #104: Testing Can Insulate Items Against Intralist Interference: Evidence From Output Interference and Retrieval-Induced Forgetting

Matthew Lowder
University of California, Davis
Area: Psycholinguistics
Abstract #42: Anticipating Speech Errors During Online Sentence Processing

Bridget McConnell
James Cook University Singapore
Area: Recall
Abstract #211: Retrieval-Induced Forgetting of Spatial Information for Items With Equal Strengths

Laura Morett
University of Pittsburgh
Area: Psycholinguistics
Abstract #248: Beat Gesture Alters How Pitch Accenting Affects Discourse Memory: Evidence for Top-Down Use of Talker Expectations

Jan Rummel
Heidelberg University, Germany
Area: Cognitive Control
Abstract #78: Towards a Better Understanding of Controlled Prospective-Memory Processing: Shared Processing, Increased On-Task Focus, or Both?

The Psychonomic Society Announces the Recipients of the

2016 GRADUATE TRAVEL AWARD

The Psychonomic Society Program Committee selected 15 Graduate Travel Awards based on the quality of the abstracts submitted by Student Members of the Society for the 2016 Annual Meeting in Boston, MA. Each recipient receives a travel stipend of $1,000 and will be recognized at the PS Business Meeting on Saturday, November 19, 2016.

Please join the Program Committee in congratulating these recipients!

Visit psychonomic.org/awards for additional information.

Kirsten Adam
University of Chicago
Abstract #1081: The Reliability and Stability of Change Detection Capacity Estimates

Siti Syuhada Binte Faizal
Washington University in St. Louis
Abstract #4200: Visual Word Processing in an Atypical Learning Situation: The Case of Non-Arabic-Speaking Qur'anic Memoriser

Sara Davis
Iowa State University
Abstract #4058: Variation in Initial Test Performance Does Not Affect the Benefit of Testing in Cued Recall

Juan Guevara Pinto
Louisiana State University
Abstract #3152: The Low-Prevalence Effect Transfers to Across Tasks

Mehmet Gunal
University of Texas at Dallas
Abstract #2108: Survival Processing of Face Memory

Hannah Hausman
Williams College
Abstract #3126: Pretesting to Facilitate Conceptual Learning From Reading Texts

Corinne Holmes
Temple University
Abstract #1068: Integrating Partial Viewpoints of Space: Array Stability Supports Flexibility

Ana Marcet
Universitat De Valencia
Abstract #4202: Does Perceptual Grouping Modulate Letter Position Coding?

Rachel Pizzie
Dartmouth College
Abstract #5042: The Academic Anxiety Inventory: Assessing the Impact of Anxiety Across Scholastic Domains

William Saban
Hebrew University of Jerusalem
Abstract #2226: From Reflexive to Volitional Processes

Edyta Sasin
University of Groningen
Abstract #1072: Can We Learn to Forget?

Michelle Stepan
Michigan State University
Abstract #5053: Sleep and Eyewitness Identifications: Changes in Decision Making Strategies

Matti Vuorre
Columbia University
Abstract #2002: The Relation Between the Sense of Agency and the Experience of Flow

Drew Weatherhead
University of Waterloo
Abstract #1190: Visual Speech Influences Lexical Access in Infants

Peiyun Zhou
University of Illinois
Abstract #5127: Is Imagining a Voice Like "Listening" to It? Evidence From ERPs

PSYCHONOMIC SOCIETY

2016 CLIFFORD T. MORGAN BEST ARTICLE AWARDS

Sponsored by Springer

The Psychonomic Society Clifford T. Morgan Best Article Award recognizes the best article published in each of the Psychonomic Society's journals in 2016. Selections are made by the Editor of each journal. Award recipients (the lead author) will receive a certificate and honorarium of $1,000 and will be recognized at the 57th Annual Meeting in Boston, MA.


Taylor

Attention, Perception, & Psychophysics (Editor: Michael Dodd)
J. Eric T. Taylor, Jason Rajsic, Jay Pratt
"Object-based selection is contingent on attentional control settings"
DOI: 10.3758/s13414-016-1074-y


Hayes

Behavior Research Methods (Editor: Michael Jones)
Taylor R. Hayes, Alexander A. Petrov
"Mapping and correcting the influence of gaze position on pupil size measurements"
DOI: 10.3758/s13428-015-0588-x


Byrne

Cognitive, Affective, & Behavioral Neuroscience (Editor: Marie Banich)
Kaileigh A. Byrne, Dominique D. Norris, Darrell A. Worthy
"Dopamine, depressive symptoms, and decision-making: The relationship between spontaneous eye blink rate and depressive symptoms predicts Iowa Gambling Task performance"
DOI: 10.3758/s13415-015-0377-0


Logan

Learning & Behavior (Editor: Jonathon Crystal)
Corina J. Logan, Alexis J. Breen, Alex H. Taylor, Russell D. Gray, William J. E. Hoppitt
"How New Caledonian crows solve novel foraging problems and what it means for cumulative culture"
DOI: 10.3758/s13420-015-0194-x


Zabelina

Memory & Cognition (Editor: Neil Mulligan)
Darya Zabelina, Arielle Saporta, Mark Beeman
"Flexible or leaky attention in creative people? Distinct patterns of attention for different types of creative thinking"
DOI: 10.3758/s13421-015-0569-4


Heilbronner

Psychonomic Bulletin & Review (Editor: Gregory Hickok)
Sarah R. Heilbronner, Benjamin Y. Hayden
"The description-experience gap in risky choice in nonhuman primates"
DOI 10.3758/s13423-015-0924-2

Cognitive Research: Principles & Implications (Editor: Jeremy Wolfe)
This journal will publish its first issue late 2016.

Visit http://www.psychonomic.org/clifford-t-morgan-best-article-awards for more information and previous recipients.

PSYCHONOMIC SOCIETY
2016 SPECIAL EVENTS

The Psychonomic Society and Social Media: Putting the Public Into Science and Making Science Public
Chaired by Stephan Lewandowsky, University of Bristol (Digital Content Editor) and the Psychonomics Digital Team
Poster #1243, 2243, 3243, & 4243: Available poster sessions I, II, III, IV
Location: Ballroom A-C, Hynes Convention Center

At a time when science and scientists are increasingly subjected to scrutiny by the public, politicians, and other stakeholders, the Society is committed to provide the public with information about its research and to solicit public commentary. Join the digital team at our poster to contribute to the discussion and to learn more about the Society's engagement on digital and social media.

Funding Opportunities for Cognitive Psychologists Through the Institute of Education Sciences
Chaired by: Erin Higgins, Institute of Education Sciences
Poster #3242, 4242; Friday evening session, Saturday noon session
Location: Ballroom A-C, Hynes Convention Center

The Institute of Education Sciences provides funding support for researchers to apply theories and recent findings from psychological science to education practice through the National Center for Education Research and the National Center for Special Education Research. Erin Higgins, the program officer for the Cognition and Student Learning topic, will be available to answer questions and talk to attendees about their proposed work at the Friday night and Saturday noon poster sessions.

Publishing Your Research Successfully: Guidance From the Editors
Chaired by: Morgan Ryan, Springer Nature
Date: Friday, November 18, 12:00 noon-1:30 p.m.
Location: Fairfax (3rd Floor)

Springer Nature and the Psychonomic Society are co-sponsoring this workshop intended for graduate students, early career researchers, and all those interested in learning more about publishing their research and the latest developments in academic publishing. Topics include authorship, peer review, post publication activities, article promotion, open research practices and trends, and data sharing and replication. The panel will be composed of the Psychonomic Society Journal Editors, the Chair of the Publications Committee of the Psychonomic Society, the Psychonomic Digital Content Editor, and representatives from the publisher, Springer Nature.

Diversity & Inclusion Reception
Date: Friday, November 18, 4:30 p.m.-5:30 p.m.
Location: Gardner Room

Please join the Governing Board and Diversity & Inclusion Committee at the inaugural reception celebrating diversity & inclusion with the Society and field. This annual networking event is an opportunity for scientists (from graduate students through senior researchers) to discuss their experiences regarding diversity in the field. If you identify as a member of an underrepresented group, join us for wine and cheese! The reception is open to all.

Graduate Student Social
Supported by the Psychonomic Society
Date: Friday, November 18, 9:00 p.m.-12:00 midnight
Location: McGreevy's Boston

Kick back and relax as you meet other graduate students at McGreevy's Boston, 911 Boylston Street, Boston, Massachusetts, 617-262-0911, www.mcgreevysboston.com. Light hors d'oeuvres and one drink ticket good for beer, wine, soda, or water will be handed out per person (limited availability). Bring appropriate ID and PS name badge.

Workshop on Non-Academic Careers for Psychologists *(by advance reservation only)*
Chaired by Robert Rauschenberger, Exponent, Inc.
Date: Saturday, November 19, 12:00 noon-1:30 p.m.
Location: Public Garden (5th Floor)

The present workshop will essay to provide an unbiased look at the obstacles psychologists face in transitioning out of academic research, and offer some advice from those who have successfully made the transition on how to overcome those impediments. A panel comprising former academic psychologists now working in user experience, on defense contracts, and in the gaming industry will share their personal experiences and then make themselves available for questions from the audience.

IN MEMORIAM

Psychonomic Society Members
July 2015-August 2016

2015

Henry Gleitman (1925-2015)

2016

Bruce Bridgeman (1944-2016)

Jerome S. Bruner (1915-2016)

Suzanne Hammond Corkin (1937-2016)

Glyn Humphreys (1954-2016)

Earl Busby (Buz) Hunt (1933-2016)

John Krauskopf (1928-2016)

Stan Kuczaj (1951-2016)

George Mandler (1925-2016)

Allan Urho Paivio (1925-2016)

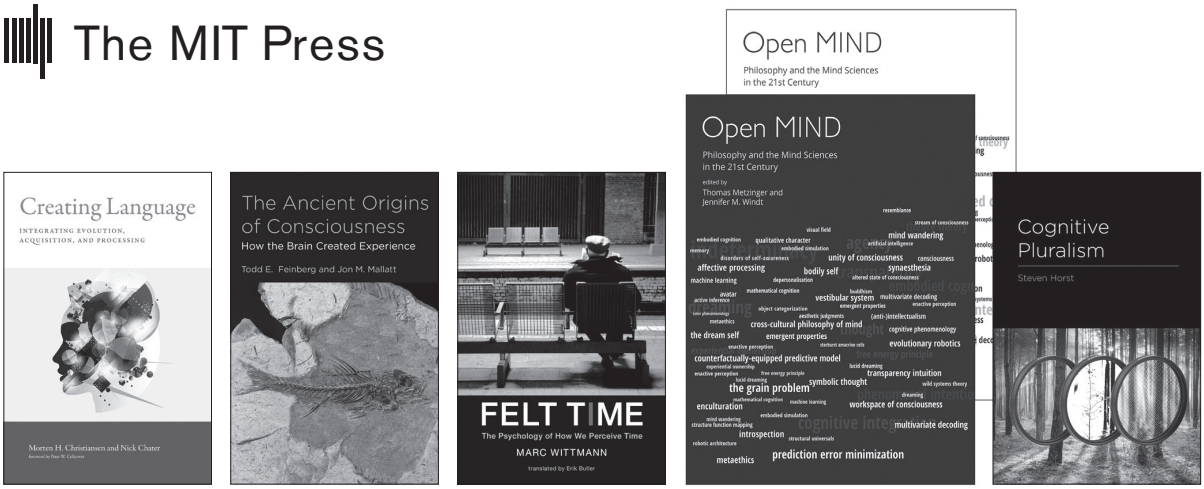
John Swets (1928-2016)

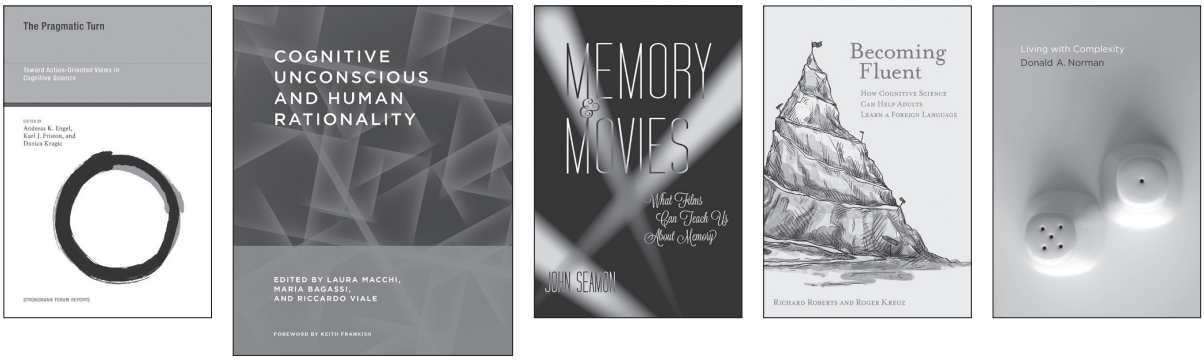
To read the obituaries of the members above, please visit our website at www.psychonomic.org/obituaries.

The Psychonomic Society would like to honor members by listing obituaries on our website.

If you know a member of our community who has recently passed away,
please contact Lynne Reder at reder@cmu.edu with the information.

The MIT Press





CREATING LANGUAGE
Integrating Evolution, Acquisition, and Processing
Morten H. Christiansen and Nick Chater
foreword by Peter W. Culicover

A work that reveals the profound links between the evolution, acquisition, and processing of language, and proposes a new integrative framework for the language sciences.

Hardcover | $40 | £29.95

THE PRAGMATIC TURN
Toward Action-Oriented Views in Cognitive Science
edited by Andreas K. Engel, Karl J. Friston, and Danica Kragic

Experts from a range of disciplines assess the foundations and implications of a novel action-oriented view of cognition.

Strüngmann Forum Reports
Hardcover | $49 | £36.95

ANCIENT ORIGINS OF CONSCIOUSNESS
How the Brain Created Experience
Todd E. Feinberg and Jon M. Mallatt

How consciousness appeared much earlier in evolutionary history than is commonly assumed, and why all vertebrates and perhaps even some invertebrates are conscious.

Hardcover | $35 | £24.95

COGNITIVE UNCONSCIOUS AND HUMAN RATIONALITY
edited by Laura Macchi, Maria Bagassi and Riccardo Viale
foreword by Keith Frankish

Examining the role of implicit, unconscious thinking on reasoning, decision making, problem solving, creativity, and its neurocognitive basis, for a genuinely psychological conception of rationality.

Hardcover | $54 | £39.95

FELT TIME
The Psychology of How We Perceive Time
Marc Wittmann
translated by Erik Butler

An expert explores the riddle of subjective time, from why time speeds up as we grow older to the connection between time and consciousness.

Hardcover | $24.95 | £18.95

BECOMING FLUENT
How Cognitive Science Can Help Adults Learn a Foreign Language
Richard Roberts and Roger Kreuz

How adult learners can draw upon skills and knowledge honed over a lifetime to master a foreign language.

Hardcover | $25.95 | £19.95

OPEN MIND
Philosophy and the Mind Sciences in the 21st Century
edited by Thomas Metzinger and Jennifer M. Windt

A unique interdisciplinary collection of papers and commentaries by leading researchers and rising scholars, representing the latest research on consciousness, mind, and brain.

Hardcover | 2 volume set | $285 | £207.95

MEMORY AND MOVIES
What Films Can Teach Us about Memory
John Seamon

How popular films from *Memento* to *Slumdog Millionaire* can help us understand how memory works.

Hardcover | $30.95 | £22.95

COGNITIVE PLURALISM
Steven Horst

An argument that we understand the world through many special-purpose mental models of different content domains, and an exploration of the philosophical implications.

Hardcover | $54 | £39.95

Now in Paperback

LIVING WITH COMPLEXITY
Donald A. Norman

Why we don't really want simplicity, and how we can learn to live with complexity.

Paperback | $20.95 | £15.95

Visit the MIT PRESS BOOTH for a 30% DISCOUNT

mitpress.mit.edu

SHERATON BOSTON HOTEL • BOSTON, MA

2016

Configural Processing Consortium

www.configural.org

Wednesday, November 16, 2016
8:30 a.m. - 5:30 p.m.

The Configural Processing Consortium (CPC) is an annual workshop bringing together researchers in the field of configurality research. We aim to tackle deep issues underpinning perceptual organization, cognition, and action as well as the most cutting edge theoretical and experimental research on configural topics. Although vision typically dominates, our interests include all modalities.

Each year, we seek to both define the major problems underlying the field of configural processing and to develop more unified ways of approaching these problems.

President

Mary A. Peterson

Organizing Committee

Karen Schloss, Takeo Watanabe, Ami Eidels, Mary Peterson, Ruth Kimchi, Jim Pomerantz, Jim Townsend, Leslie Blaha, Joseph Houpt

Funding and Support

BROWN

Center for Vision Research
Brown Institute for Brain Science

PSYCHONOMIC SOCIETY®

APCAM 2016

The 15th Annual Auditory Perception, Cognition, and Action Meeting

Sheraton Boston Hotel
Boston, Massachusetts-November 17, 2016
8:30 am – 5:00 pm
Abstract Submission Deadline: October 1

APCAM brings together researchers from various theoretical perspectives to present focused research on auditory cognition, perception, and aurally guided action. APCAM is a unique meeting in its exclusive focus on the perceptual, cognitive, and behavioral aspects of audition. This will be the fifteenth annual APCAM, and we look forward to an excellent program. We hope you can join us!

Invited Speakers:
Barbara Shinn-Cunningham, Boston University
William Hartmann, Michigan State University

Organizers:
Michael Hall (chair)
Michael Russell
Peter Pfordresher
Devin McAuley
John Neuhoff

For more information, including a call for abstracts, see www.apcam.us

Comparative Cognition Society

www.comparativecognition.org

Fall Meeting of the Comparative Cognition Society

November 17 – Sheraton Boston
All are Welcome – Registration is Free

Program Summary

8:00 - Coffee Hour
9:00 - Social Cognition
10:15 – Complex Cognitive Process
1:15 - Perception & Discrimination
2:55 - Learning & Memory Processes
4:00 - Keynote Address – Jeffrey Lamoureux (Boston College)
The Role of Attention in Extinction Processes

24th Annual *International Conference on Comparative Cognition*
Melbourne, FL April 19 - 22, 2017

Call for Papers Posted on the CCS Web Site

COMPARATIVE COGNITION & BEHAVIOR REVIEWS

The online journal of the Comparative Cognition Society

Check out these resources on the CCS website

- **Job Postings and Student Opportunities in comparative cognition (check them out and/or fill out the web form to post yours)**
- **CCS YouTube Channel: videos from laboratories, documentary footage, etc gathered by category. Post videos from your lab and let us know to be included**

Support the Activities of the Comparative Cognition Society
Please Consider Joining the Society – See the CCS Website for Details

Computational Approaches to Cognition

A symposium organized by the Society for Mathematical Psychology

Hosts: Amy Criss, Joachim Vandekerckhove, Eric-Jan Wagenmakers

Thursday, November 17, 2016

The Society for Mathematical Psychology promotes the advancement and communication of research in mathematical psychology and related disciplines. Mathematical psychology is broadly defined to include work of a theoretical character that uses mathematical methods, formal logic, or computer simulation.

Symposium schedule

8:55	*Opening remarks*	

Session I: Bidirectional constraints between neurobiology and computational models of cognition

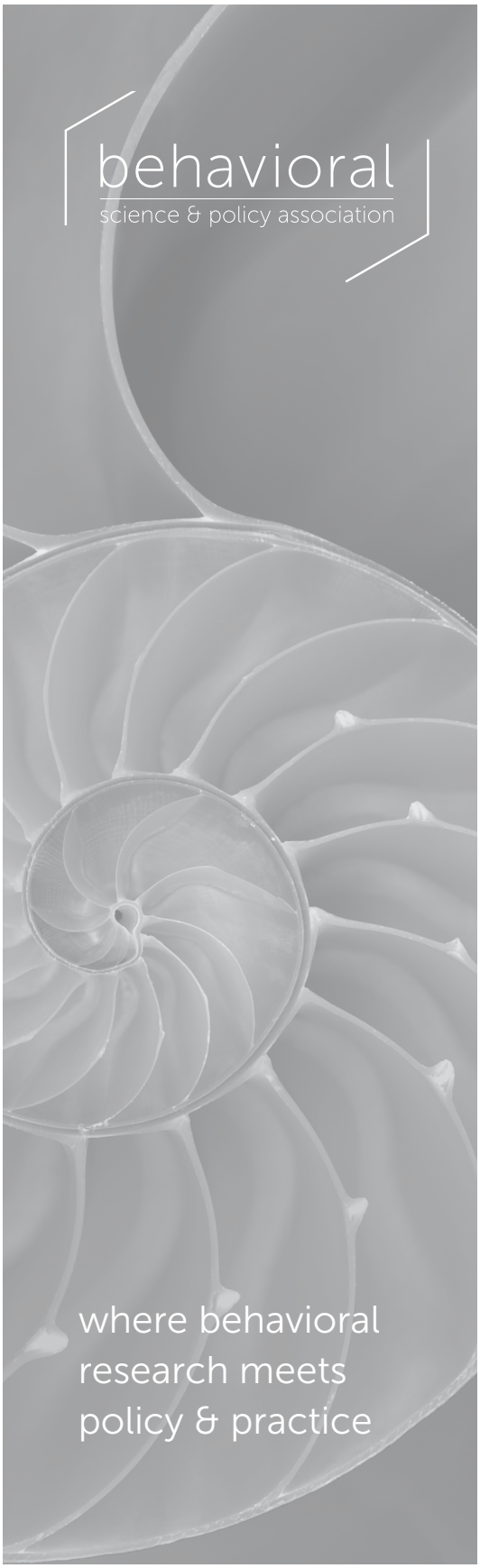
9:00	Bingni Brunton	*Understanding neural computation in long-term, naturalistic human brain recordings*
	Randy Gallistel	*The intracellular hypothesis*
	Sam Gershman	*Rethinking biological plausibility*
	Marc Howard	*Neural representations as a bridge between behavior and neurobiology*
10:20	*Break until 10:35*	

Session II: Joint modeling

10:35	Gordon Logan, Thomas Palmeri, & Jeffrey Schall	*Neurons, models, and minds*
10:55	Brandon Turner	*The neural basis of self-control in intertemporal choice*
11:15	Beth Baribault	*Using cognitive latent variable models to evaluate theories of attention*
11:35	*Lunch until 13:00*	
13:00	*Poster session until 14:15*	

Session III: New methods

14:15	John Dunn & Michael Kalish	*Testing psychological theories with state-trace analysis*
14:35	Richard Shiffrin	*A Bayesian assessment of reproduction*
14:55	Zita Oravecz & Joachim Vandekerckhove	*Individual differences in within-person dynamics in ecological momentary assessment*
15:15	Christopher Donkin & Joachim Vandekerckhove	*Large N and radical randomization to test the robustness of empirical results*



who we are

The Behavioral Science & Policy Association (BSPA) is a global public and private sector community of decision makers, behavioral science researchers, policy analysts, and other practitioners. Our mission is to promote the thoughtful application of rigorous behavioral science research to generate public- and private- sector solutions for the benefit of all. We do this through a variety of activities, including hosting conferences, workshops and briefings, networking events, creating and maintaining an online information resource designed to disseminate behavioral insights, and publishing our flagship journal, *Behavioral Science & Policy*.

become a member

There is a growing movement to ground important decisions in strong scientific evidence. We are a key part of that movement and we need your support. Sign up at behavioralpolicy.org/signup

submit to BSP

Behavioral Science & Policy is an international peer-reviewed journal that features short, accessible articles describing actionable policy applications of behavioral scientific research that serves the public interest. Do you have a paper to submit to BSP? Visit us online to learn how.

behavioralpolicy.org | bspa@behavioralpolicy.org | +1 919 681 5932

The 16th Annual Meeting of Women in Cognitive Science

Thursday, November 17, 2016
Meeting: 4-6 pm; Social Hour: 6-7 pm
Sheraton Boston, Commonwealth Room

Life in the academy: Balancing work and home

Panelists:
Karen Emmorey, San Diego State University
Victor Ferreira, University of California, San Diego
Amy Overman, Elon University
Mary Peterson, University of Arizona
Duane Watson, Vanderbilt University

Organizer/Moderator:
Natasha Tokowicz, University of Pittsburgh

WiCS Officers:
Laurie Feldman (lf503@albany.edu)
Judith Kroll (jfk7@psu.edu)
Suparna Rajaram (suparna.rajaram@sunysb.edu)
Debra Titone (dtitone@psych.mcgill.ca)
Natasha Tokowicz (tokowicz@pitt.edu)
Janet van Hell (jgv3@psu.edu)

For more information visit: http://www.womenincogsci.org/

Women in Cognitive Science is affiliated with the Psychonomic Society, and its activities are funded by the Perception Action and Cognition program and the Office of International Science and Engineering at the National Science Foundation.

THURSDAY EVENING, NOVEMBER 17, 2016

POSTER SESSION I ..... 4:00 PM-7:30 PM Hynes Convention Center, Grand Ballroom A-C
(Author present between 6:00-7:30)

Taste and Touch (1001-1006)
Cognitive Aging I (1007-1014)
Action and Perception I (1015-1026)
Associative Learning I (1027-1032)
Emotion and Cognition I (1033-1050)
Spatial Cognition I (1051-1068)
Working Memory I (1069-1082)
False Memory I (1083-1095)
Metamemory/Metacognition I (1096-1109)
Human Learning and Instruction I (1110-1124)
Cognitive Control I (1125-1142)
Attention: Capture I (1143-1151)
Letter and Word Processing I (1152-1169)
Bilingualism I (1170-1187)
Speech Perception I (1188-1204)
Decision Making I (1205-1223)
Reasoning and Problem Solving (1224-1241)
Funding from US Department of Education (1242)
PS, Social Media, and Science (1243)

FRIDAY MORNING, NOVEMBER 18, 2016

Attention: Capture I (1-5) ..... 8:00 AM-9:40 AM Grand Ballroom
Human Learning and Instruction I (6-10) ..... 8:00 AM-9:40 AM Back Bay C & D
Reading I (11-15) ..... 8:00 AM-9:40 AM Republic
Speech Perception I (16-20) ..... 8:00 AM-9:40 AM Independence
Reasoning & Problem Solving (21-26) ..... 8:00 AM-10:00 AM Back Bay B
Vision (27-31) ..... 8:00 AM-9:40 AM Liberty
Symposium I: Introduction to Model-based Cognitive Neuroscience (32-38) ..... 10:00 AM-12:05 PM Grand Ballroom
Psycholinguistics I (39-44) ..... 10:00 AM-12:00 PM Back Bay C & D
Visual Search I (45-50) ..... 10:00 AM-12:00 PM Republic
Decision Making I (51-56) ..... 10:00 AM-12:00 PM Independence
Recognition I (57-61) ..... 10:20 AM-12:00 PM Back Bay B
Perception (62-67) ..... 10:00 AM-12:00 PM Liberty

FRIDAY NOON, NOVEMBER 18, 2016

Lunchtime Workshop:
Publishing Your Research Successfully: Guidance From the Editors ..... 12:00 PM-1:30 PM Fairfax (3rd Floor)

FRIDAY NOON, NOVEMBER 18, 2016

POSTER SESSION II ..... 11:00 AM-1:30 PM Hynes Convention Center, Grand Ballroom A-C
(Author present between 12:00-1:30)

Action (2001-2009)
Embodied Cognition (2010-2017)
Emotion and Cognition II (2018-2028)
Associative Learning II (2029-2037)
Human Learning and Instruction II (2038-2053)
Autobiographical Memory I (2054-2065)
Working Memory II (2066-2079)
Recognition I (2080-2095)
Recall I (2096-2106)
Face Processing (2107-2113)
Attention: Capture II (2114-2121)
Cognitive Control II (2122-2140)
Letter and Word Processing II (2141-2154)
Psycholinguistics I (2155-2169)
Bilingualism II (2170-2185)
Neural Mechanisms of Cognition I (2186-2194)
Reasoning and Problem Solving (2195-2212)
Decision Making II (2213-2225)
Animal Learning and Cognition (2226-2241)
Funding from US Department of Education (2242)
PS, Social Media, and Science (2243)

FRIDAY AFTERNOON, NOVEMBER 18, 2016

Symposium II: Motivated Memory: Considering the Functional Role of Memory (69-74) ..... 1:30 PM-3:30 PM Grand Ballroom
Cognitive Control I (75-79) ..... 1:30 PM-3:10 PM Back Bay C & D
Speech Perception II (80-84) ..... 1:30 PM-3:10 PM Republic
Judgment (85-89) ..... 1:30 PM-3:10 PM Independence

Meaning/Semantics (90-95) ..... 1:30 PM-3:30 PM Back Bay B
Event Cognition (96-101) ..... 1:30 PM-3:30 PM Liberty
Testing Effects (102-106) ..... 3:50 PM-5:30 PM Grand Ballroom
Statistics and Methodology (107-112) ..... 3:30 PM-5:30 PM Back Bay C & D
Attention: Features & Objects (113-118) ..... 3:30 PM-5:30 PM Republic
Decision Making II (119-124) ..... 3:30 PM-5:30 PM Independence
Letter/Word Processing I (125-129) ..... 3:50 PM-5:30 PM Back Bay B
Discourse Processing (130-134) ..... 3:50 PM-5:30 PM Liberty

FRIDAY EVENING, NOVEMBER 18, 2016

POSTER SESSION III ..... 4:00 PM-7:30 PM Hynes Convention Center, Grand Ballroom A-C
(Author present between 6:00-7:30)

Vision (3001-3015)
Action and Perception II (3016-3028)
Spatial Cognition II (3029-3039)
Recall II (3040-3051)
Recognition II (3052-3068)
False Memory II (3069-3083)
Metamemory/Metacognition II (3084-3101)
Prospective Memory (3102-3113)
Human Learning and Instruction III (3114-3130)
Cognitive Control of Working Memory (3131-3149)
Visual Search I (3150-3165)
Attention: Features and Objects (3166-3176)
Scene Processing (3177-3188)
Language Production/Writing (3189-3204)
Psycholinguistics II (3205-3220)
Meaning/Semantics I (3221-3232)
Cognition and Technology (3233-3241)
Funding from US Department of Education (3242)
PS, Social Media, and Science (3243)

SATURDAY MORNING, NOVEMBER 19, 2016

Visual Working Memory (135-139) ..... 8:00 AM-9:40 AM Grand Ballroom
Cognitive Aging (140-145) ..... 8:00 AM-10:00 AM Back Bay C & D
Scene Processing (146-151) ..... 8:00 AM-10:00 AM Republic
Eyewitness Identification (152-155) ..... 8:00 AM-9:20 AM Independence
Associative Learning (156-160) ..... 8:00 AM-9:40 AM Back Bay B
Language Production and Writing (161-165) ..... 8:00 AM-9:40 AM Back Bay A
Symposium III: Language by Mouth and by Hand (166-171) ..... 10:00 AM-12:00 PM Grand Ballroom
Metamemory/Metacognition (172-176) ..... 10:20 AM-12:00 PM Back Bay C & D
Working Memory I (177-181) ..... 10:20 AM-12:00 PM Republic
Recognition II (182-188) ..... 9:40 AM-12:00 PM Independence
Spatial Cognition (189-194) ..... 10:00 AM-12:00 PM Back Bay B
Animal Learning and Cognition (195-200) ..... 10:00 AM-12:00 PM Back Bay A

SATURDAY NOON, NOVEMBER 19, 2016

Lunchtime Workshop: Non-Academic Careers (201) ..... 12:00 PM-1:30 PM Public Garden (5th Floor)

SATURDAY NOON, NOVEMBER 19, 2016

POSTER SESSION IV ..... 11:00 AM-1:30 PM Hynes Convention Center, Grand Ballroom A-C
(Author present between 12:00-1:30)

Multi-Sensory Integration (4001-4012)
Event Cognition (4013-4024)
Spatial Cognition III (4025-4035)
Recall III (4036-4050)
Testing Effects (4051-4065)
Implicit Memory (4066-4074)
Recognition III (4075-4088)
Memory and Reward, Motivation, and Emotion (4089-4099)
Autobiographical Memory II (4100-4110)
Consciousness (4111-4115)
Cognitive Control III (4116-4127)
Working Memory III (4128-4144)
Psycholinguistics III (4145-4160)
Speech Perception II (4161-4171)
Bilingualism III (4172-4189)
Letter/Word Processing III (4190-4206)
Discourse Processes I (4207-4221)
Neural Mechanisms of Cognition II (4222-4228)

Reward, Motivation, and Decision Making (4229-4241)
Funding from US Department of Education (4242)
PS, Social Media, and Science (4243)

SATURDAY AFTERNOON, NOVEMBER 19, 2016

Leading Edge Workshop
Symposium IV: The Evolutionary and Psychological Significance of Play (202-207)....1:30 PM-3:30 PM Grand Ballroom
Recall I (208-212)....1:30 PM-3:10 PM Back Bay C & D
Speech Perception III (213-217)....1:30 PM-3:10 PM Republic
Bilingualism I (218-222)....1:30 PM-3:10 PM Independence
Consciousness (223-227)....1:30 PM-3:10 PM Back Bay B
Cognitive Skill Acquisition (228-233)....1:30 PM-3:30 PM Back Bay A
Attention: Capture II (234-238)....3:50 PM-5:30 PM Grand Ballroom
Human Learning and Instruction II (239-244)....3:30 PM-5:30 PM Back Bay C & D
Psycholinguistics II (245-250)....3:30 PM-5:30 PM Republic
Memory and Beliefs (251-256)....3:30 PM-5:30 PM Independence
Neural Mechanisms of Cognition (257-262)....3:30 PM-5:30 PM Back Bay B
Embodied Cognition (263-267)....3:50 PM-5:30 PM Back Bay A

SATURDAY EVENING, NOVEMBER 19, 2016

POSTER SESSION V....4:00 PM-7:30 PM Hynes Convention Center, Grand Ballroom A-C
(Author present between 6:00-7:30)

Audition (5001-5009)
Music Cognition (5010-5019)
Numerical Cognition (5020-5035)
Emotion and Cognition III (5036-5046)
Cognitive Skill Acquisition (5047-5051)
Eyewitness Identification (5052-5063)
Human Learning and Instruction III (5064-5079)
Metamemory/Metacognition III (5080-5091)
Working Memory IV (5092-5101)
Meaning/Semantics II (5102-5111)
Discourse Processes II (5112-5126)
Psycholinguistics IV (5127-5139)
Change Detection (5140-5152)
Visual Search II (5153-5166)
Cognitive Control IV (5167-5178)
Automatic Processing (5179-5194)
Judgment (5195-5212)
Statistics and Methodology (5213-5226)
Decision Making III (5227-5241)
Funding from US Department of Education (5242)

SUNDAY MORNING, NOVEMBER 20, 2016

Letter/Word Processing II (268-272)....8:00 AM-9:40 AM Grand Ballroom
Decision Making III (273-278)....8:00 AM-9:40 AM Back Bay C & D
Recognition III (279-283)....8:00 AM-9:40 AM Republic
Cognitive Control II (284-289)....8:00 AM-10:00 AM Independence
Reading II (290-294)....8:00 AM-9:40 AM Back Bay B
Action (295-301)....8:00 AM-10:20 AM Liberty
Visual Search II (302-307)....10:00 AM-12:00 PM Grand Ballroom
Working Memory II (308-313)....10:00 AM-12:00 PM Republic
Bilingualism II (314-318)....10:00 AM-12:00 PM Back Bay C & D
Recall II (319-323)....10:20 AM-12:00 PM Independence
Human Learning and Instruction III (324-329)....10:00 AM-12:00 PM Back Bay B
Emotion and Cognition (330-333)....11:00 AM-12:00 PM Liberty

Condensed Schedule B

Grand Ballroom	Independence Ballroom	Back Bay B	Back Bay CD	Liberty BC
Thursday, November 17, 2016				
Keynote Address: Perception and Action in the Wild Roberta Klatzky 8:00 p.m.				
Friday, November 18, 2016				
Attention: Capture I 8:00 a.m.-9:40 a.m.	Speech Perception I 8:00 a.m.-9:40 a.m.	Reasoning & Problem Solving 8:00 a.m.-10:00 a.m.	Human Learning and Instruction I 8:00 a.m.-9:40 a.m.	Vision 8:00 a.m.-9:40 a.m.
SYMPOSIUM I: Introduction to Model-based Cognitive Neuroscience 10:00 a.m.-12:05 p.m.	Decision Making I 10:00 a.m.-12:00 noon	Recognition I 10:20 a.m.-12:00 noon	Psycholinguistics I 10:00 a.m.-12:00 noon	Perception 10:00 a.m.-12:00 noon
SYMPOSIUM II: Motivated Memory: Considering the Functional Role of Memory 1:30 p.m.-3:30 p.m.	Judgment 1:30 p.m.-3:10 p.m.	Meaning/Semantics 1:30 p.m.-3:30 p.m.	Cognitive Control I 1:30 p.m.-3:10 p.m.	Event Cognition 1:30 p.m.-3:30 p.m.
Testing Effects 3:50 p.m.-5:30 p.m.	Decision Making II 3:30 p.m.-5:30 p.m.	Letter/Word Processing I 3:50 p.m.-5:30 p.m.	Statistics and Methodology 3:30 p.m.-5:30 p.m.	Discourse Processing 3:50 p.m.-5:30 p.m.
Saturday, November 19, 2016				
Visual Working Memory 8:00 a.m.-9:40 a.m.	Eyewitness Identification 8:00 a.m.-9:20 a.m.	Associative Learning 8:00 a.m.-9:40 a.m.	Cognitive Aging 8:00 a.m.-10:00 a.m.	
SYMPOSIUM III: Language by Mouth and by Hand 10:00 a.m.-12:00 noon	Recognition II 9:40 a.m.-12:00 noon	Spatial Cognition 10:00 a.m.-12:00 noon	Metamemory/ Metacognition 10:20 a.m.-12:00 noon	
LEADING EDGE WORKSHOP SYMPOSIUM: The Evolutionary and Psychological Significance of Play 1:30 p.m.-3:30 p.m.	Bilingualism I 1:30 p.m.-3:10 p.m.	Consciousness 1:30 p.m.-3:10 p.m.	Recall I 1:30 p.m.-3:10 p.m.	
Attention: Capture II 3:50 p.m.-5:30 p.m.	Memory and Beliefs 3:30 p.m.-5:30 p.m.	Neural Mechanisms of Cognition 3:30 p.m.-5:30 p.m.	Human Learning and Instruction II 3:30 p.m.-5:30 p.m.	
				Psychonomic Society Business Meeting 5:10 p.m.-6:00 p.m.
Sunday, November 20, 2016				
Letter/Word Processing II 8:00 a.m.-9:40 a.m.	Cognitive Control II 8:00 a.m.-10:00 a.m.	Reading II 8:00 a.m.-9:40 a.m.	Decision Making III 8:00 a.m.-9:40 a.m.	Action 8:00 a.m.-10:20 a.m.
Visual Search II 10:00 a.m.-12:00 noon	Recall II 10:20 a.m.-12:00 noon	Human Learning and Instruction III 10:00 a.m.-12:00 noon	Bilingualism II 10:00 a.m.-12:00 noon	Emotion and Cognition 10:40 a.m.-12:00 noon

Republic Ballroom	Back Bay A	Fairfax/Public Garden	Hynes Convention Center Ballroom B
Thursday, November 17, 2016			
			Hospitality 5:30 p.m.-7:30 p.m. Poster Session I 6:00 p.m.-7:30 p.m.
Friday, November 18, 2016			
Reading I 8:00 a.m.-9:40 a.m.			
Visual Search I 10:00 a.m.-12:00 noon			
		Lunchtime Workshop: Publishing Your Research Successfully: Guidance From the Editors 12:00 noon-1:30 p.m. Fairfax	Poster Session II 12:00 noon-1:30 p.m.
Speech Perception II 1:30 p.m.-3:10 p.m.			
Attention: Features & Objects 3:30 p.m.-5:30 p.m.			
			Hospitality 5:30 p.m.-7:30 p.m. Poster Session III 6:00 p.m.-7:30 p.m.
Saturday, November 19, 2016			
Scene Processing 8:00 a.m.-10:00 a.m.	Language Production and Writing 8:00 a.m.-9:40 a.m.		
Working Memory I 10:20 a.m.-12:00 noon	Animal Learning and Cognition 10:00 a.m.-12:00 noon	Lunchtime Workshop: Non-Academic Careers 12:00 noon-1:30 p.m. Public Garden	Poster Session IV 12:00 noon-1:30 p.m.
Speech Perception III 1:30 p.m.-3:10 p.m.	Cognitive Skill Acquisition 1:30 p.m.-3:30 p.m.		
Psycholinguistics II 3:30 p.m.-5:30 p.m.	Embodied Cognition 3:50 p.m.-5:30 p.m.		
			Hospitality 5:30 p.m.-7:30 p.m. Poster Session V 6:00 p.m.-7:30 p.m.
Sunday, November 20, 2016			
Recognition III 8:00 a.m.-9:40 a.m.			
Working Memory II 10:00 a.m.-12:00 noon			

THURSDAY, NOVEMBER 17, 2016
6:00 P.M.-7:30 P.M.
POSTER SESSION I (1001-1243)
HYNES CONVENTION CENTER, GRAND BALLROOM A-C

Taste and Touch (1001-1006)
(1001) Anderson, Barrett
(1002) Wu, Klatzky
(1003) Overvliet
(1004) Bruns, Röder, Badde
(1005) Schramski, Varney, Buentello, Newell, Ziat
(1006) Hollands, Dyre, Roome, Beaudoin

Cognitive Aging I (1007-1014)
(1007) Krenzer, Devis, Gomez, Perea
(1008) Brunsdon, Bradford, Ferguson
(1009) Gargya, Naveh-Benjamin
(1010) Overman, Huhn, III, Dennis
(1011) Emery, Hardin
(1012) Peterson, Naveh-Benjamin
(1013) Zhang, Hung, Jackson, Goh, Gutchess
(1014) Brown, Mutter, Cundiff, Osbourn, Woosley

Action and Perception I (1015-1026)
(1015) Langley, Farmer-Dougan, Wagman
(1016) Pfordresher, Kovacs, Prince
(1017) Möller, Mayr, Buchner
(1018) Menzel, Bloesch
(1019) Morrow, Chrysikou
(1020) Thomas, Wagman, Hawkins, Riley
(1021) Batzloff, Balasubramaniam
(1022) Fournier, Stubblefield, Rosenbaum, Taddese, Dyre, Haflich
(1023) Laidlaw, Culham, Goodale
(1024) WITHDRAWN
(1025) Dayer, Wagman, Hajnal
(1026) Huffman, Gozli, Hommel, Pratt

Associative Learning I (1027-1032)
(1027) Smith, Federmeier
(1028) Gray, Kelley
(1029) Patel, Hill, Neider, Bohil
(1030) Vitrano, Neely
(1031) Yang
(1032) Sanchez Araujo, Georgan, Qi, Arciuli, Gabrieli

Emotion and Cognition I (1033-1050)
(1033) Rey, Dondas, Thar, Garcia-Larrea, Mazza
(1034) Cohen, Okon-Singer, Mor, Henik
(1035) Bradford, Brunsdon, Ferguson
(1036) Miyauchi, Kawasaki
(1037) Meek, Wortman, Phillips-Meek
(1038) Smith, Raman, Tchanturia, Hay
(1039) Struk, Seli
(1040) Chung, Park, Kim, Pashler, Harris
(1041) Ishikawa, Suzuki, Okubo
(1042) Katahira, Kawakami
(1043) Bezdek, Taiwo, Light
(1044) Alger, Payne
(1045) Knickerbocker, Johnson, Starr, Hall, Preti, Slate, Altarriba
(1046) Fugate, Cordeiro, Ziino
(1047) Imbault, Kuperman
(1048) Kozlik, Neumann
(1049) Perron, Ferguson, Roy-Charland, LaForge, MacLean
(1050) Marshall, Donato

Spatial Cognition I (1051-1068)
(1051) Vaid, Garcia, Dusthimer
(1052) Thomas, Gardony, Kaszowska, Wolford, Taylor
(1053) Wang, Xiao
(1054) Katzin N, Katzin D, Salti, Henik
(1055) Munion, Stefanucci, Butner, Rovira, Hendricks, Squire
(1056) Hoyer, Dopkins
(1057) Jia, Lu
(1058) Horne
(1059) Dixon, Padilla, Stefanucci, Creem-Regehr, Johnstone
(1060) Lei, Zhang, Mou
(1061) Himmelbergerer, Kraemer, Merrill
(1062) He, McNamara, Bodenheimer, Klippel
(1063) Burte, Gardony, Hutton, Taylor
(1064) Nazareth, Weisberg, Margulis, Do, Haj, Newcombe
(1065) Jee
(1066) Nelligan, Lee, Shelton
(1067) Sampaio, Wang
(1068) Holmes, Newcombe

Working Memory I (1069-1082)
(1069) Underwood, Valle-Inclan, Cowan, Hackley
(1070) Hakim, Vogel
(1071) Rajsic, Ouslis, Wilson, Pratt
(1072) Sasin, Sense, Nieuwenstein
(1073) Samper, Chein, Gepilano
(1074) Marois, Crépeau, Lévesque-Dion, Vachon
(1075) Foster, Bsales, Awh
(1076) Dagry, Barrouillet
(1077) Tsai, Kamarsu, Buschkuehl, Jonides, Shah, Jaeggi
(1078) Tart-Zelvin, Korell, Echon, Xu, Turley-Ames
(1079) Saint-Aubin, Richard, Guerrette, Guerard
(1080) Draheim, Harrison, Embretson, Engle
(1081) Adam, Fang, Vogel, Xu
(1082) Langerock, Camos, Vergauwe

False Memory I (1083-1095)
(1083) Hunt, Musicant
(1084) Long, Belli, Thomas, Gordon
(1085) Griffin, Schnyer
(1086) Weine, Kim
(1087) Brown, Schreifels, Chrobak
(1088) Wilson, Potter, Cowell
(1089) Jackson, Greene
(1090) Workman, Legault, Coane, McBride
(1091) Atkinson, Meissner

(1092) Valdes, Neill
(1093) Tanriverdi Ozkan, Selman, Pala, Duru, Bilge
(1094) Ianì, Bucciarelli, Mazzoni
(1095) Carpenter, Schacter

Metamemory/Metacognition I (1096-1109)
(1096) Middlebrooks, Kerr, Castel
(1097) Lamotte, Droit-Volet, Izaute
(1098) Cash, Lane
(1099) Sidi, Ackerman
(1100) Robey, Dougherty
(1101) Sitzman, Tauber
(1102) DeCaro, Thomas
(1103) Yan, Bjork R, Bjork E, Oyserman
(1104) Kelley, Magreehan, Serra, Davis
(1105) Wilford, Weinstein, Venuti, Cotrupi, Borrero, Khairalla
(1106) DeYoung, Miyatsu, McDaniel
(1107) Gregg, Upadhyay, Kuntzelman, Sacchi, Westerman
(1108) McDonough, Mendoza, Pody, Reynolds, Lee, Kim
(1109) Witherby, Tauber

Human Learning and Instruction I (1110-1124)
(1110) Hallinen, Schwartz
(1111) Moshontz, Marsh
(1112) Eglington, Kang
(1113) Jang, Marshall
(1114) Jaeger, Dawdanow, Shipley
(1115) Jones, Pan, Rickard
(1116) Arnold, Umanath, Thio, Reilly, McDaniel, Marsh
(1117) Runge, Sommers, Barcroft
(1118) Stull, Fiorella, Gainer, Mayer
(1119) Fiorella, Pilegard
(1120) Bernhardt, Overman, Stephens
(1121) Lacroix, Brown, Morgan, Plagianakos, Walsh
(1122) Garcia, Bjork E, Bjork R
(1123) Huff, Balota
(1124) Sana, Yan, Bjork E, Bjork R, Kim

Cognitive Control I (1125-1142)
(1125) Marsh, Labonté, Hughes, Vachon
(1126) Fischer, Gottschalk, Dreisbach
(1127) Hirsch, Nolden, Koch
(1128) Xiong, Yamaguchi, Proctor
(1129) Hutcheon, Lian, Richard
(1130) Dittrich, Schimpf, Klauer
(1131) Klein, Stolz
(1132) Jones, Kunar, Watson
(1133) Brosowsky, Crump
(1134) Gourley, Braver, Bugg
(1135) Ptok, Lees, Humphreys, Watter
(1136) Chao
(1137) Blais, Benkaim, Brewer
(1138) Seli, Maillet, Smilek, Schacter
(1139) Diede, Bugg
(1140) Varao-Sousa, Kingstone
(1141) Hill, Wismer, Neider, Bohil
(1142) McManus, Krasich, Brockmole, D'Mello

Attention: Capture I (1143-1151)
(1143) Korning Ljungberg, Hjartstrom, Eriksson Sorman
(1144) Lutfi-Proctor, Elliott
(1145) Vachon, Labonté, Lévesque-Dion, Crépeau
(1146) Truong, Handy
(1147) Labonté, Desmarais, Marsh, Vachon
(1148) Cho S, Cho Y
(1149) Stilwell, Roper, Vecera
(1150) Nickel, Hannula
(1151) Mahoney, Hannula

Letter and Word Processing I (1152-1169)
(1152) Norton, Harriott, Brown, Isaacs, Kaufer, Selph, Gaab, Gabrieli
(1153) Faust, Hill, Pierce
(1154) Roy-Charland, Foglia, LaForge, Chamberland, Charette
(1155) Christofalos, Raney
(1156) Geller, Still
(1157) Barrington, Liversedge, Kirkby
(1158) Pambuccian, Raney
(1159) Lin, Lawrence, Jaeggi, Krueger, Hwang, Hagen
(1160) Abraham, Folk, Eskenazi, Jones
(1161) Snell, Meeter, Grainger
(1162) Jones, Calcaterra, Wurm, Ofen
(1163) Jackson, Buchanan
(1164) Taylor, Eskenazi, Folk
(1165) Chetail
(1166) Juhasz
(1167) Johnson, Starr
(1168) Kim, Yap, Goh
(1169) Tejero, Roca, Insa

Bilingualism I (1170-1187)
(1170) Chong, Strybel
(1171) Declerck, Grainger, Koch, Stephan
(1172) Beatty-Martínez, Zirnstein, Kroll
(1173) Titus
(1174) Stasenko, Gollan
(1175) Adler, Valdes Kroff, Novick
(1176) Ivaz, Costa, Dunabeitia
(1177) Tuft, Incera, McLennan
(1178) Zhang, Kubota, Anders, Burke, Diaz, Kroll
(1179) Subramaniapillai, Rajah, Pasvanis, Titone
(1180) Negron, Schwartz
(1181) Rossi, Rivas
(1182) Schaeffner, Philipp
(1183) Garcia, Cieslicka, Heredia
(1184) Whitford, Joanisse
(1185) Amirazizi, Shears
(1186) WITHDRAWN
(1187) Takahesu Tabori, Kroll

Speech Perception I (1188-1204)
(1188) Luthra, Fuhrmeister, Guediche, Blumstein, Myers
(1189) WITHDRAWN
(1190) Weatherhead, White
(1191) Wu, Holt
(1192) Ayasse, Wingfield
(1193) Sumner, Davis

(1194) Gregg, Sajin
(1195) Dial, McMurray, Martin
(1196) Fernandez, Grey, van Hell, Guo
(1197) Thomas, Pitt
(1198) Cerisano, Conder, Crukley, O'Malley, Humphreys, Watter
(1199) Kajander, Kaplan, Jesse
(1200) Brown, Amichetti, Wingfield
(1201) Cooper, Bradlow
(1202) Carbonell
(1203) Saltzman, Rhone, McMurray, Toscano
(1204) Schreiber, McMurray

Decision Making I (1205-1223)
(1205) Fennell, Ratcliff
(1206) Tsuzuki, Takeda, Chiba
(1207) Schulze, Pachur, Hertwig
(1208) Friel, Howell, Thuku
(1209) Heilman
(1210) Casteel
(1211) Litvinova, Herzog, Hertwig
(1212) Hartsough, Ginther, Marois
(1213) Reichelson, Zax, Barth, Bass, Patalano
(1214) Martin, Kusev
(1215) McGuire, Breslow, Peterson, Kable
(1216) Markant, Pleskac, Diederich, Pachur, Hertwig
(1217) Park, Vickery
(1218) Bunker, Fific, Pham, Bulthuis
(1219) Palada, Neal, Martin, Tay, Heathcote
(1220) Vangsness, Young
(1221) Johnson, Luhmann
(1222) Nash, Imuta, Nielsen
(1223) Allan, Ripberger, Ybarra, Cokely

Reasoning and Problem Solving (1224-1242)
(1224) Naylor, Sanchez
(1225) Thomas, Didierjean
(1226) Vladimirov, Chistopolskaya, Sekurtseva, Lebed
(1227) Weatherford, Tedder, Hitchcock, Lane
(1228) Arnold, Klindzic, Hodge, Prike
(1229) Thalla, Packer
(1230) Prike, Arnold, Williamson
(1231) Tsapali, Quinn, Ellefson, Schlottmann, Taber
(1232) Lebed A, Lebed O, Diehl
(1233) Lebed O, Lebed A, Kelly
(1234) Gauer, Fritzen
(1235) Threadgold, Marsh, Ball
(1236) Jarosz, Jaeger
(1237) WITHDRAWN
(1238) Kaszowska, Messner, Scheutz, Taylor
(1239) Bradley, Michael
(1240) Snoddy, Kurtz
(1241) George, Wiley

Funding from US Department of Education
(1242) Higgins (Present on Friday Evening and Saturday Noon)

PS, Social Media, and Science
(1243) Lewandowsky

FRIDAY, NOVEMBER 18, 2016
8:00 A.M.-12:00 NOON
Spoken Sessions (1-67)

Attention: Capture I (1-5) Grand Ballroom
8:00-8:15 AM Hassan, Christie, Klein
8:20-8:35 AM Moore, Palmer
8:40-8:55 AM Theeuwes, Nissens, Failing
9:00-9:15 AM Boutsen, Pearson, Jüttner
9:20-9:35 AM Folk, Remington

Human Learning and Instruction I (6-10) Back Bay C & D
8:00-8:15 AM Fazio
8:20-8:35 AM Kane, Lurquin, Silvia, Smeekens, Carruth, Miyake
8:40-8:55 AM Miyake, von Bastian, Smeekens, Carruth, Lurquin, Kane
9:00-9:15 AM WITHDRAWN
9:20-9:35 AM Schloss

Reading I (11-15) Republic
8:00-8:15 AM Hyönä, Yan, Vainio
8:20-8:35 AM Li
8:40-8:55 AM Drieghe, Bouamama, Hermena, Liversedge
9:00-9:15 AM Holcombe, Ransley, Nguyen, Goodbourn
9:20-9:35 AM Staub

Speech Perception I (16-20) Independence
8:00-8:15 AM Ingvalson, Lansford, Federova, Fernandez
8:20-8:35 AM Ben-David, Gal-Rosenblum, Shakuf, Van Lieshout
8:40-8:55 AM Pollonini, Bortfeld, Beauchamp, Oghalai
9:00-9:15 AM Heald, Van Hedger, Nusbaum
9:20-9:35 AM Borrie, Lansford

Reasoning & Problem Solving (21-26) Back Bay B
8:00-8:15 AM Ellefson, Quinn, Tsapali, Schlottmann, Taber
8:20-8:35 AM Chou, Tversky
8:40-8:55 AM Danek, Wiley
9:00-9:15 AM Zeveney, Marsh
9:20-9:35 AM Thompson, Pennycook, Trippas, Evans
9:40-9:55 AM Rotello, Heit, Kelly

Vision (27-31) Liberty
8:00-8:15 AM Durgin, Portley
8:20-8:35 AM Greene
8:40-8:55 AM Ratcliff, Voskuilen, McKoon
9:00-9:15 AM Levin, Baker, Jaeger, Little
9:20-9:35 AM Cohen-Goldberg, Blazej

Symposium I: Introduction to Model-based Cognitive Neuroscience (32-38) Grand Ballroom
10:00-10:05 AM Palmeri
10:05-10:20 AM Palmeri
10:25-10:40 AM Turner
10:45-11:00 AM Forstmann
11:05-11:20 AM Anderson
11:25-11:40 AM Mack
11:45-12:00 PM Polyn

Psycholinguistics I (39-44) Back Bay C & D
10:00-10:15 AM Davis, Adelman, Gubian
10:20-10:35 AM Armstrong, Dumay, Kim, Pitt
10:40-10:55 AM Burgess
11:00-11:15 AM Lowder, Ferreira
11:20-11:35 AM van Heugten, Christophe
11:40-11:55 AM Kempe, Gauvrit

Visual Search I (45-50) Republic
10:00-10:15 AM Hillstrom, Segabinazi, Godwin, Liversedge, Benson
10:20-10:35 AM Wolfe, Alaoui-Soce
10:40-10:55 AM Makovski
11:00-11:15 AM Lleras, Wang, Madison, Buetti
11:20-11:35 AM Beck, Bahle, Hollingworth
11:40-11:55 AM Cain, Drew

Decision Making I (51-56) Independence
10:00-10:15 AM Budescu, Fan, Diecidue
10:20-10:35 AM Stevenson, Hwang
10:40-10:55 AM Lewandowsky, Somerwill, Ballard, Brown
11:00-11:15 AM Kusev, Van Schaik, Baranova
11:20-11:35 AM Fific
11:40-11:55 AM Reyna, Broniatowski

Recognition I (57-61) Back Bay B
10:20-10:35 AM Heathcote, Sauer, Gretton, Griffin, Palmer
10:40-10:55 AM Cox, Criss
11:00-11:15 AM Hyman, Jalbert, Wulff
11:20-11:35 AM Kersten, Earles
11:40-11:55 AM Hennessee, Castel, Knowlton

Perception (62-67) Liberty
10:00-10:15 AM Blumenthal, Peterson
10:20-10:35 AM Fostick, Babkoff
10:40-10:55 AM Barreau, Breen
11:00-11:15 AM Liu, Medina
11:20-11:35 AM Palmer, Peterson
11:40-11:55 AM Curby, Entenman

Lunchtime Workshop: Publishing Your Research Successfully: Guidance From the Editors, Fairfax (3rd Floor)
12:00-1:30 PM Ryan

FRIDAY, NOVEMBER 18, 2016
12:00 NOON-1:30 P.M.
POSTER SESSION II (2001-2243)
HYNES CONVENTION CENTER, GRAND BALLROOM A-C

Action (2001-2009)
(2001) Potts, Rosenbaum
(2002) Vuorre, Metcalfe
(2003) Rosenbaum, Potts, Muir
(2004) Constable, Welsh, Bayliss, Tipper, Spaniol, Pratt
(2005) Feghhi, Rosenbaum
(2006) Smith, Howard, Buxbaum
(2007) Durst, Ulrich, Janczyk
(2008) Dosso, Kingstone
(2009) Ingle, McIntosh

Embodied Cognition (2010-2017)
(2010) De Ruiter, Paschek
(2011) Gagnon, Davoli
(2012) Boddy, Paz-Alonso, Yee
(2013) Katz, Reid
(2014) Hoeben Mannaert, Dijkstra, Zwaan
(2015) Overoye, Wilson
(2016) Smith, Abrams
(2017) Higashiyama

Emotion and Cognition II (2018-2028)
(2018) Karaaslan, Amado
(2019) Chen, Yamaguchi
(2020) Mulatti, Job
(2021) Ji, Son, Kim
(2022) Diliberto-Macaluso, Kazanas, Altarriba, O'Brien, Rivera, Smith
(2023) McLean, Moulds, Balsillie, Kempe
(2024) Campbell, Davalos
(2025) Stager
(2026) Jardin, Allen, Levant, Lien, McCurdy, Villalba, Houston
(2027) Kaplan, Fortier-Brown, Bennett, Giudice
(2028) Richards, Bennett, Giudice

Associative Learning II (2029-2037)
(2029) Kahta, Schiff
(2030) Byrne, Davis, Worthy
(2031) Oshio
(2032) Griffiths, Erlinger, Beesley, Le Pelley
(2033) Karuza, Kahn, Thompson-Schill, Bassett
(2034) Carney, Levin, Vu, Knoph, Whisenhunt, Drummond, Ashe, Kern
(2035) Otsuka, Saiki
(2036) Cook, Clark-Foos, Meeks, Marsh, Urbanik
(2037) Reggev, Sharoni, Maril

Human Learning and Instruction II (2038-2053)
(2038) Buchanan, Miller, Klug, Knoph, Kusel, Marshall, Maxwell, Swadley
(2039) Butler, Raley
(2040) Bae, Park, Kim

(2041) Friedman, Moulton
(2042) Rich, Dunlosky, Van Loon, Zaragoza
(2043) Steffens, Britt, Millis
(2044) Boncoddo, Jensen, Murphy, Rogers, Alibali, Kalish
(2045) Gouravajhala, McDaniel, Daniel
(2046) Lee, Park
(2047) England, Sylvara, Ortegren
(2048) Pirozzolo, Foss
(2049) Carvalho, Goldstone
(2050) Manning, Rajah
(2051) Peters, Stubbs
(2052) LoGiudice, Sana, Kim
(2053) Stoeckenius, Yan, Sana, Bjork R, Bjork E

Autobiographical Memory I (2054-2065)
(2054) Broadbridge
(2055) Ford, Kensinger
(2056) Zator, Katz
(2057) Ngo, Newcombe, Olson
(2058) Mutlutürk, Boduroglu, Tekcan
(2059) Berg, McDermott, Gilmore
(2060) Thakral, Benoit, Schacter
(2061) Peters, Fan, Sheldon
(2062) Yang, Marsh
(2063) Shrikanth, Szpunar
(2064) Shi, Brown
(2065) Maswood, Rasmussen, Rajaram

Working Memory II (2066-2079)
(2066) Curry, Kelley
(2067) Schneider, Healy, Buck-Gengler, Kole, Barshi
(2068) Reimer, Seitz, Wong, Carlos, Romo, Selim, Rosales, Taggart, Rendler, Macias
(2069) Blacker, Negoita, Ewen, Courtney
(2070) Mohammed, Katz, Buschkuehl, Jaeggi
(2071) De Simoni, von Bastian
(2072) Smith, Huff, Peralta, Herron, Ell, McCoy
(2073) Swan, Wyble
(2074) Uittenhove, Chaabi, Camos, Barrouillet
(2075) Aust, Stahl
(2076) Cavallero, Riontino
(2077) Barideaux Jr, Pavlik Jr
(2078) Maharjan, Gold, Sekuler
(2079) Osaka M, Yaoi, Manamoto, Azuma, Osaka N

Recognition I (2080-2095)
(2080) Rosner, LaPointe, Ortiz, Milliken
(2081) Kobayashi, Kawaguchi
(2082) Ahmad, Moscovitch, Hockley
(2083) Gloede, Gregg
(2084) McDowell
(2085) Daniel, Katz
(2086) Annis, Palmeri
(2087) Moreland, Clark
(2088) Singmann
(2089) Malejka, Bröder
(2090) Fiacconi, Peter, Owais, Köhler
(2091) McLennan, Tuft, Incera, Manning
(2092) Ellis, Homa
(2093) Kuhlmann
(2094) Mooney, Santana, Deason
(2095) Strong, Tat, Flannery, Deason, Budson

Recall I (2096-2106)
(2096) Axtell, Kim, McHugh, Osnis, Truong, Olds, Miller
(2097) Scofield, Kostic, Buchanan
(2098) Maraver, Aguirre, Gomez-Ariza, Bajo
(2099) Mizrak, Oztekin
(2100) Millar, Balota, Bishara, Jacoby
(2101) Pettijohn, Radvansky
(2102) Atagi, Cohen, Bushmakin, Wingfield
(2103) Crocco, Neely
(2104) Poirier
(2105) Gerbier, Mazza, Toppino
(2106) Fernandes, Pandeirada, Nairne, Soares

Face Processing (2107-2113)
(2107) Meldrum, Meltzer, Arduengo, Bartlett
(2108) Gunal, Abdi, Bartlett
(2109) Osugi, Kawahara
(2110) Purcell, Stewart
(2111) Williams, Bond, Bohil, Kleider-Offutt
(2112) Papesh, Heisick, Warner
(2113) Bond, Kleider-Offutt

Attention: Capture II (2114-2121)
(2114) Le Pelley, Pearson, Most
(2115) Golob, Scheuerman, Anderson, Mock, Venable
(2116) Pearson, Hall, Le Pelley
(2117) Schubö, Kadel, Feldmann-Wüstefeld
(2118) Koshino, Buitron, Kim
(2119) Murphy, Dalton
(2120) Cole, D'Souza, Skarratt
(2121) Feldmann-Wüstefeld, Vogel

Cognitive Control II (2122-2140)
(2122) Nishimura, Yokosawa
(2123) Weidler, Bugg
(2124) Avital-Cohen, Tsal
(2125) Fröber, Dreisbach
(2126) Rothlein, DeGutis, Esterman
(2127) Wolska, von Muhlenen
(2128) Tillman, Eidels, Strayer, Biondi, Heathcote
(2129) Washburn, Salamanca
(2130) King, Macnamara
(2131) Nolden, Bolzius, Scheen, Koch
(2132) Kreutzfeldt, Stephan, Willmes, Koch
(2133) Seibold, Nolden, Oberem, Müsseler, Fels, Koch
(2134) Sellaro, Hommel, Colzato
(2135) Wiseheart, DSouza
(2136) Park, Myung, Pitt
(2137) Braun, Arrington
(2138) Dreisbach, Reindl, Fischer
(2139) Jeong, Cho
(2140) Lin, Hsieh

Letter and Word Processing II (2141-2154)
(2141) Eskenazi, Jones, Abraham, Folk
(2142) Chen, Wang, Lin, Wu
(2143) Marzouki, Bellaj, Feldman, Grainger
(2144) Slowiaczek, Kahan, Scott

(2145) Nakayama, Lupker, Yasushi
(2146) Yang, Chen, Houpt, Eidels, Little
(2147) Giezen, Villameriel, Dias, Carreiras
(2148) Yoshihara, Nakayama, Verdonschot, Hino
(2149) WITHDRAWN
(2150) Elmir
(2151) Ashby, Shlanta, Pagan, Agauas, Gagnon
(2152) Taikh, Lupker
(2153) Kusunose, Hino, Ida, Lupker
(2154) Sevcikova Sehyr, Emmorey, Midgley, Holcomb

Psycholinguistics I (2155-2169)
(2155) Caplan, Staub, Varkanitsa, Michaud, Eddine
(2156) Strand, Brown V, Brown H
(2157) Hsu, Kuchinsky, Thomas, Novick
(2158) Tseng, Michael, Linck, Perret, Green
(2159) Martin
(2160) Abdollahi, Tokowicz, van Hell
(2161) Black, Ferguson, Williams
(2162) Jouravlev, Ayyash, Schwartz, Mineroff, Fedorenko
(2163) Yoon, Brown-Schmidt
(2164) Riordan
(2165) Karimi, Ferreira
(2166) Ryskin, Kurumada, Brown-Schmidt
(2167) Alexander, Shetreet, Choi, Xiang, Kuperberg
(2168) Tao
(2169) Campbell, Abrams

Bilinguialism II (2170-2185)
(2170) Linck, Harper, Lin, Amer, Bowles
(2171) Wilson, Nadeu, van Hell
(2172) Degani, Prior, Hajajra
(2173) Koch, Tokowicz, Warren
(2174) Pulido-Azpiroz, Dussias
(2175) López, Tosun, Vaid
(2176) Pan, Jared
(2177) Poepsel, Weiss
(2178) Brown, Schwartz, Francis
(2179) Stephan, Koch, Grainger, Declerck
(2180) Aldosari
(2181) Bulgarelli, Bosch, Weiss
(2182) Sakuma
(2183) Chen, Bobb, Hoshino, Marian
(2184) Zappa, Pergandi, Mestre, Frenck-Mestre
(2185) Grant, Li

Neural Mechanisms of Cognition I (2186-2194)
(2186) Hill, Koch, Diana
(2187) Brashier, Wang, Wing, Marsh, Cabeza
(2188) Pinheiro, Kotz
(2189) Dabbakeh, Goldwater, Gaylord, Davis
(2190) Jouravlev, Zheng, Balewski, Goldin-Meadow, Fedorenko
(2191) Stoops, Garnsey, Ionin
(2192) Ryals, O'Neil, Palumbo, Voss
(2193) Karanian, Slotnick
(2194) Popov, Reder

Reasoning and Problem Solving (2195-2212)
(2195) Kolev II, Tirrell, Hatch, Kershaw
(2196) Bilalic
(2197) Bago, De Neys
(2198) Newman, Handley, Thompson
(2199) Stephens, Dunn, Hayes
(2200) Zemla, Sloman
(2201) Rehder
(2202) Horne, Cimpian
(2203) Levin, Friedman, Kose
(2204) Graham, Little
(2205) Yamakawa, Kiyokawa
(2206) Corral, Jones
(2207) Ditta, Storm
(2208) Hicks, Engle, Durso
(2209) Korovkin, Savinova, Lebed
(2210) Sheya, Dhaim
(2211) Chan, Schunn
(2212) White, Hicks

Decision Making II (2213-2225)
(2213) Zhao, Bhatia, Diederich
(2214) Servant, White, Montagnini, Burle
(2215) Konstantinidis, van Ravenzwaaij, Güney, Newell
(2216) Herzog, Huber, Horn, Klucharev, Rieskamp
(2217) Yamagishi, Ohnishi
(2218) Tomita, Matsushita, Yoshimitsu, Akai
(2219) Noda
(2220) Zhang, Reyes, Perez-Cotapos
(2221) Shevlin
(2222) Yeh, Green, Myerson
(2223) John, Scurich, Nguyen
(2224) Arnell, Schutten, Salgado, Stokes
(2225) Wall, Hemmer, Chapman

Animal Learning and Cognition (2226-2241)
(2226) Saban, Gabay, Klein
(2227) Watzek, Brosnan
(2228) Smith, Shears
(2229) Neiworth, Henderson
(2230) Smith, Beran
(2231) Smith, Brosnan
(2232) Whitham, Beran, Conway, James, Parrish, Washburn
(2233) WITHDRAWN
(2234) Brown, Heslin, Saxon
(2235) Malassis, Rey, Fagot
(2236) Miller, Ayoub
(2237) Ferrigno, Kornell, Cantlon
(2238) Perdue, Evans, Beran
(2239) Keller, Qadri, Kornstein, Cook
(2240) Frick, Eskelinen, Kuczaj
(2241) Metzger, Oakleaf

Funding from US Department of Education
(2242) Higgins

PS, Social Media, and Science
(2243) Lewandowsky

FRIDAY, NOVEMBER 18, 2016
1:30 P.M.-5:30 P.M.
Spoken Sessions (69-134)

Symposium II: Motivated Memory: Considering the Functional Role of Memory (69-74) Grand Ballroom

1:30-1:35 PM	Madan
1:35-1:55 PM	Murty, Tompary, Davachi, Adcock
1:55-2:15 PM	Spaniol, Williams, Dyson
2:15-2:35 PM	Alger, Payne
2:35-3:55 PM	Madan, Kensinger
3:55-3:15 PM	Gutchess
3:15-3:30 PM	Madan

Cognitive Control I (75-79) Back Bay C & D

1:30-1:45 PM	Töllner, Wang, Jung, Makeig, Müller, Gramann
1:50-2:05 PM	Chrysikou
2:10-2:25 PM	Jiang
2:30-2:45 PM	Rummel, Smeekens, Kane
2:50-3:05 PM	Heyman, Montemayor

Speech Perception II (80-84) Republic

1:30-1:45 PM	Sanders, Fitzroy
1:50-2:05 PM	Keetels, Laarhoven, Vroomen
2:10-2:25 PM	Denby, Goldrick
2:30-2:45 PM	Smiljanic, Sheft, Chandrasekaran, Shafiro
2:50-3:05 PM	Mattys, Hutson, Palmer

Judgment (85-89) Independence

1:30-1:45 PM	Caldwell-Harris, Hocaoğlu, Ayçiçegi-Dinn
1:50-2:05 PM	Treat, Viken, Corbin, Smith
2:10-2:25 PM	Hoffmann, von Helversen, Rieskamp
2:30-2:45 PM	Wolfe, Smith, Reyna
2:50-3:05 PM	Hamm

Meaning/Semantics (90-95) Back Bay B

1:30-1:45 PM	Andrews, Veldre
1:50-2:05 PM	Hofmann, Biemann, Roelke, Stuellein, Radach, Jacobs
2:10-2:25 PM	Heyman, Hutchison, Yap, Storms
2:30-2:45 PM	Hampton, Williams
2:50-3:05 PM	Westbury, Hollis, Sidhu, Pexman
3:10-3:25 PM	Sidhu, Pexman, Saint-Aubin

Event Cognition (96-101) Liberty

1:30-1:45 PM	Wahlheim, Zacks, Eisenberg
1:50-2:05 PM	Swallow, Kemp, Candan
2:10-2:25 PM	Cutting
2:30-2:45 PM	Radvansky, Fisher, Kalchik
2:50-3:05 PM	Brown, Shi, Reimer, Schweickart
3:10-3:25 PM	Hubbard, Ruppel

Testing Effects (102-106) Grand Ballroom

3:50-4:05 PM	Higham, Griffiths, Rackstraw
4:10-4:25 PM	Mulligan, Buchin
4:30-4:45 PM	Kliegl, Bäuml
4:50-5:05 PM	Ariel, Karpicke
5:10-5:25 PM	Foss, Pirozzolo

Statistics and Methodology (107-112) Back Bay C & D

3:30-3:45 PM	Morey
3:50-4:05 PM	Anderson
4:10-4:25 PM	Haaf, Rouder
4:30-4:45 PM	Myung, Kim, Gu, Lu, Pitt
4:50-5:05 PM	Donkin, Van Ravenzwaaij, Vandekerckhove, Dutilh
5:10-5:25 PM	Dyre, Roome, Beaudoin, Hollands

Attention: Features & Objects (113-118) Republic

3:30-3:45 PM	Williams, Burkle
3:50-4:05 PM	Franconeri
4:10-4:25 PM	Wyble, Callahan-Flintoft
4:30-4:45 PM	Ma, Sellaro, Lippelt, Hommel
4:50-5:05 PM	Barnes, Blair, Walshe, Tupper
5:10-5:25 PM	Sperling, Chu, Sun

Decision Making II (119-124) Independence

3:30-3:45 PM	Pachur, Trippas
3:50-4:05 PM	Trippas, Pachur
4:10-4:25 PM	Hemmer, Robbins
4:30-4:45 PM	Newell, Torgerson, Saranu, Le Pelley
4:50-5:05 PM	Faulkenberry
5:10-5:25 PM	Wang, Asche, Dominguez, Kallestad

Letter/Word Processing I (125-129) Back Bay B

3:50-4:05 PM	Keuleers, Mandera, Brysbaert
4:10-4:25 PM	Forster, Qiao
4:30-4:45 PM	Perea, Abu Mallouh, Mohammed, Khalifa, Carreiras
4:50-5:05 PM	Rastle, Lally, Taylor, Lee
5:10-5:25 PM	Vibert, Botta, Frasca, Rigalleau, Ros, Rouet, Jaafari

Discourse Processing (130-134) Liberty

3:50-4:05 PM	Dahan, Solomon
4:10-4:25 PM	Amati, Brennan
4:30-4:45 PM	Mumper, Gerrig, Bagelmann
4:50-5:05 PM	Kuperberg, Wlotko, Riley, Zeitlin, Cunha Lima
5:10-5:25 PM	Kaakinen, Ballenghein, Tissier, Baccino

FRIDAY, NOVEMBER 18, 2016
6:00 P.M.-7:30 P.M.
POSTER SESSION III (3001-3243)
HYNES CONVENTION CENTER, GRAND BALLROOM A-C

Vision (3001-3015)
(3001) Ueda, Yakushijin, Ishiguchi
(3002) Brunye, Holmes
(3003) Thompson
(3004) Dye, Lao, Stoll, Pascalis, Caldara
(3005) Hattori, Matsuo, Suzuki
(3006) Ueda
(3007) Dopkins, Hoyer
(3008) Roberts, Kingstone, Todd
(3009) Potter, Donkin, Huber
(3010) Groulx, Chubb
(3011) Kunz, Keefer, Corbin, Wright
(3012) Bushmakin, Sekuler
(3013) Holmes, Victora, Wang, Kwiat
(3014) McGoldrick, Reed, Bukach
(3015) Barnhart, Goldinger, Steinert

Action and Perception II (3016-3028)
(3016) Engert, Gallup
(3017) Roest, Pecher, Naeije, Zeelenberg
(3018) Donevska, Brunsdon, Surtees, Ferguson
(3019) Gozli, Hommel, Pratt
(3020) Baek, Yi
(3021) LaFortune, Macuga
(3022) Clement, Brockmole
(3023) Zamm, Palmer, Bauer, Bleichner, Demos, Debener
(3024) Suh, Abrams
(3025) Ramachandran, Chunharas
(3026) Hsu
(3027) Cain
(3028) Munger, Weitnauer

Spatial Cognition II (3029-3039)
(3029) Bilge
(3030) Barth
(3031) Doyle, Voyer
(3032) Chrastil, Sherrill, Stern
(3033) Klein, Stancil-Bacon
(3034) Nardi, Johnston, Guenther
(3035) Corbin, Crawford, Vavra, Keller, Hofilena, Lee
(3036) Mallik, Allen, Lien
(3037) Keller, Sutton
(3038) Minear, Holmes, Hunt, Kougl, McClure, Miller, Still
(3039) Kellis, Henderson, Cooper, Sargent

Recall II (3040-3051)
(3040) Kytola, Reese-Melancon
(3041) Tomm, Zhao
(3042) Jonker, Ritchey, Ranganath
(3043) Zawadzka, Hanczakowski, Wilding
(3044) Akan, Sahakyan
(3045) Conley, King-Shepard, Bauernschmidt
(3046) Aue, Karpicke
(3047) Meade, Wammes, Fernandes
(3048) McKinley, Benjamin
(3049) Cantor, Marsh
(3050) Mewaldt, Melvin, Michael
(3051) Kark, Kensinger

Recognition II (3052-3068)
(3052) Ma, Starns
(3053) Koop, Criss
(3054) Sloane, Curl, White
(3055) Gross, Dobbins
(3056) Rogers, Koeritzer, Van Engen, Peelle
(3057) Spitler, Hicks
(3058) Kim, Schlichting, Preston, Lewis-Peacock
(3059) Ensor, Willoughby, Surprenant, Neath
(3060) McCurdy, Leach, Leshikar
(3061) Williams, Lindsay
(3062) Selmeczy, Ghetti
(3063) MacKenzie, Alexandrou, Hancock, Donaldson
(3064) Doss, Picart, Gallo
(3065) Osth, Jansson, Dennis, Heathcote
(3066) VonderHaar, McBride
(3067) Farris, Toglia
(3068) Franks, Hicks

False Memory II (3069-3083)
(3069) Greene, Wells
(3070) Swire, Berinsky, Lewandowsky, Ecker
(3071) Calvillo, Mills, Taylor, Gossett, Flores
(3072) Hawkins, Calvillo
(3073) Zhang, Gross, Hayne
(3074) Bookbinder, Brainerd
(3075) Marin-Garcia, Paz-Alonso
(3076) Baranski, Was
(3077) Nakamura, Brainerd
(3078) Rindal, Zaragoza
(3079) Beighley, Sacco, Bauer, Hayes, Intraub
(3080) Yeh, Lu
(3081) Payne, Eakin
(3082) Vicari, Pizzica, Drummey, Kan
(3083) Arndt, Valle Flores, Smith Randle, Xu

Metamemory/Metacognition II (3084-3101)
(3084) Middlebrooks, Kerr, Murayama, Castel
(3085) Tullis
(3086) Green, Serra
(3087) Skinner, Erwin, Lester, Hammett, Dyer, Price
(3088) Pierce, McCain, Hawthorne
(3089) Miller
(3090) Putnam, DeSoto, Dekhes, Gilmore
(3091) Blake, Hargis, Castel
(3092) Hughes, Thomas, Bulevich
(3093) Flurry, Eakin
(3094) Griffin, Sarmento, Wiley, George
(3095) Tan, Eakin

(3096) Mueller, Dunlosky
(3097) Morehead, Dunlosky
(3098) Harrison, Erwin, Waldon, Skinner, Crane, Price
(3099) Magreehan, Serra
(3100) Akers, Schumacher, Taraban
(3101) Weinstein, Bard

Prospective Memory (3102-3113)
(3102) Clark-Foos, Urbanik, Whitlock, Cook
(3103) Shigeta, McBride
(3104) Sabic, Guynn
(3105) Underwood, Guynn
(3106) Ball, Bugg
(3107) Anderson, Einstein
(3108) Shelton, Scullin, Slayton, Vorwerk, James
(3109) Kurinec, Nguyen, Gao, Scullin
(3110) Parrish, Kelly A, Perdue, Love, Whitham, Luk, Kelly V, Beran
(3111) Pitães, Blais, Karoly, Okun, Brewer
(3112) Laughland, Kvavilashvili
(3113) Scolaro

Human Learning and Instruction III (3114-3130)
(3114) Liu, Reder
(3115) Martin, Underwood, Molinaro
(3116) Patel, Sahakyan
(3117) Vaughn, Kornell
(3118) Wieth, Francis, Zabel, Carr
(3119) Castro, Siew, McCartney
(3120) Uner, Roediger, III
(3121) Alarcón, Barger, Linnenbrink-Garcia, Butler
(3122) Coria, Higham
(3123) Saito, Sato, Niikuni, Horita, Muramoto
(3124) Raley, Butler, Cantor, Marsh
(3125) Maass, Pavlik Jr.
(3126) Hausman, Rhodes
(3127) Lovelett, Pan, Rickard
(3128) Toftness, Carpenter
(3129) Whiffen, Karpicke J, Blunt, Karpicke S
(3130) Hutter, Pan, Rickard

Cognitive Control of Working Memory (3131-3149)
(3131) Mielicki, Koppel, Valencia, Chun, Wiley
(3132) Tsukahara, Engle
(3133) Sussman, Butkevits, Blumenthal, Geiger, Fisenne, Jennings
(3134) Dixon
(3135) Drascher, Conway, Braver
(3136) Zukosky, Wang
(3137) Meier, Lyons, Smeekens, Kwapil, Silvia, Kane
(3138) Lim, Cho
(3139) Zuppichini, Zlochevsky, Vilanova, Ricker, Sandry
(3140) Sohn, Ryherd, Weldon, Kim
(3141) Christopher, Redick
(3142) Moffitt, Watson, Hutchison
(3143) Harrison, Engle
(3144) Riley, Okabe, Germine, Wilmer, Esterman, DeGutis
(3145) Ishiguro, Saito
(3146) Wiemers, Redick
(3147) Katz, Jones, Buschkuehl, Jonides, Jaeggi, Shah
(3148) Jones, Katz, Jaeggi, Buschkuehl, Shah
(3149) Sattizahn, Henry, Beilock

Visual Search I (3150-3165)
(3150) Walenchok, Goldinger, Hout
(3151) LeBlanc, Durand, Lauzon, Turgeon, Cousineau
(3152) Guevara Pinto, Papesh
(3153) Palmer, Bishop, Brewer, McCarley
(3154) Hout, Lopez, Robbins, Papesh
(3155) Miyazaki
(3156) Lanagan-Leitzel
(3157) Carrigan, Wardle, Rich
(3158) Cho
(3159) Abagis, Jonides
(3160) Burnham, Pasko
(3161) Chang, Cave, Menneer, Kaplan, Donnelly
(3162) Sztybel, Gibson
(3163) Kreykenbohm, Sager, McColeman, Spalek
(3164) Peltier, Becker
(3165) Phifer

Attention: Features and Objects (3166-3176)
(3166) Rodriguez, Wright, Chubb
(3167) Lu, Wright, Chubb
(3168) Nah, Shomstein
(3169) Winter, Chubb, Wright, Sperling
(3170) Bangert, Coane
(3171) Anderson
(3172) Harrison, Kang, Wilson
(3173) Hilchey, Rajsic, Huffman, Pratt
(3174) Tran, Hoffman
(3175) Kendall, Raffaelli, Kingstone, Todd
(3176) Nicora, Greenberg

Scene Processing (3177-3188)
(3177) Irwin, Robinson
(3178) Hayes, Henderson
(3179) Rosen, Mills, Dalmaijer, Dodd
(3180) Mills, Rosen, Dalmaijer, Dodd
(3181) Still, Hicks, Gall
(3182) Baker, Levin
(3183) Hunt, Hubbard, Anderson, Fehrman, Langston
(3184) Ahmed Wick, Garg, Alaoui Soce, Wolfe
(3185) Hutson, Magliano, Smith, Loschky
(3186) Nieuwenstein, Linde, Van Rijn
(3187) Mamus, Boduroglu
(3188) Zhang, Houpt, Harel

Language Production/Writing (3189-3204)
(3189) Schmank, James, Silver
(3190) Greenspon, Palmer, Pfordresher
(3191) Brill-Schuetz, Morgan-Short
(3192) Li, Graesser
(3193) Ellenblum, McCloskey
(3194) Shuster, Miozzo
(3195) White, Glidden, Abrams
(3196) Abrams, Davis, James
(3197) Oka, Kusumi
(3198) Frazer, O'Seaghdha
(3199) Chen

(3200) Colombo
(3201) Penta, Pearlmutter
(3202) Kopp, Rupp, Blaum, Wallace, Britt
(3203) Anderson, Dell
(3204) Goring, James, Schnackenberg

Psycholinguistics II (3205-3220)
(3205) Wlotko, Vandekerckhove, Choi, Kim, Kuperberg
(3206) Yip, Zhai
(3207) Yazbec, Kaschak, Borovsky, Jones, Lonigan
(3208) Fairchild, Papafragou
(3209) Holcomb, Dickey, Warren
(3210) Huebner, Willits
(3211) McPhedran, Taikh, Spinelli, Lupker
(3212) Sana, Park, Gagné, Spalding
(3213) Delaney-Busch, Morgan, Lau, Kuperberg
(3214) Zirnstein, Fricke, van Hell, Kroll
(3215) Brown, Delaney-Busch, Storch, Wlotko, Kuperberg
(3216) Mathis, Huette
(3122) Park, Sana, Gagne, Spalding
(3218) Djalal, Storms
(3219) Nakamura, Burke, Rossi
(3220) Ahn, Gollan, Abbott, Ferreira

Meaning/Semantics I (3221-3232)
(3221) Pham, Sanchez
(3222) Taylor, Davis, Rastle
(3223) Veldre, Andrews
(3224) Duris, Kumpan, Duffels, Siakaluk, Pexman
(3225) Di Lascio, Tiganj, Sederberg, Howard
(3226) Kenett, Anaki, Faust
(3227) Chen, Magid, Pyers
(3228) Whiteford Damerall
(3229) Bueno, Seigneuric, Megherbi
(3230) Lei, MacKeben, Morash
(3231) Huette, Viaud
(3232) Lou, Liu, Kaakinen, Li

Cognition and Technology (3233-3241)
(3233) Cory, Roskos
(3234) Holden, Moreau, Greene, Conway
(3235) Tran, Kimball
(3236) Larson, Hutchison
(3237) Parong, Mayer
(3238) Mettler, Massey, Kellman
(3239) Lalchandani, Healy
(3240) Shevenell, Gagne, Brown, Rekart
(3241) Onyper, Oakes, Dowley, O'Keeffe

Funding from US Department of Education
(3242) Higgins

PS, Social Media, and Science
(3243) Lewandowsky

SATURDAY, NOVEMBER 19, 2016
8 A.M.-12:00 NOON
Spoken Sessions (135-200)

Visual Working Memory (135-139) Grand Ballroom
8:00-8:15 AM Pratte
8:20-8:35 AM Matsukura, Vecera
8:40-8:55 AM Awh, Adam, Vogel
9:00-9:15 AM Saiki
9:20-9:35 AM Ricker

Cognitive Aging (140-145) Back Bay C & D
8:00-8:15 AM Bruine de Bruin, Parker, Strough
8:20-8:35 AM Henkel, Kris, Peters
8:40-8:55 AM Mitchell, Johnson
9:00-9:15 AM Kvavilashvili, Niedźwieńska, Kliegel
9:20-9:35 AM Ballesteros, Ruiz, Prieto, Toril, Peinado, Mayas, Reales
9:40-9:55 AM Rabi, Minda

Scene Processing (146-151) Republic
8:00-8:15 AM Vo, Boettcher
8:20-8:35 AM Fernandes, Castelhano
8:40-8:55 AM Luke, Darowski, Gale
9:00-9:15 AM Hutson, Magliano, Smith, Loschky
9:20-9:35 AM Broers, Potter, Nieuwenstein
9:40-9:55 AM Kneusel, Mozer

Eyewitness Identification (152-155) Independence
8:00-8:15 AM Dodson
8:20-8:35 AM Wixted, Killeen
8:40-8:55 AM McAdoo, Gronlund
9:00-9:15 AM Carlson C, Jones, Goodsell, Carlson M, Weatherford, Bednarz

Associative Learning (156-160) Back Bay B
8:00-8:15 AM Vickery
8:20-8:35 AM WITHDRAWN
8:40-8:55 AM Los, Kruijne, Meeter
9:00-9:15 AM Caplan, Burton, Lek
9:20-9:35 AM Healey, Kahana

Language Production and Writing (161-165) Back Bay A
8:00-8:15 AM Feldman, Vinson, Dale
8:20-8:35 AM Scaltritti, Pinet, Longcamp, Alario
8:40-8:55 AM Freund, Nozari
9:00-9:15 AM Humphreys, Oliver, Goldberg
9:20-9:35 AM Damian, Qu, Zhang

Symposium III: Language by Mouth and by Hand (166-171) Grand Ballroom
10:00-10:15 AM Berent, Dupuis, Brentari, Bat-El
10:20-10:35 AM Caselli, Cohen-Goldberg
10:40-10:55 AM Lillo-Martin
11:00-11:15 AM Senghas, Pyers, Plançon, Zola
11:20-11:35 AM Pyers, Perniss
11:40-11:55 AM Emmorey

Metamemory/Metacognition (172-176) Back Bay C & D
10:20-10:35 AM Cleary, Claxton
10:40-10:55 AM Undorf, Ackerman

11:00-11:15 AM Finn, Miele
11:20-11:35 AM Tekin, Roediger, III
11:40-11:55 AM Harley, Fellner, Candice, Thomas, Losch, Feuerbach

Working Memory I (177-181) Republic
10:20-10:35 AM Colzato
10:40-10:55 AM Logie
11:00-11:15 AM Shen, Reder, Popov, Delahay
11:20-11:35 AM Belopolsky, Olivers
11:40-11:55 AM Camos, Mora, Loaiza, Oftinger, Vergauwe

Recognition II (182-188) Independence
9:40-9:55 AM Peynircioğlu, Schwartz
10:00-10:15 AM Shiffrin, Nosofsky, Cao
10:20-10:35 AM Brainerd, Gomes, Moran, Reyna
10:40-10:55 AM WITHDRAWN
11:00-11:15 AM Goshen-Gottstein, Brezis, Bronfman, Yovel
11:20-11:35 AM Dubé, Westfall, Bauer
11:40-11:55 AM Criss, Cox, Aue, Hemmer, Wilson

Spatial Cognition (189-194) Back Bay B
10:00-10:15 AM Sutton, Vollebregt, Grogan
10:20-10:35 AM Yamamoto, Cheung, Baumann, Maczkowiack
10:40-10:55 AM Intraub, Ly, Vlachos, Beighley
11:00-11:15 AM Miller, Simmering
11:20-11:35 AM Leising, Cleland, Shanahan, Repeta, Wolf
11:40-11:55 AM Voyer D, Voyer S, Saint-Aubin

Animal Learning and Cognition (195-200) Back Bay A
10:00-10:15 AM McBeath, Wynne, Breeden, Raymond, Baxter, Bimonte-Nelson
10:20-10:35 AM Crystal, Pizzo, Kann, Wilson
10:40-10:55 AM Katz, Daniel, Forloines, Cook
11:00-11:15 AM Wright, Magnotti, Katz, Leonard, Vernouillet, Kelly
11:20-11:35 AM Chase
11:40-11:55 AM Pepperberg, Gray, Lesser, Hartsfield

Lunchtime Workshop: Non-Academic Careers, Public Garden (5th Floor)
12:00-1:30 PM Rauschenberger

SATURDAY, NOVEMBER 19, 2016

12:00 Noon-1:30 PM
POSTER SESSION IV (4001-4243)
HYNES CONVENTION CENTER, GRAND BALLROOM A-C

Multi-Sensory Integration (4001-4012)
(4001) Kessler, MacArthur, Trujillo-Silva, MacGillivray, Ripa, Hancock
(4002) Kwon, Hahn
(4003) Yokosawa, Tsushiro, Li, Asano
(4004) Magnotti, Beauchamp
(4005) Richoz, Hillairet de Boisferon, Quinn, Berger, Loevenbruck, Lewkowicz, Lee, Dole, Caldara, Pascalis
(4006) Dias, Rosenblum
(4007) Welles, Yee
(4008) Frissen, Mars
(4009) Stoll, Palluel-Germain, Pascalis
(4010) List, Feitelson
(4011) Unwalla, Ho, Lanzini, Cadieux, Shore
(4012) Nagai, Yokosawa, Asano

Event Cognition (4013-4024)
(4013) Huff, Brockhoff, Maurer, Papenmeier
(4014) Faber, D'Mello, Radvansky
(4015) Papenmeier, Meitz, Huff
(4016) Cohen, Adler, Goldberg, Nachimson
(4017) Kurby, Schramm, Zacks
(4018) George, Bulgarelli, Theoret, Weiss
(4019) Kenett, Allaham, Austerweil, Malle
(4020) Newberry, Bailey
(4021) Eisenberg, Zacks, Flores
(4022) Kosie, Baldwin
(4023) Bacon
(4024) Schweickert, Viau-Quesnel, Xi, Han

Spatial Cognition III (4025-4035)
(4025) Marchette, Ryan, Vass, Epstein
(4026) Du, Zhang, Mou
(4027) Kolesari, Lynch, Schmiedeler, Carlson
(4028) Fu, Roskos
(4029) Jansen, Kaltner, Memmert
(4030) Gardony, Taylor, Brunyé, Eddy, Wolford
(4031) Sjolund, Kelly
(4032) Ruginski, Gill, Padilla, Stefanucci, Cashdan
(4033) Meisinger, Barhorst-Cates, Creem-Regehr
(4034) Siegel, Kelly, George, Huney, Klesel
(4035) Smith, Almor

Recall III (4036-4050)
(4036) Hopper, Huber
(4037) Tan, Jiang
(4038) Jonker, MacLeod
(4039) WITHDRAWN
(4040) Broitman, Healey, Kahana
(4041) Chen, Wilson, Criss
(4042) Persaud, Hemmer
(4043) Szary, Jones, O'Donnell
(4044) Krefeld-Schwalb, Kellen
(4045) Christman, Lawson, London
(4046) Ross, Wilson, Sadil, Cowell
(4047) Lindsey, Logan
(4048) Scully, Hupbach
(4049) Ricks, Lieser, Meidinger
(4050) Soares, Storm

Testing Effects (4051-4065)
(4051) Nguyen, McDaniel
(4052) Clark, Bjork E, Bjork R
(4053) Peterson
(4054) Koch, Dennie
(4055) Manley, Davis, Chan, Szpunar
(4056) Barnes, Bradshaw
(4057) Wang, Raley, Butler
(4058) Davis, Myers, Chan
(4059) Fiechter, Benjamin
(4060) Sparck, Bjork E, Bjork R
(4061) Hong, Polyn, Fazio
(4062) St. Hilaire, Blumenthal, Butkevits, Fisenne, Geiger, Jennings
(4063) Paneerselvam, Callender
(4064) Bartek, Gorden, Lloyd
(4065) Crisostomo, Kimball

Implicit Memory (4066-4074)
(4066) Harada, Asano, Ngo, Hasher
(4067) Mathis, Souto Maior Osthoff, Pierce
(4068) Abel, Drummey, O'Hora, Cushing, Kan
(4069) Sadil, Huber, Cowell
(4070) Rey, Sauzeau, Guignard-Perret, Franco, Mazza
(4071) Hirsch, Was
(4072) Hernandez, Smith
(4073) Gorman, Chai
(4074) Van Hedger, Heald, Huang, Rutstein, Nusbaum

Recognition III (4075-4088)
(4075) Phillips, Kilb
(4076) DeBrock, Vlach
(4077) Kroneisen
(4078) Noe, Fischer-Baum
(4079) Díez-Álamo, Díez, Alonso, Fernandez
(4080) Jaeger, Gomides, Garcia, Gomide, Dobbins
(4081) Kim, Johnson, Johnson
(4082) Dianiska, Meissner
(4083) Chalmers
(4084) Freeman, Smith
(4085) Jeye, Slotnick
(4086) Smith, Mulligan
(4087) Taylor, Francis
(4088) Elliott, O'Rourke, Brewer

Memory and Reward, Motivation, and Emotion (4089-4099)
(4089) Lin, Reuter-Lorenz
(4090) Kotov, Pokidysheva, Kotova
(4091) De Forrest, Geraci
(4092) Sense, van den Berg, van Ravenzwaaij, van Rijn
(4093) Fujita, Kato
(4094) Ikeda, Jiang, Kakinuma, Tanaka
(4095) Mennie, Lane
(4096) Siegel, Castel
(4097) Jantz, Reuter-Lorenz
(4098) Chunharas, Ramachandran
(4099) Bowen, Kensinger

Autobiographical Memory II (4100-4110)
(4100) Nelson, Multhaup
(4101) Ikeda
(4102) Niven, Logie
(4103) Briere, Marche, von Baeyer
(4104) Özbek, Bohn, Berntsen
(4105) Palmer, Malmberg, Mansour, Erb
(4106) De Bartolo, Nahouli, Guerrini, Mazzoni
(4107) Kaya Kızılöz, Tekcan, Boduroglu
(4108) Wolters, Niven, Wang, Logie
(4109) Kraemer, McDonough, Gallo
(4110) Hosokawa, Muramoto

Consciousness (4111-4115)
(4111) Maillet, Seli, Schacter
(4112) Farley, Dixon
(4113) Yang, Tang, Xiang, Ma
(4114) Welhaf, Hood, Banks
(4115) Goldstein, Rivlin, Hassin

Cognitive Control III (4116-4127)
(4116) Aschenbrenner, Balota
(4117) Zhong, Xiong, Proctor, Vu
(4118) Kubik, Del Missier, Todorov, Mäntylä
(4119) Vaughn, Munson, Hernandez
(4120) Traut, Banich, Munakata
(4121) Hussey, Hsu, Ward, Kramer, Christianson
(4122) Schrijver, Barrouillet
(4123) Behmer Jr., Crump
(4124) Park, Junker, Cho, Shin
(4125) Bernhardt, Janzen, Baumler, Moffett, Ferraro
(4126) Dube, Chen, Eastwood, Fenske
(4127) Kinder, Tas, Buss

Working Memory III (4128-4144)
(4128) Van Stockum, Jr., DeCaro
(4129) Nespodzany, Shipstead
(4130) Solberg, Potts, Stevenson, Kustenbauder, Carlson
(4131) Dai, Thomas, Taylor
(4132) Cooke, Iordan, Moored, Katz, Buschkuehl, Jaeggi, Polk, Peltier, Jonides, Reuter-Lorenz
(4133) Ventura, Elliott, Baker, Shanahan
(4134) Ploran, Campagnolo, Ramirez, Azgar
(4135) Lilienthal
(4136) Katz, Thompson
(4137) Souza, Skóra
(4138) WITHDRAWN
(4139) Pritchard, Roth
(4140) Bies-Hernandez, Copeland, Larson
(4141) Niklaus, Rerko, Oberauer
(4142) Geigerman, Montoya, Verhaeghen
(4143) Evans, Steyvers, Brown
(4144) Xu, Wu

Psycholinguistics III (4145-4160)
(4145) Orihuela, Giraudo
(4146) Miles, Higby, Donnelly, Monge, Nuesi
(4147) Dickinson, Chamberland, Smith, Streich, Gallant, Graham
(4148) Siew, Vitevitch
(4149) Bulkes, Tanner

(4150) White D, Weatherhead, Besner, White K
(4151) Leinenger
(4152) Grey, Cosgrove, Van Hell
(4153) Desroches, Lawrence-Dewar, O'Neil
(4154) Newman
(4155) Martinez
(4156) Roembke, McMurray
(4157) Knoph, Buchanan, Kostic
(4158) Balass, Antalek
(4159) Raman I, Ikier, Raman E
(4160) Yallak, Akırmak, Guerzoni, Mungan

Speech Perception II (4161-4171)
(4161) Manheim, Lavie, Banai
(4162) Baese-Berk, Morrill
(4163) Hunter, Adams, Pisoni
(4164) Uddin, Heald, Van Hedger, Klos, Nusbaum
(4165) Jesse, Bartoli
(4166) Zhang, Holt
(4167) Chan, Hall
(4168) Zheng, Samuel
(4169) Rysling, Kingston, Staub, Cohen, Starns
(4170) Rosenblum, Dorsi, Dias, Ashkar, Sun
(4171) Shatzer, Shahin, Pitt

Bilingualism III (4172-4189)
(4172) Botezatu, Kroll
(4173) Li, Gollan
(4174) Lin Y, Lin P
(4175) Ivanova
(4176) Ratiu, Azuma
(4177) Malavanti, Anderson, Kurinec
(4178) Lam, Schroeder, Marian
(4179) Kim S, Lee, Kim Y, Kim J, Nam
(4180) Friesen, Jared, Whitford, Titone
(4181) Dogruel, Tosun
(4182) Buffington, Vaid, Lopez, Tosun
(4183) Comesaña, Demestre, Valente, Gonçalves, Soares, van Heuven, Ferré
(4184) Sarkis, Boland
(4185) Abrahamyan, Luce
(4186) Kato, Baese-Berk
(4187) McDonald, Edwards, Kaushanskaya
(4188) Comeaux, McDonald
(4189) Higby, Shafer, Vargas, Perez, Ramirez, Varela, Meza, Fernandez, Obler

Letter/Word Processing III (4190-4206)
(4190) Vasilev, Slattery, Kirkby, Angele
(4191) WITHDRAWN
(4192) Rimzhim, Johri, Kelty-Stephen, Fowler, Katz
(4193) Rice, Balass, Tokowicz
(4194) Chen, Perfetti, Fang
(4195) Harvey, Adelman
(4196) WITHDRAWN
(4197) Ktori, Mousikou, Rastle
(4198) WITHDRAWN
(4199) Carter, Luke
(4200) Binte Faizal, Khattab
(4201) Vasilev, Angele
(4202) Marcet, Perea, Baciero, Gomez
(4203) Meade, Midgley, Winsler, Holcomb
(4204) Trifonova, Adelman
(4205) Sawi, Rueckl
(4206) Degno, Soltész, Hepsomali, Donnelly, Liversedge

Discourse Processes I (4207-4221)
(4207) Weingartner, Masnick, Reider
(4208) Shears, Amirazizi, Lee, Kim, Jerome, Hamilton, Smith
(4209) Palena, Copeland
(4210) Takaki
(4211) Upadhyay, Houghton, Klin
(4212) WITHDRAWN
(4213) Higgs, Britt, Magliano
(4214) Donovan, Rapp
(4215) Gunawan, Copeland
(4216) Kopatich, Millis, Parker, Ray, Magliano
(4217) Benson, Kaakinen, Howard
(4218) Escudero, León, Moreno, Martín, Olmos, Ruiz, Lorch
(4219) Will, Vlach, Kendeou
(4220) Trude, Nozari
(4221) Kemp, Cash

Neural Mechanisms of Cognition II (4222-4228)
(4222) Smith, Cameron, Villalobos, Brust
(4223) Cunningham, Ward, Hussey, Paul, Kramer
(4224) Harris, Dux, Jones, Mattingley
(4225) Richmond, Zacks
(4226) Jodoin, Brodeur
(4227) Grossi
(4228) Baribault, Vandekerckhove

Reward, Motivation, and Decision Making (4229-4242)
(4229) Garner, Keep, Raymond
(4230) Mitko, Grosso, Liu, Morris, DeGutis, Esterman
(4231) Cane, Ferguson, Ulrich, Apperly
(4232) Hart, Schweitzer
(4233) Ozgurer, Tosun
(4234) Ybarra, Schatz, Cokely
(4235) Ballard, Neal
(4236) Galotti
(4237) Johnson, Duran, Nicholson
(4238) Clay, Harris, Clithero, Reed
(4239) Tiernan, Wright, Langford, Heatherly, Reece, Grishaw, Corley
(4240) Horn, van den Bos, Lorenz, Pleskac
(4241) West, Anderson

Funding from US Department of Education
(4242) Higgins

PS, Social Media, and Science
(4243) Lewandowsky

SATURDAY, NOVEMBER 19, 2016

1:30 P.M.-5:30 P.M.

Spoken Sessions (202-267)

Leading Edge Workshop: The Evolutionary and Psychological Significance of Play (202-207) Grand Ballroom

1:30-1:40 PM Miller
1:40-2:00 PM Hill
2:00-2:20 PM Pellis
2:20-2:40 PM de Voogt
2:40-3:00 PM Lillard
3:00-3:30 PM Miller

Recall I (208-212) Back Bay C & D

1:30-1:45 PM Oberauer, Souza
1:50-2:05 PM Barrouillet, O'Murchu, Dagry
2:10-2:25 PM Smith, Handy, Hernandez, Jacoby
2:30-2:45 PM McConnell, Zheng
2:50-3:05 PM Hanczakowski, Beaman, Jones

Speech Perception III (213-217) Republic

1:30-1:45 PM Remez, Giglio, Thomas
1:50-2:05 PM Gow, Ahlfors
2:10-2:25 PM Samuel
2:30-2:45 PM Mousikou, Rastle
2:50-3:05 PM Altieri, Lentz, Townsend, Wenger

Bilingualism I (218-222) Independence

1:30-1:45 PM Jared, Jouravlev
1:50-2:05 PM Lavric, Clarke, Monsell
2:10-2:25 PM Bélanger, Brederson, Morford
2:30-2:45 PM Hernandez, Vaughn, Munson
2:50-3:05 PM Paap, Mikulinsky, Masuda, Anders

Consciousness (223-227) Back Bay B

1:30-1:45 PM Isham, Mejia, Wulf
1:50-2:05 PM Jordano, Kane, Touron
2:10-2:25 PM Weinstein, Wilford
2:30-2:45 PM Mishra, Patil, Prasad
2:50-3:05 PM Stahl, Barth, Haider

Cognitive Skill Acquisition (228-233) Back Bay A

1:30-1:45 PM Altmann, Hambrick
1:50-2:05 PM Strobach, Schubert
2:10-2:25 PM Logan, Ulrich, Lindsey
2:30-2:45 PM Basak, O'Connell, Nashiro, Qin, Smith
2:50-3:05 PM Gray, Destefano
3:10-3:25 PM Xing, Corter, Zahner

Attention: Capture II (234-238) Grand Ballroom

3:50-4:05 PM Reeves, Nador
4:10-4:25 PM Gaspelin, Luck
4:30-4:45 PM Parmentier
4:50-5:05 PM Rusconi, Huber
5:10-5:25 PM WITHDRAWN

Human Learning and Instruction II (239-244) Back Bay C & D

3:30-3:45 PM Carvalho, Goldstone
3:50-4:05 PM Zaki, Rich, Stacy
4:10-4:25 PM Nosofsky, Meagher, Sanders, Lee
4:30-4:45 PM Rawson, Vaughn, Walsh, Dunlosky
4:50-5:05 PM Speelman, Shadbolt
5:10-5:25 PM McDermott, Zerr, Berg

Psycholinguistics II (245-250) Republic

3:30-3:45 PM Schroeder, Häikiö, Pagan, Hyönä, Liversedge
3:50-4:05 PM Boiteau, Smith, Almor
4:10-4:25 PM Pardo, Urmanche, Wilman, Wiener
4:30-4:45 PM Morett, Fraundorf
4:50-5:05 PM Foraker, Kalinowski, Wekenmann
5:10-5:25 PM Berent, Dupuis

Memory and Beliefs (251-256) Independence

3:30-3:45 PM Howe, Otgaar, Wang, Moldoveanu
3:50-4:05 PM Scoboria
4:10-4:25 PM Mazzoni
4:30-4:45 PM Conway, Akhtar, Hohl
4:50-5:05 PM Thomas, Smith, Mazerolle
5:10-5:25 PM Ecker

Neural Mechanisms of Cognition (257-262) Back Bay B

3:30-3:45 PM Lyle, Depue, Dombroski, Switala, Hopkins, Leppanen
3:50-4:05 PM Glass, Sinha
4:10-4:25 PM Santhi, Lazar, McCabe, Lo, Groeger, Dijk
4:30-4:45 PM Krampe, Wenderoth, Swinnen
4:50-5:05 PM Vankov, Bowers
5:10-5:25 PM Conway, Deocampo, Smith

Embodied Cognition (263-267) Back Bay A

3:50-4:05 PM Geuss, Creem-Regehr, Mohler
4:10-4:25 PM Inhoff, Gregg, Connine
4:30-4:45 PM Masson, Bub
4:50-5:05 PM Zeelenberg, Pecher
5:10-5:25 PM Dumitru

Business Meeting Liberty

5:10-6:00 PM Moore

SATURDAY, NOVEMBER 19, 2016
6:00 P.M.-7:30 P.M.
POSTER SESSION V (5001-5242)
HYNES CONVENTION CENTER, GRAND BALLROOM A-C

Audition (5001-5009)
(5001) Roark, Holt
(5002) Lotto, Traut
(5003) Ogg, Slevc, Idsardi
(5004) Zobel, Freyman, Sanders
(5005) Hove, Martinez
(5006) Neuhoff, Bochtler
(5007) Cabe, Neuhoff, Bochtler
(5008) Getz, Kubovy
(5009) Peynircioglu, Tatz, Brent, Wyatt

Music Cognition (5010-5019)
(5010) Fisher, Sprengelmeyer, Jentzsch
(5011) Halpern, Zioga, Shankleman, Lindsen, Pearce, Bhattacharya
(5012) Beck, Rieser
(5013) Plater, Zaki-Azat, Scheerer, Jones
(5014) Ting, Beck, Jackson, Van Hell
(5015) Knowles, Wong
(5016) Kleinsmith, Neill
(5017) Sherman, Maiti
(5018) Mantell, Forrester-Fronstin, McCarthy, Hancock
(5019) Scheurich, Zamm, Bogetti, Palmer

Numerical Cognition (5020-5035)
(5020) Marghetis, Goldstone, Landy
(5021) Garrett, Thorpe, Landy, Houpt, Eidels
(5022) WITHDRAWN
(5023) Bowman, Faulkenberry
(5024) Pinhas, Zaks-Ohayon, Tzelgov
(5025) Plummer, DeWolf, Bassok, Gordon, Holyoak
(5026) Lewis, Zax, Cordes
(5027) Goldman, Tzelgov, Gronau
(5028) Huebner, Muldner, LeFevre
(5029) Lazareva, Dressler, Berger, Gazes
(5030) Tronsky, Iannuccilli, Pollock
(5031) Braithwaite, Tian, Siegler
(5032) Alards-Tomalin, Leboe-McGowan J, Mondor, Leboe-McGowan L
(5033) Guedin, Castel, Fluss, Thevenot
(5034) Kaschak, Kowalsky
(5035) Hwang, Oh

Emotion and Cognition III (5036-5046)
(5036) Buetti, Ng, Sanders, Hur, Heller
(5037) Kim, Lee, Hahn
(5038) Hong, Kim
(5039) Puig, Szpunar
(5040) Tamayo, Pinilla, Rueda
(5041) Kawakami, Katahira
(5042) Pizzie, Kraemer
(5043) Hensley, Otani, Knoll
(5044) Kazanas, Altarriba
(5045) Kapucu, Rotello
(5046) Sovansky, Wiley

Cognitive Skill Acquisition (5047-5051)
(5047) Frank, Macnamara
(5048) Kranz, Hussey, Baniqued, Cunningham, Kramer
(5049) Peralta, Smith, Helie, Ell
(5050) Shamloo, Ell, Helie
(5051) Tran, Pashler

Eyewitness Identification (5052-5063)
(5052) Hancock, Jent
(5053) Stepan, Berkowitz, Mansour, Peltier, Fenn
(5054) Kurinec, Malavanti, Nesbitt, Weaver, III
(5055) Bednarz, Carlson C, Carlson M, Weatherford, Young, Wooten
(5056) Key, Allan, Cokely, Gronlund
(5057) Kim, Kwon, Vo, Ceci
(5058) DeFranco, Zaragoza
(5059) Eslick, Baumgartner, Strandberg
(5060) Wetmore, McAdoo, Gronlund, Neuschatz
(5061) Havard, Humprhies, Memon
(5062) Wilson, Vo, Wixted
(5063) Lin, Roediger, III

Human Learning and Instruction III (5064-5079)
(5064) Lim, Heng, Nunes, Karpicke
(5065) Potts, Shanks
(5066) Soderstrom, Sparck, Bjork
(5067) Pan, Rickard
(5068) Martin, Engle
(5069) Zamary, Rawson
(5070) Bates, DeLosh
(5071) Xu, Coley
(5072) Li, Brown, Zhao, Rueckl
(5073) Coane, Minear, Cowen, Boland, Cooney
(5074) Goodman, Seymour
(5075) Seo, Kalish
(5076) Terao, Takahashi, Kiyokawa
(5077) Visser, Beek, Raijmakers
(5078) Wissman
(5079) Phelan, Toppino

Metamemory/Metacognition III (5080-5091)
(5080) Ramanathan, Lindsey, Yao, Galindo, Perez
(5082) Rhodes, DeLozier, Wehe
(5083) Hargis, Castel, Bell
(5084) Kelemen, Bassili
(5085) Besken
(5086) Martín-Luengo, Shtyrov, Myachykov
(5087) Enam, McDonough, Eakin
(5088) Griffiths, Higham
(5089) Martin, Altarriba
(5090) Chua, Ahmed, Garcia
(5091) Thorup, England, Wikowsky

Working Memory IV (5092-5101)
(5092) Rothweiler, Goodwin, Kotansky
(5093) Mathy, Chekaf, Cowan
(5094) Sanada, Ueno, Allen
(5095) Korenz, Miller
(5096) Tobin, Kalinowski, Race
(5097) Ngiam, Goodbourn
(5098) Doherty, Rhodes, Barrouillet, Camos, Cowan, Naveh-Benjamin, Logie
(5099) Griffin, Benjamin
(5100) Thalmann, Souza, Oberauer
(5101) Shepherdson, Oberauer

Meaning/Semantics II (5102-5111)
(5102) Hollis, Westbury
(5103) Fitneva, Christiansen
(5104) Semenuks, Phillips, Dalca, Kim, Boroditsky
(5105) Xu, Malt, Srinivasan
(5106) Lawrence, Hwang, Lin, Hagen, Jaeggi
(5107) Al-Azary, Katz
(5108) Davis, Libben, Segalowitz
(5109) White, Verheyen, Malt, Storms
(5110) Eddington, Tokowicz
(5111) Neal, Wiemer

Discourse Processes II (5112-5126)
(5112) Smith, Edwards, Booth, McNorgan
(5113) Campbell, Raney
(5114) Stiegler-Balfour, Jakobsen, Stroud, Daniel
(5115) Hannon
(5116) Boveri, Millis
(5117) Miller, Raney
(5118) Blasko, Kazmerski, Pointon
(5119) Chin, Green, Landi, Irwin, Naigles
(5120) Liu, Fox Tree
(5121) Tolins, Fox Tree
(5122) Butterfuss, Kendeou
(5123) Hall, Ferretti, Singer
(5124) Bou Mansour, Crews, Jacobsen, Larsen, Magats, Monaghan, Park, Van Der Wege
(5125) Litcofsky, Van Hell
(5126) Blair, Goldman

Psycholinguistics IV (5127-5139)
(5127) Zhou, Garnsey, Christianson
(5128) Zhou, Yao, Christianson
(5129) Rysling, Rotello, Dillon
(5130) Reyes, Tanner
(5131) Tooley
(5132) Randall, Xu, Emerson, MacNeal, Fiallo
(5133) Qian
(5134) Cintron-Valentin, Ellis
(5135) Parshina, Ricker, Che, Obeid, Brooks
(5136) Mirkovic, Gaskell
(5137) Saryazdi, Chambers
(5138) Boltz, Mangigian, Allen
(5139) Snefjella, Connolly

Change Detection (5140-5152)
(5140) Cleland, Malone, Lee, Wolf, Taylor, Leising
(5141) Wiradhany, Nieuwenstein
(5142) Sager, Kreykenbohm, Wish, Spalek
(5143) Shi, Wright
(5144) Izoutcheev, Yovel, Gronau
(5145) VanWormer, Blalock, Powers
(5146) Roberge-Vallieres, Hodgetts, Vachon, Tremblay
(5147) Baroja, Bouzas
(5148) Donaldson, Yamamoto, Allard
(5149) Taylor, Witt, Pratt
(5150) Noll, O'Haver, Gregg
(5151) Hall, Daly, Gaston, Dickerson
(5152) Costello, Buss, Kaplan, Fera

Visual Search II (5153-5166)
(5153) Hebert, Goldinger
(5154) Ericson, Kravitz, Mitroff
(5155) Solman, Kingstone
(5156) Savage, Tatler, Potter
(5157) Dunn, White, Kemp
(5158) Wall, Brown
(5159) Williams, Drew
(5160) Lagroix, Boyd, Jankovic, Richardson, Di Lollo, Spalek
(5161) Drisdelle, West, Jolicoeur
(5162) Doro, Jolicoeur, Dell'Acqua
(5163) Van der Stigchel, Van der Stoep, Postma, Schut
(5164) Becker, Gagnon, Peltier
(5165) Ng, Buetti, Lleras
(5166) Prince, McCarley

Cognitive Control IV (5167-5178)
(5167) Buss, Hazeltine, Magnotta, Spencer
(5168) WITHDRAWN
(5169) Pieczykolan, Huestegge
(5170) Huestegge, Pieczykolan
(5171) Hoffmann, Pieczykolan, Huestegge
(5172) Schacherer, Hazeltine
(5173) Dowman, Liszczynsyj, Ebert, Wolf
(5174) Chen, Seibold, Zhong, Müsseler, Proctor
(5175) Griffin-Oliver, Proctor
(5176) Zheng, Charette
(5177) Földes, Philipp, Badets, Koch
(5178) Yamani, Karpinsky, Morley, Horrey

Automatic Processing (5179-5194)
(5179) Neumann, Rochford, Nkrumah, Russell
(5180) Green, Locker, Boyer, Sturz
(5181) Shimomura, Inukai
(5182) Xiong, Proctor
(5183) Max, Lagroix, Di Lollo, Tsal, Spalek
(5184) Garza, Heredia, Cieslicka
(5185) Houston, Allen, Lien, Loth, Vorster, Luciano
(5186) Monachesi, Laeng, Pecchinenda
(5187) Marin A, Marin A, Munoz, Yep
(5188) Christensen, Nuttall, Koci, Wade, Kotter, Lundwall
(5189) Meyerhoff, Papenmeier, Huff
(5190) Sharma
(5191) Giesen, Rothermund

(5192) McGill, Elliott
(5193) Steele, Fisher, Novachek, Retarides, Vernon, Orr, Martin
(5194) Redden, Ivanoff, Christie, Klein

Judgment (5195-5212)
(5195) Chaney, Parente
(5196) Simsek, Buckmann
(5197) Nakamura
(5198) Chesney, Obrecht, Salim
(5199) Swan, Spears, Zamanzadeh, Revlin
(5200) Ellinghaus
(5201) Cooke, Kusev
(5202) Demnitz, Joslyn
(5203) Leong, McKenzie, Müller-Trede, Sher
(5204) Nguyen, Dougherty, Buttaccio
(5205) Kary, Newell, Donkin
(5206) Corey, Hayakawa, Foucart, Aparici, Botella, Keysar, Costa
(5207) Sagi
(5208) Wismer, Bohil
(5209) Weser, Proffitt
(5210) Basnight-Brown
(5211) Heit, Kelly, Rotello
(5212) Tousignant, Bodner

Statistics and Methodology (5213-5226)
(5213) White, Servant, Logan
(5214) Cooper, Braver
(5215) Cassey, Logan
(5216) Robbins, Cunningham, MacDonald, Hout
(5217) Hofer, Pitt, Myung, Nelson
(5218) Sutton
(5219) Chrabaszcz, Tidwell, Dougherty
(5220) Ksander, Madan, Kark, Kensinger
(5221) Rhodes, Parra, Cowan, Logie
(5223) Botella, Suero, Privado
(5225) Paxton, Griffiths
(5226) Etz, Vandekerckhove

Decision Making III (5227-5242)
(5227) Hotaling, Rieskamp, Gluth
(5228) Henninger, Glöckner, Hilbig, Jekel
(5229) Atchley, Tran, Salehinejad
(5230) Cataldo, Cohen, Isbell, Starns
(5231) Pang, Byrne
(5232) Bedell, Lydick, Treat, Dawley, Collins, Wilke
(5233) Kapatsinski, Harmon
(5234) Dunn, Risko
(5235) Chubala, Jamieson
(5236) Naefgen, Dambacher, Janczyk
(5237) Schneider, Schwarz, Koole
(5238) Voskuilen, Ratcliff
(5239) Fang, Schooler
(5240) Sekścińska
(5241) Sumner, Lee, Sarnecka

Funding from US Department of Education
(5242) Higgins

SUNDAY, NOVEMBER 20, 2016

8:00 A.M.-12:00 Noon
Spoken Sessions (268-333)

Letter/Word Processing II (268-272) Grand Ballroom
8:00-8:15 AM Palinski, Smith
8:20-8:35 AM Dumay, Massol
8:40-8:55 AM Kinoshita, Norris
9:00-9:15 AM Content, Chetail
9:20-9:35 AM Fischer-Baum, Englebretson

Decision Making III (273-278) Back Bay C & D
8:00-8:15 AM Griffiths
8:20-8:35 AM Trueblood, Holmes, Heathcote
8:40-8:55 AM Nelson, Crupi, Meder, Cevolani, Tentori
9:00-9:15 AM Simsek, Lichtenberg, Wheeler, Katsikopoulos
9:20-9:35 AM Luan, Tan, Schooler
9:40-9:55 AM Beran, Kelly A, Perdue, Whitham, Love, Luk, Kelly V, Parrish

Recognition III (279-283) Republic
8:00-8:15 AM Flombaum, Schurgin
8:20-8:35 AM Hayes, Dunn, Joubert, Taylor
8:40-8:55 AM Dennis, Sreekumar, Evans, Garrett
9:00-9:15 AM Garcia-Marques, Marques, Orghian
9:20-9:35 AM Singh, Howard

Cognitive Control II (284-289) Independence
8:00-8:15 AM Biggs, Seech, Littman, Caldwell
8:20-8:35 AM Harrison, Hicks, Draheim, Tsukahara, Engle
8:40-8:55 AM Mordkoff, Dewald, Stewart
9:00-9:15 AM Yamaguchi, Wall, Hommel
9:20-9:35 AM Schneider
9:40-9:55 AM Monsell, Lavric

Reading II (290-294) Back Bay B
8:00-8:15 AM Slattery, Yates, Parker
8:20-8:35 AM Sheridan
8:40-8:55 AM Schotter, Leinenger
9:00-9:15 AM Adelman
9:20-9:35 AM McMurray, Roembke, Freedberg, Hazeltine

Action (295-301) Liberty
8:00-8:15 AM Enns, Pesquita, Chapman
8:20-8:35 AM Brooks, Qadri, Cook
8:40-8:55 AM Fajen, Barton, Steinmetz, Matthis
9:00-9:15 AM Slifkin, Eder, Dey, Byrne
9:20-9:35 AM Eitam
9:40-9:55 AM Jordan, Bai, Schloesser
10:00-10:15 AM Rieser, Davis, Weaver, Khuu, Johnson, Narasimham, Erdemir

Visual Search II (302-307) Grand Ballroom

10:00-10:15 AM Irons, Leber
10:20-10:35 AM Godwin, Fitzsimmons, Weal, Liversedge, Hout, Menneer
10:40-10:55 AM Drew
11:00-11:15 AM Goh, Bode, Bennett, Little
11:20-11:35 AM Max, Lagroix, Spalek, Di Lollo, Tsal
11:40-11:55 AM Mitroff, Ericson, Kravitz

Working Memory II (308-313) Republic

10:00-10:15 AM Vergauwe, Langerock
10:20-10:35 AM Marche, McIntyre, Claypool, Briere
10:40-10:55 AM Loaiza
11:00-11:15 AM Morey, Mareva, Lelonkiewicz
11:20-11:35 AM Tolan, Tehan, Arber
11:40-11:55 AM von Bastian, De Simoni

Bilingualism II (314-318) Back Bay C & D

10:20-10:35 AM Gollan, Goldrick
10:40-10:55 AM Gullifer, Titone
11:00-11:15 AM Duyck, Dirix, Cop, Drieghe, Keuleers
11:20-11:35 AM Grainger, Declerck, Marzouki
11:40-11:55 AM Penalver, Francis

Recall II (319-323) Independence

10:20-10:35 AM Howard, Belevski, Eidels, Dennis
10:40-10:55 AM Mewhort, Shabahang, Franklin
11:00-11:15 AM Negley, Kelley
11:20-11:35 AM Jones, Delaney
11:40-11:55 AM Stevenson, Carlson

Human Learning and Instruction III (324-329) Back Bay B

10:00-10:15 AM Kornell, Vaughn
10:20-10:35 AM Watter, Ptok, Thomson, Humphreys
10:40-10:55 AM Kellman, Massey, Mettler
11:00-11:15 AM Liefooghe, De Houwer
11:20-11:35 AM Wohldmann, Alegria
11:40-11:55 AM Verbruggen, McLaren, Pereg, Meiran

Emotion and Cognition (330-333) Liberty

10:40-10:55 AM WITHDRAWN
11:00-11:15 AM Pecchinenda, Petrucci
11:20-11:35 AM Most, Onie
11:40-11:55 AM Iran-Nejad, Stager, Bordbar

Attention: Capture I
Grand Ballroom, Friday Morning, 8:00-9:40
Chaired by Raymond M. Klein, Dalhousie University

8:00-8:15 (1)

Global and Local Activation of the Oculomotor System by Arrays of Uninformative Peripheral Visual Stimuli. TARIQ HASSAN, JOHN CHRISTIE and RAYMOND M. KLEIN, *Dalhousie University* (Presented by Raymond Klein) — We previously demonstrated (Christie et al., 2015, EBR) that an uninformative array of visual prime stimuli generates facilitation near the center of the prime array within 50 ms. In contrast to findings from the saccade averaging and remote distractor paradigms, this "global," or center of gravity, effect does not break down as the separation of the prime's elements increases. In the new research presented here we generalize our fecund saccadic priming paradigm by permitting a more random selection of prime and target locations. And we extend it to allow the exploration of filtering based on task-related attentional control settings. In this more generalized situation we continue to find global priming effects that are insensitive to the separation of the prime's elements. Immediately after presentation of the prime array there is a local inhibitory effect at the location of each element in the prime array. Because, in contrast to the global facilitation effect, this effect has a relatively narrow spatial gradient and decays rapidly we attribute it to forward masking. We attribute the positive priming at the center of gravity of the prime's elements to an oculomotor winner-take-all computation, possibly taking place in the superior colliculus.
Email: Raymond Klein, ray.klein@dal.

8:20-8:35 (2)

The Flanker Task Reveals Sensory Interactions Rather Than Limitations of Selective Attention. CATHLEEN M. MOORE, *University of Iowa*, JOHN PALMER, *University of Washington* — In the flanker task, observers respond to a visual stimulus at a cued location while not responding to otherwise identical stimuli at other locations. Performance declines as the separation between stimuli decreases. We show that this separation effect is larger than is predicted by a model that attributes the flanker effect to limitations in localizing a single stimulus. However, measuring localization for pairs of stimuli as a function of their separation shows an effect similar to the separation effect found in the flanker task. These results suggest that flanker effects reflect sensory interactions between stimuli (crowding), rather than limits of selective attention alone. Further experiments explore the contributions of both sensory interactions and selective attention in the flanker task.
Email: Cathleen Moore, cathleen-moore@uiowa.edu

8:40-8:55 (3)

People Look at the Object They Fear: Oculomotor Capture by Stimuli That Signal Threat. JAN THEEUWES, *Vrije Universiteit Amsterdam, The Netherlands*, TOM NISSENS, *Vrije Universiteit Amsterdam and Ghent University,* MICHEL FAILING, *Vrije Universiteit Amsterdam* — In order to adequately deal with threat, it is important that potential danger is immediately detected and acted upon. It is known that people covertly attend to threatening stimuli even when it is not beneficial for the task. In the current study we examined overt selection and investigated whether eye movements are affected by the presence of an object that signals threat. We demonstrate that stimuli capture the eyes more often when they merely signal the possibility of receiving an electric shock compared to when they signal no shock. Capture occurred even though this threat-signaling stimulus was neither physically salient nor task relevant. Crucially, even though fixating the threat-related stimulus made it more likely to receive a shock, our results suggest participants could not help but doing it. Our findings indicate that the presence of a stimulus that merely signals the possibility of receiving a shock, is prioritized in selection eliciting oculomotor capture even when selection ultimately results in the realization of the threat. Consistent with the idea that threat affects selection at a very early state of processing, capture was particularly pronounced in the fastest saccades.
Email: Jan Theeuwes, J.Theeuwes@psy.vu.nl

9:00-9:15 (4)

The Effect of a Salient Disfiguring Feature on Overt and Covert Attention to Faces. LUC BOUTSEN, *Aston University*, NATHAN PEARSON, *University of Warwick*, MARTIN JÜTTNER, *Aston University* — Facial disfigurements can generate avoidance behaviour in observers, yet little is known about the underlying attentional mechanisms. We studied overt and covert orienting to faces when these contained a simulated unilateral disfiguring feature (a 'port-wine stain'), a non-disfiguring feature (occluder), or no salient feature. We asked whether a disfiguring feature could capture (c)overt attention differently compared to a non-disfiguring feature, as measured through eye movements during free exploration (Experiment 1) and in a spatial cueing task with peripheral and foveal distractor faces (Experiments 2-3). In Experiment 1, fixations were directed towards the side of disfiguring and occluding features, suggesting attentional capture. This effect was stronger for left facial features, suggesting a within-face spatial bias. Further, cueing attention to a distractor face caused interference when it contained a disfiguring feature (Experiment 2), especially when it was located near the target stimulus (Experiment 3). We suggest that the attentional response to facial disfigurements can differ from that by other salient features and we discuss these results in the context of disease avoidance mechanisms.
Email: Luc Boutsen, l.boutsen@aston.ac.uk

9:20-9:35 (5)

Let's Not Dwell on the Past: Variations in Abrupt Onset Capture are Independent of Search Difficulty. CHARLES L. FOLK, *Villanova University*, ROGER REMINGTON, *University of Queensland* — According to Contingent Attentional Capture (CAC) theory, variations in the magnitude of cueing effects produced by noninformative abrupt onset cues (i.e., attentional capture) are attributed to top-down control settings. Against this account, Gaspelin, et al. (2016) presented evidence suggesting that the modulation of onset capture by task goals only occurs for easy search when the target is a salient feature singleton. They argue that abrupt onsets always produce purely stimulus-driven attentional capture, and that variations in the magnitude of

cuing effects are related to how long attention dwells at the cued location on the target display, which is determined by search difficulty. We report a series of spatial cuing studies showing that, consistent with CAC, contextual variables (e.g., changes in the proportion of easy and hard search trials or the presence of target-matching cues) influence the magnitude of onset capture independent of search difficulty, effectively disconfirming the difficulty/dwell time hypothesis.
Email: Charles L. Folk, charles.folk@villanova.edu

Human Learning and Instruction I
Back Bay C & D, Friday Morning, 8:00-9:40
Chaired by Lisa K. Fazio, Vanderbilt University

8:00-8:15 (6)
Retrieval Practice in Middle School Teacher Talk. LISA K. FAZIO, *Vanderbilt University* — Activities that involve retrieving information from memory, such as answering short answer questions, are more effective at improving learning than restudying, concept mapping, and other study techniques. These findings suggest that retrieval practice opportunities provided during lectures and classroom discussions should also have positive effects, but the idea has not yet been empirically tested. We examined videotapes of 40 middle school mathematics classrooms to identify how often teachers ask questions that require retrieval and whether the use of retrieval questions is related to student learning. We found wide variability in the frequency and type of questions asked across classrooms. On average, almost half of the non-classroom management questions provided an opportunity for retrieval practice. However, we found no connection between the number of retrieval questions asked and students' growth on a test of mathematics achievement. Our findings highlight the difficulties in moving from laboratory research to teacher practice.
Email: Lisa Fazio, lisa.fazio@vanderbilt.edu

8:20-8:35 (7)
A Multi-Site Investigation of Mind Wandering in the Classroom. MICHAEL J. KANE, *University of North Carolina at Greensboro*, JOHN H. LURQUIN, *University of Colorado Boulder*, PAUL J. SILVIA and BRIDGET A. SMEEKENS, *University of North Carolina at Greensboro*, NICHOLAS P. CARRUTH and AKIRA MIYAKE, *University of Colorado Boulder* — Approximately 900 students enrolled in introductory psychology and psychological statistics courses at two public universities completed a semester-long study. During the second week of class, students completed on-line surveys about their academic behaviors, goals, interests, motivations, and beliefs. During one in-class lecture before the first course exam, and one in-class lecture shortly after the first exam, students recorded their immediately preceding thought content at 6-9 unpredictable thought probes (a ringing bell); after the lecture they also reported on some in-class behaviors. Each thought-probe report indicated either on-task thinking or one of several categories of off-task thought. At the semester's end, students completed on-line surveys about their in-class behaviors and interest in the material; they also permitted release of their course grades. We report rates of different mind-wandering types, their prediction of course outcomes, and multilevel-modeling tests of their mediation of the associations between assessed academic "traits" and course outcomes.
Email: Michael J. Kane, mjkane@uncg.edu

8:40-8:55 (8)
Reducing Mind-Wandering and Increasing Learning: When and for Whom Utility-Value Interventions Are Beneficial. AKIRA MIYAKE and CLAUDIA C. VON BASTIAN, *University of Colorado Boulder*, BRIDGET A. SMEEKENS, *University of North Carolina at Greensboro*, NICHOLAS P. CARRUTH and JOHN H. LURQUIN, *University of Colorado Boulder*, MICHAEL J. KANE, *University of North Carolina at Greensboro* — We examined whether two utility-value interventions—one directed and one self-generated—would reduce students' mind-wandering during a lecture and thereby help increase their learning and interests of the lecture content. A total of 400 students watched either a brief video that directly communicated the everyday utility of statistics or a control video. They then wrote either an essay about why learning statistics may be useful to them personally or a control essay. Subjects then watched a 50-min video lecture on statistics while occasionally responding to mind-wandering probes. On the basis of earlier laboratory studies using similar interventions (Canning & Harackiewicz, 2015), we hypothesized that self-generated utility-value information would have more beneficial effects on subjects' learning and interests than directly communicated (video-based) information, but that such effects of utility-value interventions would be moderated by some individual differences variables (e.g., levels of baseline interest and confidence). We also hypothesized that the beneficial intervention effects on student learning and interests would be mediated, at least in part, by the frequencies of during-lecture mind-wandering.
Email: Akira Miyake, akira.miyake@colorado.edu

9:00-9:15 (9)
A Proposal for a Radical Change in the Co[illegible]nt and Teaching of School Arithmetic. PATRICIA [illegible]AGGETT, *New Mexico State University*, ANDRZEJ [illegible]IFEWICHT, *University of Colorado emeritus* — Mode[illegible] sc[illegible]rithmetic evolved from methods used to teach 19[illegible]h cen[illegible] accountants. Today its scope is broader, but the se[illegible]e of topics remains almost the same. The goal of te[illegible]ing [illegible]thmetic has changed from achieving speed and acc[illegible] written computation to understanding mathemati[illegible] pr[illegible]iples and the structure of algorithms. Attempts [illegible]ve b[illegible]n made to reach this goal just by changing pedago[illegible]. Unfor[illegible]nately the new pedagogy treats arithmetic as a t[illegible]pic [illegible]e studied by not as skills to be used. We propose [illegible]adically different sequence of topics, and some changes i[illegible]tent t[illegible]at teach arithmetic as a tool for solving proble[illegible] one [illegible]t works equally well in low-tech and high-tech [illegible]vir[illegible]ments. We provide a theoretical justification for the c[illegible]ge and give examples of how this sequence and content can [illegible]e[illegible]n classrooms, based on actual lessons taught according to [illegible]new schema.
Email: Patricia Baggett, baggett@nmsu.edu

WITHDRAWN

9:20-9:35 (10)

A Perceptual-Cognitive Mapping Approach to Information Visualization. KAREN B. SCHLOSS, *University of Wisconsin - Madison* — To understand information presented in visual displays (e.g., graphs, maps, and signs), an observer must translate perceptual input into abstract representations. I will present the Perceptual-Cognitive Mapping (PCM) framework, which considers interpreting visual displays as a problem of analogy. In it, there are two forms of mappings between perceptual features and abstract concepts: (1) *internal mappings* existing in the observer's mind and (2) *stimulus mappings* defined within a visual display through legends or labels. The prediction is that observers will be faster at interpreting visual displays when internal and stimulus mappings are structurally consistent. Therefore, determining which stimulus mappings facilitate fastest response times will reveal the nature of internal mappings. Results from two studies on color-concept mappings in data visualizations support the PCM approach, revealing robust lightness-quantity internal mappings (Dark-is-More bias) and the ability to learn relation-based *ad hoc* mappings. Understanding how observers process visual displays will facilitate visual communication.
Email: Karen B. Schloss, karenschloss@gmail.com

Reading I
Republic, Friday Morning, 8:00-9:40
Chaired by Jukka Hyönä, University of Turku

8:00-8:15 (11)

Morphological Structure Influences the Initial Landing Position in Words During Reading Finnish. JUKKA HYÖNÄ, *University of Turku*, MING YAN, *University of Potsdam*, SEPPO VAINIO, *University of Turku* — The preferred viewing location in words (Rayner, 1979) during reading is near the word center. Parafoveal word length information is utilized to guide the eyes toward it. A recent study of Yan et al. (2014) demonstrated that the word's morphological structure may also be used in saccadic targeting. The study was conducted in a morphologically rich language, Uighur. The present study aimed at replicating their main findings in another morphologically rich language, Finnish. Similarly to Yan et al., it was found that the initial fixation landed closer to the word beginning for morphologically complex than monomorphemic words. Word frequency, saccade launch site, and word length were also found to influence the initial landing position. It is concluded that in addition to low-level factors (word length and saccade launch site) also higher-level factors related to the word's morphological structure and frequency may be utilized in saccade programming during reading.
Email: Jukka Hyönä, hyona@utu.fi

8:20-8:35 (12)

A Model of Eye Movement Control During Chinese Reading. XINGSHAN LI, *Institute of Psychology, Chinese Academy of Sciences* — Popular computational models of eye movement control during reading of alphabetic language experienced great challenges when modeling Chinese reading. In reading of alphabetic language, there are spaces between words to demarcate word boundaries. Thus, readers could perceive word boundaries with parafoveal vision and then move their eyes to the center of a word. Most models depend on this assumption when planning where to move their eyes. However, Chinese readers cannot do so because there are no spaces between words in Chinese text. To understand how Chinese readers control their eye movements, we constructed an eye movement control model during Chinese reading. In this model, we assumed that Chinese readers plan their eye movements using a processing based strategy: they estimate the amount of information they can process at a given fixation, and then move their eyes to a location that carries novel information. To address the word segmentation problem, this model adopted some important assumptions of a model of word recognition and segmentation during Chinese reading (Li, Rayner, Cave, 2009). The model successfully simulated many important findings during Chinese reading.
Email: Xingshan Li, lixs@psych.ac.cn

8:40-8:55 (13)

Age of Acquisition Effects in Arabic Reading. DENIS DRIEGHE, SANA BOUAMAMA, EHAB W. HERMENA and SIMON P. LIVERSEDGE, *University of Southampton* — The Age of Acquisition (AoA) effect on word recognition processes has been found in multiple visual word recognition tasks and during reading where an early acquired word receives shorter fixation durations than a late acquired word (Juhasz & Rayner, 2006). We aimed to investigate the AoA effect in Arabic but were confronted with the lack of a suitable database. After an extensive survey of teaching instruction methods across the Arabic world, we established that instruction at specific ages was tightly linked with specific chapters of the Quran and this was consistent across countries. A stimulus set was created by selecting words based on their first appearance in early versus late taught chapters of the Quran, and matched on word length and frequency. A subsequent eye-tracking experiment during reading showed for the first time the AoA effect in Arabic through shorter fixation durations on early compared to late acquired words.
Email: Denis Drieghe, d.drieghe@soton.ac.uk

9:00-9:15 (14)

Implied Reading Direction and Prioritization of Letters for Identification. ALEX O. HOLCOMBE, KIM RANSLEY, ELIZABETH NGUYEN and PATRICK T. GOODBOURN, *The University of Sydney* — When two letters are briefly presented, accuracy is often higher for identifying the letter on the left. This is often attributed to a right-hemisphere attention advantage. We assessed the role of implied reading direction by (1) testing bilinguals in both Arabic and English, and (2) using rotated English letters. Each trial comprised two concurrent RSVP streams of letters, with the letters to be identified cued by rings presented simultaneously around both streams. Canonically-oriented letters yielded a sizeable left-side advantage (left, 72% accurate; right, 45%) that disappeared when letters were rotated to face to the left (n=54). Testing bilinguals (n=17) yielded a left advantage in English, but no left advantage in Arabic. Modeling of participants' errors (reports of letters before or after the cue) indicates that selection was approximately simultaneous for

the two sides, ruling out the theory that the letter on one side was sampled first before a shift of attention to the other letter. Thus, the poorer performance on one side reflects the dynamics of a post-sampling process, such as tokenization or memory consolidation. Implied reading direction appears to determine the letter prioritized at a high-level bottleneck.
Email: Alex Holcombe, alex.holcombe@sydney.edu.au

9:20-9:35 (15)

The Effect of Lexical Predictability on Early Eye Movement Measures Requires Valid Parafoveal Preview, but the Effect of Frequency Does Not. ADRIAN STAUB, *University of Massachusetts Amherst* — A word's predictability and its context-independent frequency have robust, additive effects on the early eye movement measures of first fixation duration and gaze duration during normal reading. However, previous display change studies have found that predictability effects seem to disappear with invalid parafoveal preview (e.g., Balota, Pollatsek, & Rayner, 1985). The effect of word frequency, on the other hand, appears to be undiminished by invalid preview (e.g., Reingold, Reichle, Glaholt, & Sheridan, 2012). The present eye movement experiment (N = 79) directly investigated this apparent difference by means of a 2 (predictability) x 2 (frequency) x 2 (preview validity) design. With valid preview, the usual effects of both predictability and frequency were in evidence in both first fixation duration and gaze duration on the target word. With invalid preview of an unrelated word, however, only frequency effects were in evidence. This result directly confirms the dissociation that is implicit in the previous findings. As suggested by Staub (2015), predictability may primarily influence the early orthographic processing that takes place during parafoveal viewing of a word during reading.
Email: Adrian Staub, astaub@psych.umass.edu

Speech Perception I
Independence, Friday Morning, 8:00-9:40
Chaired by Erin M. Ingvalson, Florida State University

8:00-8:15 (16)

Vocabulary and Working Memory Influences on Older and Younger Adults' Perception of Accented Speech. ERIN M. INGVALSON, KAITLIN L. LANSFORD, VALERIYA FEDEROVA and GABRIEL FERNANDEZ, *Florida State University* — An area of growing interest is older adults' ability to perceive difficult speech, including speech embedded in noise. Previous work has indicated that working memory capacity and receptive vocabulary may play a larger role for older adults' perception of difficult speech compared to younger adults. Data are mixed, however, regarding the relative roles working memory capacity and receptive vocabulary may play in older adults' perception of difficult speech (e.g., Marsh & Campbell, 2016; McAuliffe et al., 2013). We hypothesized that a third type of naturally occurring difficult speech, speech spoken by a talker with a foreign accent, could help clarify the relative roles of working memory and receptive vocabulary in difficult speech perception by both older and younger adults. Twenty older adults and twenty younger adults all completed tests of receptive vocabulary and auditory working memory as well as identified speech spoken by talkers with foreign accents. Preliminary results indicate that receptive vocabulary and working memory both predict identification accuracy for older, but not younger, adults; however, working memory capacity may predict more of the variance in difficult speech perception. These data support the growing body of evidence that working memory capacity does play a role in difficult speech perception for older adults.
Email: Erin Ingvalson, erin.ingvalson@cci.fsu.edu

8:20-8:35 (17)

Age-Related Effects in Emotional Speech Processing: Older Adults Attend to Semantics, While Younger Adults to the Prosody. BOAZ M. BEN-DAVID, SARAH GAL-ROSENBLUM and VERED SHAKUF, *Interdisciplinary Center Herzliya*, PASCAL VAN LIESHOUT, *University of Toronto* — The ability to correctly identify emotions in speech is at the core of human communication. To identify an emotion, one should be able to process and identify the semantics (lexical meaning) and the prosody (tone of speech) of the utterance, and integrate them. Deciphering this complex interplay of prosody and semantics may become even more challenging in older age. Age-related changes in auditory-sensory factors and cognitive processing may hinder correct identification of emotions in spoken language. The current study used a novel tool, Test for Rating of Emotions in Speech (T-RES), designed to assess the complex interaction of prosody and semantics in spoken emotions. Forty older (age: 65-75) and 40 younger (age: 20-30) listeners were presented with 25 spoken sentences. The emotional valence of prosody and semantics appear in different combinations from trial to trial, with four separate discrete emotions (anger, fear, happy and sad) and a neutral one. Results reveal significant age-related differences. For younger adults, emotional ratings appear to be impacted mainly by the prosodic dimension, with only a small contribution of the semantics. Whereas for older adults, both dimensions contribute to the emotional ratings.
Email: Boaz M. Ben-David, boaz.ben.david@idc.ac.il

8:40-8:55 (18)

Cortical Activation Patterns Correlate with Speech Understanding After Cochlear Implantation. LUCA POLLONINI, *University of Houston*, HEATHER BORTFELD, *University of California, Merced*, MICHAEL BEAUCHAMP, *Baylor College of Medicine*, JOHN OGHALAI, *Stanford University* (Presented by Heather Bortfeld) — Cochlear implants are a standard therapy for deafness, yet the ability of implanted patients to understand speech varies widely. To better understand this variability, we used functional near-infrared spectroscopy to image activity within regions of the auditory cortex and compared that to behavioral measures of speech perception. Both control and implanted participants with good speech perception exhibited greater cortical activation to natural speech than to unintelligible speech. In contrast, implanted participants with poor speech perception had large, indistinguishable cortical activations to all stimuli. Moreover, the ratio of cortical activation in response to normal speech relative to that of scrambled speech directly correlated with the comprehension scores, though not with auditory

threshold, age, side of implantation, or time after implantation. Finally, implanted adults with low speech perception scores demonstrated large cortical activation areas to all stimuli without preferential response to speech, a finding that indicates compensatory processing effort.
Email: Heather Bortfeld, hbortfeld@ucmerced.edu

9:00-9:15 (19)

Working Memory Predicts Individual Differences in Learning Synthetic Speech Produced by Rule. SHANNON L.M. HEALD, STEPHEN C. VAN HEDGER and HOWARD C. NUSBAUM, *The University of Chicago* — While adult listeners are able to learn synthetic speech (SS) produced by rule, listeners differ in performance. In generalization training, learning appears to redirect attention to the phonetically relevant acoustic cues. In other studies, adults learn to adapt to distorted speech (DS), such as simulated cochlear implant speech (CIS) and sinewave speech (SWS). Recent evidence suggests variation across these tasks may stem from differences in working memory capacity (WMC). We examined individual differences in speech processing by assessing if SS learning is related to WMC and/or performance perceiving DS. While recognition performance for the two types of DS (CIS & SWS) was related to one another, performance perceiving either DS was not related to changes in performance due to learning SS. However, a significant positive relationship between WMC and learning SS was found. Implications for extant models of perceptual learning in speech will be discussed.
Email: Shannon LM Heald, smbowdre@uchicago.edu

9:20-9:35 (20)

Locus of Learning in Musicians and Non-Musicians Following Familiarization with Dysrhythmic Speech. STEPHANIE A. BORRIE, *Utah State University*, KAITLIN L. LANSFORD, *Florida State University* — The *musical advantage* describes the idea that musicians, relative to non-musicians, are more successful at deciphering speech in challenging listening conditions. One assumption is that fine-tuned rhythm perception skills in the musical domain translate to fine-tuned processing of rhythm cues in the speech domain. In a recent study, we demonstrated that the dysrhythmic cues that characterize dysarthric speech interfered with the musical advantage. Interestingly, this interference was assuaged by a brief opportunity to learn something about the degraded speech—intelligibility improvements following familiarization with dysarthric speech were superior for musicians, relative to non-musicians. One plausible explanation is that musicians, with an aptitude for detecting rhythm cues in the musical domain, were able to learn something informative about the aberrant suprasegmental information. An alternative explanation, however, is that musicians focused their attention toward the segmental information. Here, we examine locus of learning in musicians and non-musicians following familiarization with dysarthric speech.
Email: Stephanie Borrie, stephanie.borrie@usu.edu

Reasoning & Problem Solving
Back Bay B, Friday Morning, 8:00-10:00
Chaired by Michelle R. Ellefson, University of Cambridge

8:00-8:15 (21)

Property Induction About Mixing. MICHELLE R. ELLEFSON, CONNOR QUINN and MARIA TSAPALI, *University of Cambridge*, ANNE SCHLOTTMANN, *University College London*, KEITH S. TABER, *University of Cambridge* — The property induction paradigm has been applied to a variety of domains and situations, but as yet it has not been used to investigate naïve chemistry reasoning. Here, we apply property induction to mixing a solid and a liquid to look at the extent that categorical and physical features of everyday materials influence participants' judgements about mixing. We include two different experiments with over 400 participants aged 5-years, 7-years, 9-years, 11-years, and adults. In general, the results followed the patterns seen when this paradigm has been applied to other domains (e.g., physics, biology), with both categorical and physical features informing inductive generalisation, even for the youngest children. In addition, we studied whether verbal reasoning is influenced by both our experimental manipulation and the age of the participant. Overall, the results highlight the value of the property induction paradigm for investigating naïve chemistry reasoning.
Email: Michelle Ellefson, mre33@cam.ac.uk

8:20-8:35 (22)

Mindfulness Overshadows Mindwandering for Creativity. JULIET CHOU, *Columbia Teachers College*, BARBARA TVERSKY, *Columbia University and Stanford University* (Presented by Barbara Tversky) — Finding new and original ideas and solutions can be challenging in everyday situations as well as in innovation in design, science, business, and technology. Some have claimed that mind-wandering increases ideation. However, premier design firms and schools recommend human-centric approaches. In two experiments participants generated new uses for 7 common objects using no specified mindset or either a mind-wandering or human-centric mindset. In both studies, the human-centric mindset yielded both more ideas and more original ideas than the other conditions. Original ideas were more frequently produced later in ideation. The effectiveness of the human-centric mindset seems to derive from people's ability to imagine many different tasks and situations encountered by people in different roles and occupations. Participants used that knowledge as a search strategy to find new and innovative ideas.
Email: Barbara Tversky, btversky@stanford.edu

8:40-8:55 (23)

The Case of False Insights. AMORY H. DANEK and JENNIFER WILEY, *University of Illinois at Chicago* — In the context of human problem solving, the Aha! experience is often reported as a marker of insightful solutions. The present study decomposed the multi-dimensional Aha! experience into its cognitive and affective constituents and asked problem solvers to rate their subjective solution experience with regard to each of six dimensions (happiness, suddenness, certainty, surprise,

relief and drive). The task domain of magic was used, presenting participants with video clips of magic tricks and asking them to find out how the magician achieved the effect. No solution feedback was given. This paradigm allows for multiple trials, but it also allows for false insights, as problem solvers can sometimes generate implausible, false solutions but still report the Aha! feeling. The differences between true and false insights are explored with regard to their time course, as well as on several of the self-reported dimensions.
Email: Amory H. Danek, danek@uic.edu

9:00-9:15 (24)

They Understand, So I Understand: The Influence of Others' Understanding on the Illusion of Explanatory Depth. ANDREW S. ZEVENEY and JESSECAE K. MARSH, *Lehigh University* (Presented by Jessecae Marsh) — While people believe they understand how everyday objects work (e.g., faucets), asking them to explain these objects illuminates how little they actually understand. This illusion of explanatory depth (IoED) may arise partly because people mistake what they understand about an object with what the general population understands about that object. If the IoED stems from this misattribution, then it should not exist in domains where people acknowledge there is less shared understanding of the domain overall. We explored participants' judgments of their understanding before and after explaining domains endorsed as well understood (i.e., devices) and not well understood (i.e., mental disorders). The IoED was present but smaller for domains where people endorsed less shared understanding. When participants were explicitly told others understood a domain poorly, they showed no IoED. Our results suggest that beliefs about shared understanding influence people's judgments of their own understanding.
Email: Jessecae Marsh, jessecae.marsh@lehigh.edu

9:20-9:35 (25)

Do Smart People Have Better Intuitions? VALERIE A. THOMPSON, *University of Saskatchewan*, GORDON PENNYCOOK, *University of Waterloo,* DRIES TRIPPAS, *Max Planck Institute for Human Development,* JONATHAN ST. B. T. EVANS, *University of Plymouth* — Dual Process Theories of reasoning propose that Type 1 processes deliver autonomous answers and Type 2 processes require working memory. A key pillar of support for this theory is the robust relationship between cognitive capacity and reasoning performance, which assumed to arise from Type 2 processes. We tested this hypothesis in two large (*N*=224) experiments in which people were instructed to respond to base rate neglect or deductive reasoning problems based either on their beliefs or based on logic/probability. As predicted by Dual Process Theories, for low capacity reasoners, conflicting beliefs interfered with their ability to give logic/probability responses. In contrast, for high capacity reasoners, the reverse was true, such that logic and probability interfered with their ability to make belief judgements. This suggests that high capacity reasoners may have intuitions that are based on probability or logic, challenging the Dual Process account of the capacity-reasoning relationship.
Email: Valerie Thompson, valerie.thompson@usask.ca

9:40-9:55 (26)

Do Modals Identify Better Models? A Comparison of Signal Detection and Probabilistic Models of Inductive Reasoning. CAREN M. ROTELLO, *University of Massachusetts*, EVAN HEIT and LAURA J. KELLY, *University of California, Merced* — Lassiter and Goodman (2015) proposed the probability threshold model (PTM) as an alternative to the two-dimensional signal detection (SDT) model of inductive and deductive reasoning (e.g., Heit & Rotello, 2005; Rotello & Heit, 2009). According to this SDT model, inductive and deductive judgments are based on a weighted combination of evidence varying along a dimension of logical validity and a dimension of similarity or consistency with prior knowledge. PTM is a one-dimensional model with a flexible response rule based on power law functions. Here, for the first time, we report comparative model fitting of both models, as well as a one-dimensional SDT model, to data from several reasoning experiments using arguments with varying modals (e.g., possible, probable, likely, certain). In general, the fit of PTM was relatively poor compared to both SDT models, however, there were mixed conclusions with regard to the issue of one versus two dimensions.
Email: Caren Rotello, caren@psych.umass.edu

Vision
Liberty, Friday Morning, 8:00-9:40
Chaired by Frank H. Durgin, Swarthmore College

8:00-8:15 (27)

Why Is There a Flexible Elbow in the Estimation of Visual Number? FRANK H. DURGIN and MAKAYLA PORTLEY, *Swarthmore College* — Prior evidence suggests that numerosity estimates for large numbers (> 20) are typically too low. How is a unit established for such high numbers? Will exposure to lower numbers of elements help to calibrate the estimation of larger numbers? We compared number estimation functions for logarithmic ranges of numbers that extended either from 1 to 224 or from 28 to 224 (N = 40). Estimates for up to about 20 dots were fairly accurate, but systematic underestimation occurred for higher numbers, forming an elbow in the estimation function in log-log space. Although underestimation was slightly less pronounced for 30-40 dots when the much lower numbers were also estimated, the numerosity scale in this case also became more compressed with a slope of only 0.5 in log-log space for numbers from 28 up to 224. In contrast, when only this range was estimated, the slope in log-log space was significantly higher (0.7). This pattern of data suggests a trade-off between discriminability in the upper range and accuracy near the "elbow" that we will seek to model.
Email: Frank H. Durgin, fdurgin1@swarthmore.edu

8:20-8:35 (28)

Convolutional Neural Networks Do Not Share Category Representations With Human Observers. MICHELLE R. GREENE, *Minerva Schools at KGI* — Predictive modeling is essential for checking our understanding of cognitive systems. Recently there has been increasing interest surrounding deep convolutional neural networks (CNNs) as models of the human visual system, due to their accuracy in object categorization.

However, accuracy alone is not enough to accept these models. I examined the extent to which CNNs share category representations with humans. Specifically, I tested whether effects such as entry-level preference and typicality effects are present in the model using representational similarity analysis. Using the AlexNet CNN architecture (Krizhevsky et al, 2012) trained on the ImageNet database, I found that unlike human observers, the CNN prioritizes subordinate-level category representations over entry-levels. Furthermore, while human observers show strong typicality effects, the CNN does not. While these results argue for caution in using CNNs as models of the human visual system, they hint at the possibility that object recognition may be solved in multiple ways.
Email: Michelle R. Greene, mrgreene@stanford.edu

8:40-8:55 (29)

Internal and External Variability in Perceptual Decision-Making. ROGER RATCLIFF, CHELSEA VOSKUILEN and GAIL MCKOON, *The Ohio State University* — There are currently two, sharply-divided, classes of models to explain perceptual and cognitive decision-making. In one, there are two sources of noise: external noise is variability in the cognitive representations of stimuli and internal noise is variability in the decision process itself. In the second, there is only internal variability. We describe the results of five perceptual and cognitive decision-making experiments in which exact stimuli were repeated from one block of trials to another. The probability that the response on the second trial was the same as on the first was greater than chance, that is, the responses were not independent, as would be expected from internal noise alone. Estimates of external variability were calculated by fitting a standard diffusion decision-making model to the data to measure the relative contributions to performance of random (internal) and correlated (external) noise. The results of these experiments provide the first direct behavioral evidence that there is external variability in the cognitive representations of perceptual stimuli within the framework of diffusion decision models.
Email: Roger Ratcliff, ratcliff.22@osu.edu

9:00-9:15 (30)

Events Do Not Need to Be Temporally Matched to Support Perceptual Continuity. DANIEL LEVIN, LEWIS J. BAKER, CHRIS B. JAEGER and JOSH LITTLE, *Vanderbilt University* — Faced with the task of combining different views of an event to create the appearance of continuity, filmmakers often place edits mid-action, showing an actor begin an action in one shot, then complete it in a second shot. Shimamura et al. (2014) found that viewers prefer edits that closely reproduce the depicted actions to those that either leave out, or repeat, a large segment of action. Overlaid on this preference was a preference for a 100 ms overlap in action. We tested whether these findings were induced by Shimamura's method of comparing different versions of edits. Across several experiments, viewers did not prefer an overlap, and judged mismatches ranging from 400 ms overlaps to 400 ms ellipses to be equally continuous when they view events in isolation. We argue that event perception is inferential and that it does not necessarily involve precise representation of the current state of actions.
Email: Daniel Levin, daniel.t.levin@vanderbilt.edu

9:20-9:35 (31)

Multicolored Words: Uncovering the Relationship Between Reading Mechanisms and Synesthesia. ARIEL M. COHEN-GOLDBERG and LAURA J. BLAZEJ, *Tufts University* — Grapheme- and lexical-color synesthesia are some of the most commonly studied forms of synesthesia yet relatively little is known about them as psycholinguistic phenomena. We present a case study of WBL, a 21-year-old male who experiences synesthetic colors for letters and words. Over 3 months, we obtained nearly 3000 color judgments for a variety of visually presented words. In Experiment 1 we show that WBL's word color is nearly always determined by the color of the first letter. Prefixed and compound words were frequently reported as having 2 colors, both determined by the first letter of each morpheme. In Experiment 2 we use logistic mixed-effects analyses (DV=1 color vs. 2 colors) to analyze WBL's percepts of compounds. We find opposing effects of stem and compound frequency, an influence of stem-initial synesthetic color similarity, and a frequency-mediated effect of semantics. Our results suggest that WBL's synesthetic experiences emerge from the gradient interactive processes involved in visual word recognition and morphological processing. They also provide novel support for the role of both decomposed and whole-word representations and raise questions about the necessity of semantic effects in compound processing.
Email: Ariel M. Cohen-Goldberg, ariel.goldberg@tufts.edu

Symposium I: Introduction to Model-based Cognitive Neuroscience
Grand Ballroom, Friday Morning, 10:00-12:05
Organized by Thomas J. Palmeri, Vanderbilt University and Brandon M. Turner, Ohio State University

10:00-10:05 (32)

Introduction to Model-Based Cognitive Neuroscience. THOMAS J. PALMERI, *Vanderbilt University* — What is model-based cognitive neuroscience? A brief overview of the approach and of the symposium is provided.
Email: Thomas Palmeri, thomas.j.palmeri@vanderbilt.edu

10:05-10:20 (33)

Approaches to Model-Based Cognitive Neuroscience: Bridging Levels of Understanding of Perceptual Decision Making. THOMAS J. PALMERI, *Vanderbilt University* — Cognitive modeling and neuroscience have converged on well-known accumulation of evidence models (including the diffusion model, the linear ballistic accumulator model, race and counter models, and competing accumulator model) to explain the behavioral and neural dynamics of perceptual decision making. Building off a taxonomy of approaches to model-based cognitive neuroscience we recently outlined in a collaborative paper (Turner et al., in press), I will describe how we have use neural data to constrain cognitive models (such as

accumulator models), how we use cognitive models to predict neural data, and how we connect abstract cognitive models with mechanisms taking places at the level of individual neurons and ensembles of neurons.
Email: Thomas Palmeri, thomas.j.palmeri@vanderbilt.edu

10:25-10:40 (34)

Joint Models of Neural and Behavioral Data. BRANDON M. TURNER, *The Ohio State University* — The need to test a growing number of theories in cognitive science has led to increased interest in inferential methods that integrate multiple data modalities. We present a flexible Bayesian framework for combining neural and cognitive models. Joining neuroimaging and computational modeling in a single hierarchical framework allows the neural data to influence the parameters of the cognitive model and allows behavioral data, even in the absence of neural data, to constrain the neural model. Critically, our Bayesian approach reveals interactions between behavioral and neural parameters, and hence between neural activity and cognitive mechanisms. In this talk, we demonstrate the utility of our approach with applications to data fusion — the integration of EEG, fMRI, and behavioral data — and extensions to sparse representations of high dimensional data. We demonstrate that in both a generative and predictive sense, models that consider neural data perform better than those that do not.
Email: Brandon Turner, turner.826@osu.edu

10:45-11:00 (35)

Decision Threshold Dynamics in the Human Subcortex Measured With Ultra-High Resolution Magnetic Resonance Imaging. BIRTE U. FORSTMANN, *University of Amsterdam* — Deciding between multiple courses of action often entails an increasing need to do something as time passes - a sense of urgency. This notion of urgency is not incorporated in standard theories of speeded decision-making that assume information is accumulated until a critical fixed threshold is reached. In two experiments, we investigated the behavioral and neural evidence for an 'urgency signal' in humans. Experiment 1 found that as the duration of the decision-making process increased, participants made a choice based on less evidence for the selected option. Experiment 2 replicated this finding, and additionally found that variability in this effect across participants covaried with activation in striatum. These results are extended by using ultra-high resolution 7Telsa magnetic resonance imaging (MRI) to zoom in the spatio-temporal dynamics of the urgency signal in the striatum. We conclude that the striatum plays a more general role in the decision-making process than previously reported.
Email: Birte Forstmann, buforstmann@gmail.com

11:05-11:20 (36)

Combining Space and Time in the Mind. JOHN R. ANDERSON, *Carnegie Mellon University* — Many cognitive modeling efforts are concerned with when cognitive events occur in time and many cognitive neuroscience efforts are concerned with where things are happening in the brain. We have combined hidden semi-Markov models (HSMM) and multivariate pattern analysis (MVPA) to merge the information from both sources. I will describe how we have used HSMM-MVPA to both discover and test models of cognitive processes.
Email: John Anderson, ja0s@andrew.cmu.edu

11:25-11:40 (37)

Tracking the Neural Dynamics of Conceptual Knowledge During Category Learning With Computational Model-Based Neuroimaging. MICHAEL L. MACK, *University of Toronto* — Learning requires updating our knowledge to incorporate goal-relevant information. Computational models provide a formal account of how attention guides this process, with item representations shifting to reflect diagnostic features over learning. Neurally, such updating is hypothesized to rely on hippocampal memory processes; however, a direct link between memory mechanisms and attention-weighted representation has not been shown. Here, we combine computational modeling with fMRI to investigate the neural mechanisms of learning-based shifts in category representation. Participants performed two classification tasks that required different attentional strategies. We used a computational learning model, SUSTAIN, to quantify each participant's attention-weighted knowledge representations. We found that neural representations in left anterior hippocampus correspond with model predictions of conceptual knowledge. Our method uniquely advances current cognitive neuroscience approaches to link neural measures and cognitive models. Leveraging model predictions of latent knowledge organization to constrain neuroimaging analysis enabled us to index the neural codes underlying concept formation.
Email: Michael Mack, mack.michael@gmail.com

11:45-12:00 (38)

The Neurocognitive Dynamics of Memory Search. SEAN M. POLYN, *Vanderbilt University* — In the free-recall task, participants study a series of items, and are then asked to recall the items in whatever order they come to mind. The analysis of the identity, order, and latency of the remembered items provides fertile ground for the development of computational models of the cognitive processes engaged during memory search. These models describe a dynamic system in which executive processes construct and deploy a retrieval cue to probe memory structures in order to reactivate the details of recent past experience. These dynamic cognitive models provide a natural framework to characterize the functional properties of neural signals recorded during both study and recall periods. I will describe recent and ongoing work using the neurocognitive memory search (NCMS) modeling framework to specify models that link univariate and multivariate neural signals to specific cognitive processes and representations in the model. These models provide evidence for neural processes related to recall initiation, the temporal and semantic organization of memories, and the termination of search.
Email: Sean Polyn, sean.polyn@vanderbilt.edu

Psycholinguistics I
Back Bay C & D, Friday Morning, 10:00-12:00
Chaired by Colin J. Davis, University of Bristol

10:00-10:15 (39)

Frankenstein's Models: How to Create New Models of Cognition by Combining the Components of Existing Models. COLIN J. DAVIS, *University of Bristol*, JAMES S. ADELMAN, *University of Warwick*, MICHELE GUBIAN, *University of Bristol* — An impediment to comparison of computational models of cognition is that models usually differ in many respects, and often it is not obvious which of these differences is relevant to the successes and failures of a model. A systematic approach to model comparison would involve changing a single component at a time, and observing the effects of this change. This approach has been greatly facilitated by the recent development of easynet, a general-purpose software package for simulating computational models. This software allows different components to be "plugged in" as required. This talk will describe this software and will illustrate how it can be used to: a) simulate existing models, b) perform credit-assignment on models by changing one component at a time, and c) construct entirely new models by combining different components from existing models. These features will be demonstrated in the context of well-known models of visual word recognition.
Email: Colin Davis, pscjd@bristol.ac.uk

10:20-10:35 (40)

Generalization from Newly Learned Words Reveals Structural Properties of the Human Reading System. BLAIR C. ARMSTRONG, *Basque Center on Cognition, Brain and Language*, NICOLAS DUMAY, *University of Exeter*, WOOJAE KIM, *Howard University*, MARK A. PITT, *The Ohio State University* (Presented by Mark Pitt) — Connectionist accounts of spelling-sound correspondences in English represent exception words (*pint*) amidst regular words (*mint*) via a graded *warping* mechanism (Kim et al., 2013). Warping allows a neural network to extend the dominant pronunciation to nonwords with minimal interference from exceptions. We tested for a behavioral marker of warping by investigating the degree to which participants generalized from newly learned made-up words with regular, ambiguous, or exceptional pronunciations. Two days of training were followed after another 48 hrs by a tempo naming test assessing generalization to nonword orthographic neighbors (*gint*) Frequency of regularization (i.e., the complement of generalization) was related to the degree of warping required to learn the pronunciation of the new word. Simulations with the Plaut et al (1996) model paralleled the behavioral data. These results support the psychological reality of warping and highlight the need to develop integrated theories of learning, representation, and generalization.
Email: Blair C. Armstrong, b.armstrong@bcbl.eu

10:40-10:55 (41)

Embodied Cognition's Strawman. CURT BURGESS, *University of California - Riverside* — Researchers pursuing the idea that representations are the result of simulating perceptual and motor behaviors have repeatedly demonstrated that the brain is involved in cognition. Many who take the embodied cognition perspective have a tradition of complaining about distributed, co-occurrence models not being symbol grounded. Two theoretical issues related to this controversy involve how an embodied system can (coherently) represent abstract concepts and how co-occurrence models could possibly account for feature inter-correlations that are (presumably) based on perceptual experience. In this talk, the HAL model is used to illustrate how abstract concepts can be encoded just like concreate concepts and how (perceptually based) feature inter-correlations are picked up by the statistical regularities in language. Recent work using brain imaging methods is described that supports these findings. The conclusion is reached that those in the embodied cognition camp and the co-occurrence model camp might be able to get along.
Email: Curt Burgess, curt@ucr.edu

11:00-11:15 (42)

Anticipating Speech Errors During Online Sentence Processing. MATTHEW W. LOWDER (Member Select-Speaker Award Recipient) and FERNANDA FERREIRA, *University of California, Davis* — Two visual-world eye-tracking experiments investigated listeners' use of contextual and linguistic cues to anticipate and mentally correct speech errors during online sentence processing. Experiment 1 demonstrated additive effects of contextual plausibility and speaker certainty, such that listeners were quicker to correct an error if the speaker said something implausible or signaled some uncertainty about the utterance. In Experiment 2, the speaker made an error but continued with the sentence before correcting it. This led to interactive effects of plausibility and speaker certainty, such that listeners were quick to correct the error only when it was both implausible and spoken with uncertainty. However, listeners in Experiment 2 overall were slower to correct errors than listeners in Experiment 1. Listeners actively model the communicative intentions of the speaker, rapidly integrating relevant cues to anticipate and mentally correct speech errors, even without an overt signal from the speaker that an error has occurred.
Email: Matt Lowder, mlowder@ucdavis.edu

11:20-11:35 (43)

The Flexibility of Syntactic Processing Across Development. MARIEKE VAN HEUGTEN, *University at Buffalo, State University of New York* (Member Select-Speaker Award Recipient), ANNE CHRISTOPHE, *PSL Research University* — Listeners of all ages continuously optimize their language comprehension by rapidly adapting to the characteristics of the speaker at hand. For example, at the sound form level, brief exposure to accented speech enables both young children and adults to tune into that accent. Here, we ask to what extent listeners also process *syntactic* information, such as grammatical gender cues, in a speaker-specific fashion. In particular, using the Preferential Looking Procedure, we examined whether toddlers, preschoolers, and adults continue to take into account grammatical gender information during online language processing when a speaker makes many gender errors. By manipulating gender cues in filler trials, participants heard a speaker who was either reliable (0% gender errors) or

unreliable (60% gender errors), but crucially, all test items were grammatically correct. In line with previous work, listeners of all age groups made rapid use of gender information in the presence of a reliable speaker. By contrast, when the speaker appeared to be unreliable with regard to gender, listeners' use of this grammatical cue was severely reduced. This suggests that, across development, syntactic processing is incredibly flexible in nature.
Email: Marieke van Heugten, mariekev@buffalo.edu

11:40-11:55 (44)

Comparing Emergence of Structure During Cultural Transmission of a Novel Signaling System in Children and Adults. VERA KEMPE, *Abertay University Dundee*, NICOLAS GAUVRIT, *University of Paris VIII and École Pratique des Hautes Études* — Iterated artificial language learning studies have shown that linguistic structure emerges because languages evolve to satisfy the constraints of learnability and referential efficiency. So far, such studies have examined adults learning familiar-looking pseudo-words; yet language is acquired by children learning unfamiliar sound sequences. We developed a novel signaling medium consisting of binary auditory sequences comprised of high and low tones to investigate how children's limitations in referential efficiency and processing capacity affect emergence of structure. Twelve chains of adults and 12 chains of 5-7-year-old children (10-12 generations per chain) learned 6-8-bit sequences denoting referents varying in dimensions like size, shape etc. While compositional structure failed to emerge reliably, learnability (operationalized as similarity between consecutive languages) and combinatorial structure (operationalized as length-normalized algorithmic complexity of individual sequences) evolved faster in adults than in children. These findings challenge the notion that children's processing limitations drive the emergence of structure in language.
Email: Vera Kempe, v.kempe@abertay.ac.uk

Visual Search I

Republic, Friday Morning, 10:00-12:00

Chaired by Anne P. Hillstrom, University of Southampton

10:00-10:15 (45)

Cat and Mouse Search: The Influence of Scene and Object Analysis on Eye Movements When Targets Change Locations During Search. ANNE P. HILLSTROM, *University of Southampton*, JOICE D. SEGABINAZI, *Federal University of Rio Grande do Sul*, HAYWARD J. GODWIN, SIMON P. LIVERSEDGE and VALERIE BENSON, *University of Southampton* — We explored the influence of early scene analysis and visible object characteristics on eye movements when searching for objects in photographs of scenes. On each trial, participants were shown a scene preview or a uniform grey screen (250ms), then a visual mask, then the name of the target, and then the scene, now including the target at a likely location. During the participant's first saccade during search, the target location changed to: (1) a different likely location, (2) an unlikely but possible location, or (3) an implausible location. The results showed that the first saccade landed more often on the first likely than the second, and more on the second than on unlikely or implausible locations; the first saccade landed nearer the first target location with a preview than without. Hence, rapid scene analysis influenced initial eye movement planning, but availability of the target rapidly modified that plan. After the target moved, it was found more quickly when it appeared in a likely location than when it appeared in an unlikely or implausible location. The findings show that both scene gist and object properties are extracted rapidly, and are used in conjunction to guide saccadic eye movements during visual search.
Email: Anne P Hillstrom, a.hillstrom@soton.ac.uk

10:20-10:35 (46)

Find Any Animal or This Boot: Hybrid Search for Mixtures of Specific and Categorical Targets. JEREMY M. WOLFE, *Brigham & Women's Hospital/Harvard Medical School*, ABLA ALAOUI-SOCE, *Brigham & Women's Hospital* — In hybrid search, observers (Os) search through visual displays for any of N target types, held in memory. RTs for hybrid search are well-described as a log function of the size of the memory set, whether the targets are specific (e.g. this specific boot, glass, or hammer) or categorical (e.g. any animal, coin, or toy). Searches for categorical targets are several hundred msec slower than searches for specific targets. What happens if specific and categorical targets are mixed in the same block of trials (e.g. find this specific boot, glass, or hammer as well as any animal, coin, or toy)? If a single recognition process is at work, RTs for specific targets might rise to those for categorical targets. However, specific target RTs remain faster than categorical, suggesting independent identification processes for each item in the memory set. RTs for absent trials indicate that the presence of fast RTs for specific targets tends to encourage Os to quit unsuccessful searches somewhat too soon, given the possibility of categorical targets. As a result, categorical targets are missed at a higher rate in mixed, categorical/specific blocks then they are in pure categorical blocks.
Email: Jeremy M Wolfe, jwolfe@partners.org

10:40-10:55 (47)

No Meaning in Learning: Contextual Cueing Relies on Objects' Visual Features and Not Semantics. TAL MAKOVSKI, *The Open University of Israel* — People easily learn regularities embedded in the environment and use them to facilitate visual search. It has been recently shown that this learning, termed contextual cueing (CC), occurs only when the same objects are repeated at the same locations. However, it is unknown whether this learning relies on the visual features of the objects or on their meaning. This study revealed that meaning is not necessary for learning as CC was also found with meaningless objects. It further showed that after learning meaningful objects, CC was not diminished by a manipulation that distorted the objects' meaning but preserved their visual properties. By contrast, CC was eliminated when the learned objects were replaced with different category examplers. Together, these data strongly suggest that the acquired context that facilitate search relies primarily on the visual properties and spatial locations of the objects, but not on their meaning.
Email: Tal Makovski, talmak@openu.ac.il

11:00-11:15 (48)

Estimating Distractor-Distractor Suppression Effects in Parallel Search. ALEJANDRO LLERAS, ZHIYUAN WANG, ANNA M. MADISON and SIMONA BUETTI, *University of Illinois at Urbana-Champaign* — Various theories have proposed that distractor-distractor suppression effects play an important role in visual search. However, thus far, the putative effects of this type of suppression have not been quantitatively evaluated. We recently demonstrated that performance on fixed-target parallel search tasks can be well understood within a computational model that assumes each item in a display is processed independently from one another, in parallel and with unlimited capacity. Each item is processed until a decision is reached: is this item a likely target or not? Here, we extend our work on homogeneous displays to heterogeneous displays of two types. (1) Spatially-intermixed displays where distractor-distractor suppression is less frequent, and (2) spatially-segregated displays, where different types of distractors are present in spatially segregated regions. Our model using parameters estimated from homogeneous displays allowed us to predict over 90% of the RT variance on heterogeneous displays as well as to estimate the contribution of distractor-distractor suppression on performance.
Email: Alejandro Lleras, alejandrolleras@gmail.com

11:20-11:35 (49)

The Guidance of Attention by Multiple Items in Visual Working Memory. VALERIE M. BECK, BRETT BAHLE and ANDREW HOLLINGWORTH, *The University of Iowa* (Presented by Andrew Hollingworth) — Most theories of attention propose that goal-directed orienting is implemented by an attentional template maintained in visual working memory (VWM). However, there is debate over the architecture of interaction between VWM and perceptual selection. According to the single-item template hypothesis, only one item in VWM is maintained in an active state capable of guiding selection. In contrast, we have argued that multiple items in VWM, maintained concurrently via sensory activation, can guide attention simultaneously. In the present talk, we discuss three converging lines of evidence relevant to this debate. The first examined whether there are limitations on VWM-based guidance as a function of the number of items maintained in VWM. The second examined whether secondary, task-irrelevant items in VWM influence selection when search is guided by a primary VWM template. The third tested whether items that each match different features in VWM compete for selection, consistent with the claim that multiple features bias attention. In each of these cases, we observed results consistent with the multiple-item template hypothesis. Implications will be discussed for theories of visual search and for general theories of working memory.
Email: Valerie Beck, valerie-beck@uiowa.edu

11:40-11:55 (50)

Evaluating the Role of Working Memory in Subsequent Search Miss Errors During Multiple-Target Visual Search. MATTHEW S. CAIN, *U.S. Army Natick Soldier Research, Development, & Engineering Center*, TRAFTON DREW, *University of Utah* — In visual search with multiple possible targets in the display, miss errors are often more common after one target has been detected (subsequent search miss [SSM] errors). The resource depletion hypothesis of SSM errors posits that the first found target occupies working memory resources that would otherwise be used to search more effectively (Cain & Mitroff, 2013). However, work from single-target search has demonstrated that loading visual working memory has a negligible impact on search performance (Drew, Boettcher, & Wolfe 2015). In a series of experiments, we tested the effects of various visuospatial working memory loads on SSM errors. We found no systematic effect of working memory load on single-target search performance, replicating prior findings. Further, there was a significant increase in SSM errors when searchers held target-shaped objects rotations in working memory, but not when they were holding colors or locations in working memory.
Email: Matthew S. Cain, matthew.s.cain6.civ@mail.mil

Decision Making I
Independence, Friday Morning, 10:00-12:00
Chaired by David V. Budescu, Fordham University

10:00-10:15 (51)

Decisions with Compound Lotteries. DAVID V. BUDESCU and YUYU FAN, *Fordham University*, ENRICO DIECIDUE, *INSEAD Business School* — Violations of Reducibility of Compound Lottery axiom (ROCL) were documented in the literature, but they are not fully understood. This paper aims to comprehensively test the effects of six factors that could influence DMs' evaluations of compound lotteries, and to explain how the stage-specific probabilities of compound lotteries are aggregated in the decision process. We elicited Certainty Equivalents of simple and compound lotteries from 125 subjects. We confirmed the existence of the systematic violations of ROCL, and found that the number of stages and the global probability had prominent effects. We developed three classes of descriptive models based on Prospect Theory. The best fitting model was the one that assumes that DMs anchor on the lowest stage probability and then apply the weighting function. Results also showed that the "aggregate first and weigh second" outperformed the "weight first and aggregate second" models.
Email: Yuyu fan, yfan2@fordham.edu

10:20-10:35 (52)

Future Gains and Losses: The Impact of Contextual Shifts. MARY KAY STEVENSON and LESLIE HWANG, *California State University East Bay* — Temporal discounting refers to the impact of future consequences. People prefer to receive gains sooner and defer losses. According to previous studies, people discount gains and losses differently when they are presented in different studies or conditions. These experiments combine gains and losses to see how judgement is affected by the timing in simple and complex stimuli. The results indicate that gains and losses are discounted differently regardless of whether they are presented alone or together. Context is defined by the

range of values or time delays in a judgment task. Time ranges and magnitudes were shifted demonstrating the stability and flexibility of the temporal discounting process.
Email: Mary Kay Stevenson, marykay.stevenson@csueastbay.edu

10:40-10:55 (53)

Cognitive vs. Normative Construals of Uncertainty. STEPHAN LEWANDOWSKY and LUKE SOMERWILL, *University of Bristol*, TIMOTHY BALLARD, *University of Queensland and University of Bristol*, GORDON D. A. BROWN, *University of Warwick* — Many global problems, from climate change to food security and prevention of violent conflict, are beset by inescapable uncertainty. What are the cognitive and normative implications of this uncertainty? We report data which show that people tend to view uncertainty as a stimulus for "wishful thinking" or undue optimism. We contrast people's responses to the normative (i.e., actual and mathematically warranted) implications of uncertainty based on an ordinal analysis (i.e., statements of the form "greater than") of the effects of scientific uncertainty within the climate system. This analysis is not sensitive to people's cultural cognition or subjective risk perceptions and reveals that greater (i.e., "greater than expected") uncertainty provides an even stronger impetus for climate mitigation. This normative result stands in contrast to people's response to uncertainty. We suggest ways in which this discrepancy may be resolved.
Email: Stephan Lewandowsky, stephan.lewandowsky@bristol.ac.uk

11:00-11:15 (54)

Moral Decision-Making: How Utilitarian Similarity, Content, and Psychological Ownership Influence Moral Rationality. PETKO KUSEV, *Kingston University London*, PAUL VAN SCHAIK, *Teesside University*, VICTORIA BARANOVA, *Lomonosov Moscow State University* — Is it acceptable and moral to sacrifice a few people's lives or jobs to save many others? Research on moral dilemmas has shown that respondents judge personal moral actions as less appropriate than equivalent impersonal moral actions. Accordingly, theorists have argued that judgments of appropriateness in personal moral dilemmas are (i) more emotionally salient and more cognitively demanding than impersonal moral dilemmas (e.g., Greene et al., 2001) and (ii) dependent on utilitarian uncertainty – comprehensive information about moral actions and consequences boost utility maximization in moral choices (Kusev et al., 2016, Psych. Bull. & Rev.). In three experiments, we found that utilitarian similarity, content and ownership inform the psychological mechanisms employed in moral choice, independent of the emotional 'personal involvement' effects. Information about utilitarian content, similarity and ownership alter human utilitarian preferences. Our findings highlight a need to investigate how variation in moral descriptions produces variation in utilitarian judgments.
Email: Petko Kusev, p.kusev@kingston.ac.uk

11:20-11:35 (55)

Determination of Decision Making Stopping Rules Using the Pattern Analysis. MARIO FIFIC, *Grand Valley State University* — Several stopping decision rules (critical difference, runs, fixed-sample size, guessing and one-reason decision making) were analyzed and compared to the Cast-Net approach that theoretically combines all these stopping rules. The goal was to explore whether the complex Cast-Net model can justify the increase of the model's complexity by the fit improvement over a simple stopping rule model(s). Subjects participated in a deferred decision making task and were asked to open an optional number of either positive or negative recommendations about the quality of products, in the context of a shopping situation. To compare the models, we calculated the likelihood of different stopping rules given the observed distribution of stopping patterns of recommendations, for each individual subject, jointly for both correct and incorrect decisions. The results indicated that the Cast-Net model provides reasonable theoretical grounds of how different simple stopping rules can be combined within one decision making model.
Email: Mario Fific, ficm@gvsu.edu

11:40-11:55 (56)

Qualitative Decision-Making Under Uncertainty: A Formal Model of Fuzzy-Trace Theory. VALERIE F. REYNA, *Cornell University*, DAVID A. BRONIATOWSKI, *George Washington University* — Fuzzy-trace theory assumes that decision-makers process qualitative "gist" and quantitative "verbatim" representations in parallel. We present a lattice model of fuzzy-trace theory that provides a novel formalization of how: decision-makers encode multiple representations of options in parallel; representations compete or combine so that choices often turn on the simplest gists; and choices between representations are made based on positive vs. negative valences associated with social and moral principles stored in long-term memory (e.g., saving lives is good). The model integrates effects of individual differences in numeracy, metacognitive monitoring and editing, and sensation seeking. We conducted a systematic review of experiments on risky decision-making and tested whether our model could predict observed choices. The model predicted more than 90% of studies demonstrating 16 separate effects, including risky-choice framing and the Allais paradox, as well as theoretically critical manipulations that eliminate or exaggerate such effects, supporting the model's predictions over prospect theory.
Email: Valerie Reyna, vr53@cornell.edu

Recognition I
Back Bay B, Friday Morning, 10:20-12:00
Chaired by Andrew Heathcote, University of Tasmania

10:20-10:35 (57)

Don't Know Responses in Recognition Memory. ANDREW HEATHCOTE, JIM SAUER, MATTHEW GRETTON, VALERA GRIFFIN and MATTHEW PALMER, *University of Tasmania* — "Don't Know" (DK) responses are thought to be used to improve accuracy in recognition memory tasks where false alarms or misses are highly consequential (e.g., eyewitness

recognition). We examined the factors that affected DK rates in a recognition memory paradigm where participants studied a set of pictures of faces, with different groups tested on either single faces or pairs of faces. Test faces were presented against a different background to study, and decision difficulty was manipulated using target and lure pairs that were morphs falling nearer of further apart between two base faces. Two different settings of reward and penalty points for correct and error responses were used to manipulate DK rate, and we examined the effect of time pressure using instructions that emphasized either speed or accuracy. Racing accumulators were used to model DK rates, recognition accuracy and response times for each type of response.
Email: Andrew Heathcote, andrew.heathcote@utas.edu.au

10:40-10:55 (58)

Parallel Facilitatory Retrieval of Item and Associative Information from Event Memory. GREGORY E. COX (Member Select-Speaker Award Recipient) and AMY H. CRISS, *Syracuse University* — Memory contains information about individual events (items) and combinations of events (associations), yet it remains unclear whether items and associations are stored in a different form or whether independent processes are used to retrieve each kind of information. We use model-independent group-level qualitative properties of response dynamics, as measured by Systems Factorial Technology (Townsend & Nozawa, 1995), to establish that item and associative information are retrieved concurrently, with positive memory evidence arising from a holistic match between a test cue and the contents of memory. This interpretation is validated by quantitative modeling of individual performance. These results rule out the possibility that item information must be retrieved prior to associative information. Pooling of item and associative matches further implies that while item and associative information might be represented in separate stores, they are not stored in a qualitatively different form, nor are independent processes (e.g., familiarity for items and recollection for associations) used to retrieve them.
Email: Gregory E. Cox, gecox100@syr.edu

11:00-11:15 (59)

Stealing Memories: An Egocentric Source Monitoring Bias Following Collaborative Remembering. IRA E. HYMAN, MADELINE JALBERT and ALIA WULFF, *Western Washington University* — Collaborative remembering allows people to reach an agreed upon version of the past. But can people track the original source of their memories? Dyads individually studied information containing partially overlapping material – word lists in some studies and pictures in others. During collaborative remembering, some dyads only recorded information that both studied whereas others included all information. On a subsequent source monitoring test, participants displayed an egocentric pattern of errors: They more often claimed their partner's memories as their own than they attributed their memories to their partner. Even in conditions designed to aid source monitoring accuracy, the errors showed an egocentric bias. Stealing memories may be a basic response following collaborative remembering.
Email: Ira Hyman, ira.hyman@wwu.edu

11:20-11:35 (60)

Executive Function in Older Adults Predicts Source Memory for Actions Only for Small Numbers of Sources. ALAN W. KERSTEN and JULIE L. EARLES, *Florida Atlantic University* — Prior research suggests a distinction between item and source memory, with item memory dependent upon medial temporal associative functions and source memory dependent upon frontally-mediated executive functions. A potentially important distinction is that studies of source memory typically involve many items but few sources, perhaps encouraging strategic encoding of source information. Kersten and Earles (2010) examined memory for the sources of actions performed by many different actors. Age differences in this task patterned differently than effects of distraction in young adults, suggesting that age differences reflected declines in basic associative abilities rather than executive functions. The present study examined whether employing a small number of sources promotes the use of executive functions. Healthy older adults viewed a series of actions, either performed by many actors or only two actors. Performance was related to Glisky et al.'s battery of tests of executive and memory functioning. When only two actors performed the actions, executive function predicted memory for which actor performed each action. In contrast, with large numbers of actors, only memory functioning predicted memory for the sources of actions.
Email: Alan Kersten, akersten@fau.edu

11:40-11:55 (61)

Value-Directed Remembering in Older Adults is Associated With Reduced Memory for Incidental Details. JOSEPH P. HENNESSEE, ALAN D. CASTEL and BARBARA J. KNOWLTON, *University of California, Los Angeles* (Presented by Barbara Knowlton) — Older adults remember important information as well as younger adults despite overall reductions in memory. We investigated whether this intact memory for high-value items includes memory for incidental details. Older and younger adults studied words presented in colors and worth different point values. They were told that they would receive the points appearing with the word if they later recognized it. After a 5 min delay, they completed a recognition test and for each recognized word indicated the associated point-value and color. An age X value interaction was observed, with impaired performance in older adults for low-value words, but no difference for high-value words. However, younger adults were more likely to correctly retrieve the color of high-value words, but no difference was observed for point-value memory. Value enhances recognition memory and this effect can be unaffected by age. However, older adults' memory for valuable information is accompanied by fewer incidental details.
Email: Joseph Hennessee, jhennessee@ucla.edu

Perception
Liberty, Friday Morning, 10:00-12:00
Chaired by Terry D. Blumenthal, Wake Forest University

10:00-10:15 (62)
Inhibition of Startle Responding by White or Pink Noise, and by Gaps in Noise. TERRY D. BLUMENTHAL and HOPE PETERSON, *Wake Forest University* — The human startle eyeblink response can be inhibited by a change in the stimulus environment briefly before the startling stimulus. The use of gaps in ongoing background has been proposed as a way to investigate tinnitus, the perception of ringing (or buzzing or whooshing) that many people experience. We measured startle eyeblinks in 20 college students, where startle stimuli were preceded by no prepulse or a 75 dB white or pink noise prepulse in silence or in 65 dB background noise, or by a gap in that background. All prepulses inhibited startle, suggesting that a variety of types of change in ongoing stimulation can be used in studies investigating prepulse inhibition of startle. This raises hopes that prepulse inhibition of startle might eventually be sensitive enough to be used to evaluate the variety of manifestations of tinnitus in patients.
Email: Terry D. Blumenthal, blumen@wfu.edu

10:20-10:35 (63)
Auditory Training to Improve Speech Perception Abilities for Elderly Individuals. LEAH FOSTICK, *Ariel University*, HARVEY BABKOFF, *Bar-Ilan University* — A common complaint among the elderly is a difficulty in understanding speech, especially when it is rapid or accompanied by noise. This difficulty is explained in the literature by an age-related deficit in auditory temporal processing (ATP), the ability to perceive rapid stimuli presented consecutively. In the present study we aimed to test whether ATP training will improve speech perception among elderly participants. Eighty-two individuals, aged 60-83 years, were divided into three groups: training in ATP (ATPtrain), training in non-temporal processing (non-ATPtrain), and no-training (No-train). Training was done for 14 days, independently by each participant, using internet-based computerized program. ATP, intensity-discrimination (a non-ATP task), and speech perception were measured for all participants pre-training, post-training, and at three-months follow-up. The ATPtrain group had lower ATP thresholds and higher speech perception accuracy at post-training and follow-up, as compared with pre-training. The non-ATPtrain had lower intensity-discrimination thresholds at post-training and follow-up, as compared with pre-training, but no change in speech perception. The No-train group did not change in any of the measures.
Email: Leah Fostick, leah.fostick@ariel.ac.il

10:40-10:55 (64)
Context Modulates the Action-N400 During Perception of Dance Sequences: An ERP Study. CELINE BARREAU and MARA BREEN, *Mount Holyoke College* (Presented by Mara Breen) — Unexpected images in action sequences elicit N400-like effects, which are larger for experienced than non-experienced viewers. We investigated the role of context and experience on the action-N400 by recording ERPs during presentation of highly constrained ballet sequences and unconstrained modern dance sequences to experienced dancers (N=15) and non-dancers (N=15). Participants viewed ten-frame stop-motion videos of ballet and modern dance sequences, which featured a mismatched image (from a different sequence of the same dance genre) at either the fifth or tenth position. For ballet sequences only, mismatched images in the tenth position elicited a significant negativity 500-700ms after onset. For ballet and modern sequences, mismatched images elicited a significant positivity 700-900ms after onset at both the fifth and tenth positions. Effects did not differ between dancers and non-dancers. These results indicate that more constraining contexts (e.g., ballet) allow viewers to make predictions about upcoming actions, similar to effects in language.
Email: Mara Breen, mbreen@mtholyoke.edu

11:00-11:15 (65)
Influence of the Body Schema on Multisensory Integration: Evidence from the Mirror Box Illusion. YUQI LIU and JARED MEDINA, *University of Delaware* (Presented by Jared Medina) — Using a mirror box, we developed a novel illusion to examine whether biomechanical constraints, as encoded in the body schema, influence multisensory integration. The participant's unseen left hand and right hand (reflected to look like a left hand) were positioned in opposing postures (palm up vs. palm down). After synchronous bimanual hand movement, the unseen left hand was perceived as rotated towards the visual estimate (illusory rotation). We then used this illusion to examine how the body schema influences multisensory integration. We varied the amount of angular displacement (e.g. 90° vs. 180°) and biomechanical constraints between the unseen and viewed hand posture (e.g. pronation from the unseen to the viewed posture is less constrained than supination). As expected, we found more illusory rotation for conditions with less angular displacement between the hands. Importantly, when comparing conditions in which angular displacement was the same, but biomechanical constraints between the two positions differed, we found more illusory rotation for the less constrained difference. This demonstrates that biomechanical constraints influence multisensory integration.
Email: Jared Medina, jmedina@psych.udel.edu

11:20-11:35 (66)
Hierarchical Structure of Musical and Visual Meter in Cross-Modal "Fit" Judgments. STEPHEN E. PALMER and JOSHUA PETERSON, *University of California, Berkeley* — The metrical hierarchy of musical rhythm is defined by the structure of emphasis on beats in measures. We investigated 3/4 and 4/4 time signatures in auditory and visual meter using cross-modal goodness-of-fit ratings for visual and auditory probes, respectively. For *auditory contexts*, 4 measures in 3/4 or 4/4 time were defined by a louder beat followed 2 or 3 softer, equally-timed beats, respectively. A visual probe circle occurred in the next 4 measures at one of 12 phase-angles relative to the auditory downbeat: 0/45/60/90/120/135/180/225/240/270/300/315°. Context and probe modalities were reversed for the *visual contexts*. Participants rated how well probe stimuli "fit" the rhythmic context in the other modality. Visual contexts showed

an expected beat-defined hierarchy, with highest ratings on the downbeat, next-highest for the other beats, and lowest for non-beats. Auditory contexts showed a single broad peak for the downbeat, with little evidence of elevated fit ratings for other beats over non-beats. Similar results were obtained when participants made explicit ratings of cross-modal synchrony using the same stimuli. Various factors relevant to explaining the asymmetry between these cross-modal conditions are discussed.
Email: Stephen E. Palmer, sepalmer@gmail.com

11:40-11:55 (67)

Holistic Face Perception: Is It All in the (Perceptual) Grouping? KIM M. CURBY, *Macquarie University*, ROBERT ENTENMAN, *Temple University,* — Faces appear to enjoy special status as perceptual objects. One challenge is determining which aspects of face processing are unique and which overlap with domain-general mechanisms. Having previously found that holistic face perception is modulated by manipulations impacting perceptual grouping of face parts (Curby et al., 2013; 2016), we probed whether reduced holistic perception of misaligned faces can be attributed to disrupted grouping. Participants made part-matching judgments about composite faces presented within intact oval frames or frames made from misaligned oval parts. By introducing discontinuities only in the external contour, grouping of face parts was discouraged even as face configuration was preserved. Disrupting only perceptual grouping reduced holistic perception similarly to disrupting both grouping and configuration. An additional study replicated and extended this result by suggesting that intact face configuration may support grouping. These findings support the importance of domain-general mechanisms in understanding even "specialized" aspects of face perception.
Email: Kim Curby, kim.curby@mq.edu.au

Lunchtime Workshop: Publishing Your Research Successfully: Guidance from the Editors
Fairfax (3rd Floor), Friday Noon, 12:00-1:30
Chaired by Morgan Ryan, Springer-Nature

12:00-1:30 (68)

Springer Nature and The Psychonomic Society are co-sponsoring this workshop intended for graduate students, early career researchers, and all those interested in learning more about publishing their research and the latest developments in academic publishing. A large range of topics will be discussed, such as authorship, peer review, post publication activities, article promotion, open research practices and trends, and data sharing and replication. There will be a dedicated time for open questions and answers. The panel will be composed of the Psychonomic Society Journal Editors, the Chair of the Publications Board of the Psychonomic Society, the Psychonomic Press Editor, and representatives from the publisher, Springer Nature.

Symposium III: Motivated Memory: Considering the Functional Role of Memory
Grand Ballroom, Friday Afternoon, 1:30-3:30
Organized by Christopher Madan, Boston College

1:30-1:35 (69)

Introduction. CHRISTOPHER MADAN, *Boston College* — Memory does not serve as a veridical recording of prior experiences that can be played back, instead many factors can lead some experiences to be more memorable than others. This leads to an important consideration: What is the functional role of memory? From this perspective, some experiences are more valuable in informing future behavior and should be selectively prioritized, such as those that evoke reward- or emotion-related processes. Here we broadly consider these processes as effects of motivational salience on memory. To capture the breadth of this topic, research highlighted in this symposium spans a variety of research approaches, including fMRI, cognitive aging, sleep-related consolidation, and cross-cultural differences.
Email: Christopher Madan, madanc@bc.edu

1:35-1:55 (70)

Reward Motivation Facilitates Hippocampal-Dependent Encoding and Consolidation. VISHNU P. MURTY, *University of Pittsburgh*, ALEXA TOMPARY and LILA DAVACHI, *New York University*, R. ALISON ADCOCK, *Duke University* — Motivation has been shown to facilitate episodic memory. Animal models suggest that these memory enhancements emerge through interactions of the ventral tegmental area (VTA) and hippocampus both during and after encoding. I will present two fMRI studies detailing mechanisms guiding reward-motivated memory enhancements. In Study 1, I will show that rewarding contexts facilitate VTA hippocampal interactions resulting in enhanced hippocampal responses to salient, un-rewarded, events. Further, I will show that enhanced hippocampal responses is paralleled with increased memory for those salient events. In study 2, I will show that post-encoding changes in network connectivity of the VTA and hippocampus predict better long-term memory for reward-associated events. Critically, post-encoding VTA-hippocampal interactions specifically targeted sensory cortex that was associated with reward during encoding. These findings support a model by which VTA-hippocampal interactions enhance episodic memory for rewarding events by (1) enriching encoding and (2) selectively stabilizing reward memory following encoding.
Email: Vishnu Murty, vishnu.murty@gmail.com

1:55-2:15 (71)

Mechanisms of Motivational Modulation of Attention in Younger and Older Adults. JULIA SPANIOL and RYAN S. WILLIAMS, *Ryerson University*, BENJAMIN J. DYSON, *University of Sussex* — Motivational signals bias attention across the lifespan. Significant evidence suggests that aging is associated with an attentional positivity effect, but the mechanisms underlying this age-related shift are still poorly understood. In the present study, we examined the link between phasic arousal, linked to noradrenergic neuromodulation, and the impact of gain and loss motivation on attention. Younger

adults (aged 18–34 years) and older adults (60–82 years) completed the Attention Network Test (ANT; Fan et al., 2002), modified to include gain and loss incentives. The behavioral alerting index served as a marker of phasic arousal efficiency. For younger adults, this marker correlated positively with the effect of both gain and loss incentives on ANT performance. In contrast, for older adults, the correlation held for gain incentives only, suggesting an age-related reduction in phasic arousal to loss signals. We discuss this finding in the context of Adaptive Gain Theory (Aston-Jones, 1994).
Email: Julia Spaniol, jspaniol@psych.ryerson.ca

2:15-2:35 (72)

Preferential Consolidation of Emotional Components of Memory During a Nap is Preserved With Age. SARA E. ALGER and JESSICA PAYNE, *University of Notre Dame* — Emotionally salient information is better remembered at the expense of less relevant details. Sleep increases the magnitude of this memory trade-off, preferentially preserving emotional components in young adults. Although both memory and sleep decline with age, little is known about whether their functional relationship changes. The current study compared changes in memory for negative and neutral components of scenes across a retention period containing an immediate or delayed nap versus wake. All subjects (18-64yrs) demonstrated the emotional memory trade-off effect. Interestingly, covarying for age, immediately napping led to the greatest increase in negative memory trade-off compared to both wake and delayed napping, indicating that sleep facilitated preferential consolidation of emotional components. There was a positive correlation between slow-wave sleep and negative object memory across all nap subjects, providing strong evidence that even as we age, sleep preserves salient information over less important details, despite general declines in memory and sleep.
Email: Sara Alger, salger@nd.edu

2:35-2:55 (73)

Motivational Salience and Association-Memory: Positive Affect is Not Like the Others. CHRISTOPHER R. MADAN and ELIZABETH A. KENSINGER, *Boston College* — Memory in daily life is not simply for occurrence of isolated information, but also for associations between different pieces of information. By using tasks such as paired-associate learning and cued recall to disentangle effects of item- and association-memory, previous research has demonstrated that negative affect, rewards, and motor-related information can all enhance memory for items, while simultaneously impairing memory for associations. Here we examined the influence of positive affect on item- and association-memory and found an enhancement of both memory for items and associations, relative to emotionally neutral information. This benefit of positive affect on association-memory was consistently demonstrated, revealing a different pattern than with equally arousing negative affect. These results provide strong evidence that positive information is processed differently than negative, and also differently than other types of motivationally salient information, such as rewarding or motor-related information.
Email: Christopher Madan, madanc@bc.edu

2:55-3:15 (74)

Culture Motivates What is Remembered Accurately and Erroneously. ANGELA GUTCHESS, *Brandeis University* — Although individual differences in cognition have long been recognized, it is only recently that the influence of cultural background has begun to be investigated as a potential source of individual differences in cognition. Culture can be thought of as a lens that shapes what information an individual is motivated to attend to and encode into memory, as well as a filter for the strategies and retrieval biases that can operate on that information. Thus, measures of memory can serve as assays of what is valued and prioritized by a culture. The talk will include data illustrating that cultures can differ in their accurate memory for specific perceptual details and in the engagement of neural regions supporting memory. In addition, the talk will establish that cultural groups can differ in their tendency to commit memory errors based on the content of information, and consider the impact of aging on cultural differences.
Email: Angela Gutchess, gutchess@brandeis.edu

3:15-3:30

Discussion. CHRISTOPHER MADAN, *Boston College.*

Cognitive Control I

Back Bay C & D, Friday Afternoon, 1:30-3:10

Chaired by Thomas Töllner, Ludwig-Maximilians-University Munich

1:30-1:45 (75)

Two Independent Frontal Midline Theta Oscillations During Conflict Detection and Adaptation in the Simon Task. THOMAS TÖLLNER, *Ludwig-Maximilians-University Munich*, YIJUN WANG, *Chinese Academy of Sciences*, TZYY-PING JUNG and SCOTT MAKEIG, *University of California San Diego*, HERMANN J. MÜLLER, *Ludwig-Maximilians-University Munich*, KLAUS GRAMANN, *Berlin Institute of Technology* — One of the most firmly established factors slowing response latencies towards action-critical stimuli is the spatial non-correspondence between stimulus and response locations. While there is a consensus that this stimulus-response (S-R) conflict is mediated via theta activity over frontal midline (fm) brain areas, it remains controversial in which cortical region this signal is generated, and whether it depends on intertrial history. Here we used independent component analysis and subsequent time-frequency domain statistics on source level activity to identify fm theta (4-7 Hz) and its responsiveness to conflict detection and adaptation. During target processing, notably, our results revealed two independent fm theta oscillations located in or near the anterior cingulate, with only one of them reflecting S-R conflicts. However, this fm theta response was not exclusively linked to conflicts, but involved additional, conflict-independent processes that caused response slowing. Our results draw a detailed picture regarding the oscillatory correlates of conflict detection and adaptation effects in the Simon task, and mitigate the prevalent notion that fm theta reflects a common cognitive control process for human conflict processing.
Email: Thomas Töllner, thomas.toellner@psy.lmu.de

1:50-2:05 (76)

Behavioral Interventions and Noninvasive Brain Stimulation Alter Flexibility in Cognitive Control. EVANGELIA G. CHRYSIKOU, *University of Kansas* — Cognitive control refers to a set of complex and powerful regulatory mechanisms that are supported by the prefrontal cortex (PFC) and which guide behavior depending on context. Research has shown that different aspects of cognition benefit differently from cognitive regulation depending on individual differences and task demands. In a series of experiments, we examined factors that can contribute to the flexible engagement of cognitive control systems using behavioral interventions or transcranial direct current stimulation (tDCS) over PFC. We hypothesized that manipulations shown to increase cognitive control would influence performance on certain tasks, but not others; manipulations shown to decrease cognitive control would elicit the reverse effects. Our results reveal dissociable effects of these behavioral and non-invasive brain stimulation interventions as a function of the tasks, supporting a view of cognitive control as a flexible system that can be altered through experimental manipulations with measurable consequences for performance depending on context.

Email: Evangelia G. Chrysikou, lilachrysikou@ku.edu

2:10-2:25 (77)

Goal-Driven and Habitual Spatial Attention are Qualitatively Different Systems. YUHONG V. JIANG, *University of Minnesota* — Extensive research contrasts top-down attention with bottom-up attention. Here I argue that a second dichotomy exists between goal-driven and habit-driven attention. To introduce goal-driven attention, participants were asked to prioritize one visual quadrant in a visual search task. Task instruction induced an explicit goal to attend to the instructed region. To produce habit-driven attention, other participants searched for a target that was frequently placed in one visual quadrant. Although no instructions were used and most participants were unaware of the target's location probability, they developed an attentional bias toward the high-probability quadrant. Results showed that both task goals and habits were highly effective in modulating spatial attention. However, goal-driven and habitual attention differed qualitatively in their i) flexibility, ii) dependency on explicit knowledge, iii) reliance on working memory resources, iv) spatial reference frame, v) effects of aging, and vi) spread of attention to background images.

Email: Yuhong Jiang, jiang166@umn.edu

2:30-2:45 (78)

Towards a Better Understanding of Controlled Prospective-Memory Processing: Shared Processing, Increased On-Task Focus, or Both? JAN RUMMEL, *Heidelberg University* (Member Select-Speaker Award Recipient), BRIDGET A. SMEEKENS and MICHAEL J. KANE, *University of North Carolina at Greensboro* — Holding prospective memory (PM) intentions interferes with ongoing tasks—indicating that attention is distributed between these tasks. Based on research relating mind-wandering and attentional control (Kane & McVay, 2012), we argue that people may not only adjust their ongoing task processing when given a PM intention, but may also focus more strongly on the entire task setting by dedicating considerable conscious thought to the PM goal and the ongoing-task goal. We tested this hypothesis by assessing thought self-reports during prototypical PM tasks. Task-unrelated thought (TUT) rates were reduced when participants performed an ongoing task with versus without an embedded PM task (Experiment 1), even when PM demands were minimized (Experiment 2). TUT-rates dropped further when PM performance was incentivized (Experiment 3). Our findings suggest that PM demands not only elicit a cost to ongoing-task processing, but also reduce off-task thinking and promote conscious thoughts about the PM intention.

Email: Jan Rummel, jan.rummel@psychologie.uni-heidelberg.de

2:50-3:05 (79)

Dissociating Eye Movements and Attention in an Eye Tracking Procedure. GENE M. HEYMAN and JAIME MONTEMAYOR, *Boston College* — In a recent paper we introduced a method for quantifying the allocation of attention. On the basis of the size of the stimuli, we assumed we were measuring covert (not overt) attention. The present experiment tested this assumption. We plotted the probability of a correct response as a function of the angular distance between a fixation and its target. The monitor displayed two small stimuli simultaneously for about 140 msec. Each stimulus measured 1.0 x 0.42° and was separated from the other by 0.15°. Angular distances were determined by areas of interest (AOIs). The probability of a correct response for both stimuli remained relatively high up to a distance of about 2.5°, suggesting that each stimulus projected an image that was within the same fixed gaze. However, on any particular trial correct responses were limited to just one stimulus. Thus, fixations encompassed both stimuli, attention was restricted to one.

Email: Gene M. Heyman, heymang@bc.edu

Speech Perception II

Republic, Friday Afternoon, 1:30-3:10

Chaired by Lisa D. Sanders, University of Massachusetts - Amherst

1:30-1:45 (80)

EEG and ERP Measures of Live Speech Processing in a Multi-Talker Environment. LISA D. SANDERS and AHREN FITZROY, *University of Massachusetts - Amherst* — There is currently no way to determine if laboratory studies of speech-in-noise processing adequately recreate the challenging communication environments listeners face in the real world. To bridge that gap, we recorded EEG while participants in the lab attended a live talker or one of two live side conversations. Acoustic onsets in attended speech elicited larger amplitude ERPs than similar onsets in unattended speech. This effect was modulated by the location of the target talker. Cross-correlations between EEG and speech envelopes were also larger for attended speech. Further, EEG measures were reliable when made across spans as short as three seconds. Comparisons of the EEG and ERP measures suggest that the EEG measures are more robust to the decreased signal quality that would be expected in field-

recorded data. Our technique will make it newly possible to assess the effects of attention on neurophysiological processing of speech in noisy, real-world environments.
Email: Lisa D. Sanders, lsanders@psych.umass.edu

1:50-2:05 (81)

Adaptive Plasticity in the Perception of Speech-in-Noise: Speaker-Specific Adaptation by Lipread Speech. MIRJAM KEETELS, THIJS VAN LAARHOVEN and JEAN VROOMEN, *Tilburg University* (Presented by Jean Vroomen) — Spoken word recognition in noise improves if the speaker can be seen. We hypothesized that the sight of a speaker can also induce long-lasting adaptive adjustments that generate predictions about the distorted acoustic signal. In a pre- post-test design, listeners tried to recognize spoken words in noise (audio-only), while in-between they were exposed to speech-in-noise either with or without the sight of the same speaker. We found pre-post-test improvements only if listeners had seen the speaker during the exposure phase. This improvement disappeared if a different speaker was seen during exposure, thus demonstrating that adaptive perceptual learning by lipread speech is speaker-specific.
Email: Jean Vroomen, j.vroomen@uvt.nl

2:10-2:25 (82)

Why Adapt? Phonotactic Learning as Non-Native Language Adaptation. THOMAS DENBY and MATTHEW GOLDRICK, *Northwestern University* (Presented by Matthew Goldrick) — Listeners rapidly adapt to novel phonotactic distributions in experimental settings, quickly learning new phonotactic constraints. This is puzzling in light of the fact that individual speakers of a given language do not differ significantly in the phonotactic distributions they produce. Why do listeners retain such plasticity into adulthood if not to adapt to individual speakers? Given that listeners leverage phonotactic knowledge in speech perception, and that phonotactics clearly differ between speech communities, we hypothesize that listeners adapt to novel phonotactic distributions to better comprehend speakers of different languages. We used a recognition memory task to test this hypothesis, comparing adaptation to a phonotactic constraint over native language phonemes under two conditions: when non-native phonemes were also present in the stimuli vs. when only native phonemes were presented. We predict that listeners should adapt to novel phonotactic distributions in non-native language contexts more quickly than in native language contexts.
Email: Thomas Denby, ThomasDenby2018@u.northwestern.edu

2:30-2:45 (83)

Recognition of Interrupted Speech for Native and Non-Native Listeners. RAJKA SMILJANIC, *University of Texas at Austin*, STANLEY SHEFT, *Rush University Medical Center*, *BHARATH CHANDRASEKARAN, *University of Texas at Austin*, VALERIY SHAFIRO, *Rush University Medical Center* — Speech perception in adverse listening environments is more difficult for non-native than for native listeners. We examined if greater speaking clarity and semantic context can increase the intelligibility of sentences that were interrupted periodically at rates varying from slow to fast (0.5 – 16 Hz) for native and non-native American English listeners. Semantic and acoustic-phonetic enhancements produced better speech intelligibility in both groups. Overall, greater speech clarity enabled listeners to utilize higher-level semantic cues at slower interruption rates. Although both listener groups were able to use contextual information, native listeners derived larger benefit at lower gating rates, indicating greater ability to access semantic information with limited acoustic-phonetic input. The non-native speech-perception deficit in adverse listening conditions may be due in part to reduced ability to utilize higher-level information to compensate for loss of intelligibility at lower levels of processing, and to reduced ability to benefit from available lower-level acoustic cues.
Email: Rajka Smiljanic, rajka@austin.utexas.edu

2:50-3:05 (84)

Lexical Knowledge Boosts Statistically-Driven Speech Segmentation. SVEN MATTYS, JAMES HUTSON and SHEKEILA PALMER, *University of York* — Speech segmentation is largely driven by stored lexical knowledge. In the absence of lexical knowledge, however, non-lexical heuristics are called upon (acoustic, segmental, prosodic). In three experiments, we investigated the effect of lexical knowledge on statistical learning. Following a large and well-documented literature, we started with an artificial language containing four trisyllabic nonwords and observed the standard above-chance recognition memory performance in a subsequent 2AFC task. We then replaced one of the four nonwords with a real word (tomorrow) and noted improved segmentation of the three nonwords. This improvement was maintained when the real word was a different length than the nonwords (philosophy), ruling out an explanation based on rhythmic expectations. The improvement was also maintained when the real word was added to the four original nonwords rather than replacing one of them. Together, these results show that recognizable portions of speech in an otherwise meaningless stream serve as anchors for discovering new words. Mechanisms supporting the enhancement of statistical learning by lexical knowledge are discussed.
Email: Sven Mattys, sven.mattys@york.ac.uk

Judgment
Independence, Friday Afternoon, 1:30-3:10
Chaired by Catherine L. Caldwell-Harris, Boston University

1:30-1:45 (85)

Less Ethical Choices in a Foreign Language Compared to a Native Language Despite Similar Physiological Arousal. CATHERINE L. CALDWELL-HARRIS, *Boston University*, SEVIL HOCAOĞLU and AYSE AYÇIÇEGI-DINN, *Istanbul University* — Bilinguals respond differently when evaluating a dilemma in a foreign language compared to their native language. In prior work, reasoning in a foreign language reduced loss aversion; potential hazards such as "traveling by airplane" were perceived to be less risky and were judged to offer larger benefits; more utilitarian judgments were made to "trolley dilemmas." Turkish university students who had learned

English via classroom instruction read 6 ethical dilemmas (3 in English, 3 in Turkish) while skin conductance was recorded. Ratings of agreement with a proposed selfish action were higher in the foreign language, while ratings of agreement with a proposed ethical action were higher in the native language. The consistency of these effects across dilemmas and Ps was striking. Skin conductance was low during passive reading but rose when Ps gave their rating. However, the amplitudes of skin conductance responses were similar for two language conditions. The idea that emotional blunting is a mechanism underlying the foreign language effect is appealing, but may be difficult to support with psychophysiological measures. Enhanced deliberative reasoning in a foreign language is consistent with the findings.
Email: Catherine Caldwell-Harris, charris@bu.edu

1:50-2:05 (86)

Effects of Cognitive Training and Alcohol Consumption on Men's Perceptions of Women's Sexual Interest. TERESA A. TREAT, *University of Iowa*, RICHARD J. VIKEN, *Indiana University*, WILLIAM R. CORBIN, *Arizona State University*, JODI R. SMITH, *University of Iowa* — Theoretical models and a burgeoning empirical literature implicate impoverished processing of women's nonverbal affective cues in sexual aggression by college-aged males toward female acquaintances. In a 2x2 between-subjects design, 120 college men either did or did not complete a cognitive-training procedure designed to enhance the accuracy of their perceptions of women's sexual interest; did or did not consume a moderate dose of alcohol (target BrAC = .06); and then completed transfer tasks assessing attention, decision-making, and behavioral-intention processes. The training procedure enhanced attention to women's nonverbal affective cues, increased reliance on affective cues during decision making, and decreased behavioral intentions to exhibit sexual aggression. Alcohol reduced attention to affective cues and increased behavioral intentions. Training also reduced the effect of alcohol on attention and behavioral intentions. The effects of the training on cue utilization during decision-making were maintained at a follow-up session approximately one week later.
Email: Teresa Treat, teresa-treat@uiowa.edu

2:10-2:25 (87)

Testing Learning Mechanisms of Rule-Based Judgment. JANINA A. HOFFMANN, *University of Konstanz* (Member Select-Speaker Award Recipient), BETTINA VON HELVERSEN, *University of Zürich*, JÖRG RIESKAMP, *University of Basel* — Making accurate judgments such as choosing a job candidate presumes an adequate weighting of more and less important aspects, say the candidate's skills. In social judgment theory, these weighting processes have been successfully modeled with linear models. How people learn to make judgments has received less attention. The delta-learning rule can perfectly learn to solve linear problems, but does not adequately describe human learning. We amended the delta learning rule with three learning mechanisms – a decay, a capacity restriction, or attentional learning – and tested how well those learning mechanisms can describe and predict learning in a rule-based judgment task. In this judgment task, participants first learned to predict a continuous criterion, but after 200 trials, the importance of the cues for predicting the criterion changed. On average, judgment accuracy improved from trial 1 to 200, dropped when the task structure changed, but improved again until the end of the task. A capacity-restricted learning model best described and predicted the learning curve of the majority of participants. Taken together, these results suggest that rule-based learning models can better predict learning if they assume a capacity limit.
Email: Janina Hoffmann, janina.hoffmann@uni-konstanz.de

2:30-2:45 (88)

On Judgments of Approximately Equal (≈). CHRISTOPHER R. WOLFE and RICHARD J. SMITH, *Miami University, Ohio*, VALERIE F. REYNA, *Cornell University* — In three studies, participants judged the smaller of two numbers as either less than or approximately equal to a larger number. In Study 1, the smaller-to-larger ratio predicted the proportion of approximately equal judgments. In Study 2, the items were presented in sentences regarding breast cancer statistics and as numbers only, displayed either as percentages or as X in 100,000. We designated half of the breast cancer items as justifiably approximately equal based on information from reputable health websites. As predicted by Fuzzy-Trace Theory, participants were more likely to appropriately judge quantities as approximately equal in the context of breast cancer sentences and when data were presented as percentages. Knowledge of breast cancer significantly predicted appropriate judgments. In Study 3, following Fuzzy-Trace Theory half the participants received gist-evoking text asking whether the difference was a substantial, yielding significantly more appropriate judgments. Breast cancer knowledge again predicted appropriate approximately equal judgments.
Email: Christopher R. Wolfe, WolfeCR@MiamiOH.edu

2:50-3:05 (89)

A Spreadsheet That Produces Judgment Study Stimulus Case Sets With Specified Cue-Cue Correlations. ROBERT M. HAMM, *University of Oklahoma Health Sciences Center* — In designing sets of stimuli for use in judgment policy description studies, the cue values are often varied independently. It is easier to interpret regression analyses when cue-cue intercorrelations are near 0, and good regression models can be fit with participants judging a relatively small number of cases. However, it may be helpful to present stimulus sets with correlated cues, as when the cues are correlated in the ecology for Brunswik lens model studies. Barriers to the use of data sets with correlated cues are that one may not know the appropriate correlations, and one may not know how to produce data sets with those correlations. I describe an available spreadsheet in which one can specify a) number of cues, b) number of levels for each cue, c) number of levels of the criterion, d) number of cases, e) cue-criterion correlations, and f) selected cue-cue correlations. Further, since different judged categories (e.g., diseases) may have different cue-cue correlations, one can specify g) different "class conditional" cue-cue correlations, within two categories

(e.g., diseased/not). The spreadsheet randomly generates data sets with both continuous and categorized cue values, with approximately the desired correlations.
Email: Robert M. Hamm, robert-hamm@ouhsc.edu

Meaning/Semantics
Back Bay B, Friday Afternoon, 1:30-3:30
Chaired by Sally Andrews, University of Sydney

1:30-1:45 (90)
Parafoveal Semantic Preview Benefit Depends on Both Preview Plausibility and Target Predictability. SALLY ANDREWS and AARON VELDRE, *University of Sydney* — Recent eye movement studies have shown that preview benefit can be obtained from a parafoveal word that is a plausible continuation of the sentence, regardless of its semantic or orthographic relatedness to the target word. This study tested whether this plausibility preview benefit is modulated by the contextual constraint of the sentence. Participants' eye movements were recorded as they read sentences in which target words that were either highly predictable or unpredictable in the sentence were replaced by identical, predictable, unpredictable or implausible previews until the reader's eyes passed an invisible boundary immediately before the target word location. Target predictability significantly interacted with identity and plausibility preview effects: Identical previews yielded significantly more benefit than plausible previews for highly predictable targets, but for unpredictable targets a plausible preview was as beneficial as an identical preview. These findings shed light on the role of contextual predictability in early lexical processing and suggest that readers activate a set of contextually compatible words prior to the presentation of the target word.
Email: Sally Andrews, sally.andrews@sydney.edu.au

1:50-2:05 (91)
Associative Read-Out in a Large-Scale Interactive Activation Model of Semantic Priming. MARKUS J. HOFMANN, *University of Wuppertal*, CHRIS BIEMANN, *Technical University Darmstadt*, ANDRE ROELKE, *University of Wuppertal*, NICOLE STUELLEIN, *University of Hagen*, RALPH RADACH, *University of Wuppertal*, ARTHUR M. JACOBS, *Free University of Berlin* — Interactive Activation Models so far lacked a fully implemented semantic layer. The Associative Read-Out Model defines associations between any possible word pair using the log likelihood that they occur more often together in a huge corpus than predictable by single word frequencies. Here, we tested whether many common associated words of prime and target during lexical decision reflects semantic feature overlap, thus expecting more reliable effects in automatic processing at an SOA of 200ms. In contrast, direct associations may account for free association performance, thus being more pronounced in strategic processing at a long SOA of 1000ms. We confirmed these predictions and found common associations to de-activate occipital, left fusiform, temporal, inferior frontal and mediofrontal regions, suggesting top-down effects across the whole ventral visual stream. Finally, we show preliminary simulations of the spread of semantic activation across a large-scale semantic lexicon.
Email: Markus J. Hofmann, mhofmann@uni-wuppertal.de

2:10-2:25 (92)
Limitations to Response Time Distribution Analyses of the Semantic Priming Effect. TOM HEYMAN, *University of Leuven*, KEITH HUTCHISON, *Montana State University*, MELVIN YAP, *National University of Singapore*, GERT STORMS, *University of Leuven* (Presented by Gert Storms) — Many recent studies within the semantic priming domain have used response time distribution analyses to test certain hypotheses (e.g., Balota, Yap, Cortese, & Watson, 2008; De Wit & Kinoshita, 2015). The idea is that distributional analyses provide a richer picture of how the relatedness manipulation has its effect. Rather than focusing on central tendency measures, it considers the (potential) influence of priming on the entire distribution. However, item effects are rarely taken into account even though they can render response time distribution analyses difficult to interpret. To demonstrate the, underappreciated, impact of item-level effects, we re-analyzed the data from three published studies on semantic priming. More specifically, distributional analyses were performed on the entire item set and then on different random subsets of prime-target pairs. The results raise questions about the stability and generalizability of response time distribution patterns, at least in the context of a typical semantic priming study.
Email: Tom Heyman, tom.heyman@kuleuven.be

2:30-2:45 (93)
When Asking for Clarity Leads to Greater Vagueness. JAMES A. HAMPTON and SHAUNA-KAYE WILLIAMS, *City, University of London* — If asked to say when a face is "clearly happy" or "clearly surprised", are people more consistent than when simply judging if it is happy or surprised? To answer this question, sets of morphed faces were created in equal steps ranging from neutral to either happy or surprised. Participants made Yes/No judgments of whether the faces were "happy", "surprised", "clearly happy" and "clearly surprised" on two occasions a week apart. Logistic threshold functions were fit to individual data and revealed that although adding the adverb "clearly" raised the threshold for a Yes response, it either had no effect or could even paradoxically reduce the sharpness of the category boundary. Similarly there was no difference in the stability of where individuals positioned the thresholds across occasions. The implication is that second-order vagueness (the vagueness in determining the boundary of the vague region of a category) is at least as great as first-order vagueness (the region in which responses are not unanimous).
Email: James A. Hampton, hampton@city.ac.uk

2:50-3:05 (94)
Quantifying Sound Symbolism Effects: A Big Data Approach. CHRIS F. WESTBURY and GEOFF HOLLIS, *University of Alberta*, DAVID SIDHU and PENNY PEXMAN, *University of Calgary* — We asked participants to make binary judgments about thousands of randomly-generated nonword

strings (presented simultaneously in the visual and auditory modalities), deciding if they were good examples for each of twenty different semantic categories. Highly reliable regression models predict human semantic decisions from formal cues for semantic categories, including (but not limited to) categories that anchored 'classic' sound symbolism dimensions such as sharp/round, masculine/feminine, and large/small. Our results extend previous claims about the source of sound symbolic effects, by demonstrating that different poles of the same semantic dimension differ in their predictability from form cues; that many previously unsuspected dimensions show strong sound symbolic effects; and that both phonological and orthographic cues may contribute to sound symbolism. We are also able to quantify the extent to which membership in different semantic categories is predictable from formal cues.
Email: Chris Westbury, chrisw@ualberta.ca

3:10-3:25 (95)

Assessing Arbitrariness: Are Grammatical Gender and Sound Symbolism Cues to Shape? DAVID M. SIDHU and PENNY M. PEXMAN, *University of Calgary*, JEAN SAINT-AUBIN, *Université de Moncton* (Presented by Penny Pexman) — The relationship between grammatical gender and meaning is mostly arbitrary, yet studies have demonstrated that speakers of a language with grammatical gender associate certain qualities with masculine and feminine nouns. Here we examined if grammatical gender is also associated with shape, drawing on a previously established association between shape and gender (roundness with females; angularity with males). Further, we investigated whether associations between grammatical gender categories and shape co-occur with sound symbolic associations between phonemes and shape (i.e., the Maluma/Takete effect; Köhler, 1929). French-speaking participants were visually (Experiment 1) or auditorily (Experiment 2a) presented with round- or sharp-sounding nonwords that had endings typical of either masculine (e.g., *-age*) or feminine nouns (e.g., *-arde*), to pair with a round or sharp visual shape. These participants demonstrated a Maluma/Takete effect and an effect of grammatical gender: masculine (feminine) nonwords were paired with sharp (round) shapes. English-speaking participants (Experiment 2b) only showed a Maluma/Takete effect. These results suggest a non-arbitrary relationship between grammatical gender categories and meaning.
Email: Dave Sidhu, dsidhu@ucalgary.ca

Event Cognition

Liberty, Friday Afternoon, 1:30-3:30

Chaired by Jeffrey M. Zacks, Washington University in St. Louis

1:30-1:45 (96)

Change Detection in Event Comprehension and Memory. CHRISTOPHER N. WAHLHEIM, *University of North Carolina at Greensboro*, JEFFREY M. ZACKS and MICHELLE L. EISENBERG, *Washington University in Saint Louis* (Presented by Jeffrey Zacks) — People use related previous episodes to comprehend and remember. However, events never repeat exactly. How do people process changes in events? To study this, participants viewed movies of an actor performing everyday activities during two fictional days. On the second day, she repeated some activities identically, repeated others with a single feature changed, and performed some new activities. When memory was tested at a one-week delay, changes that were detected and remembered improved memory for the second day. However, changes that were subsequently forgotten impaired memory. We also recorded eye movements, finding evidence that viewers reactivated the representation of the first-day event when processing the second-day movie, and that this guided their eyes. We propose that reactivating related previous event representations enables online predictions while encoding a new event. When event features change, these predictions are violated. Monitoring prediction violations may be adaptive for comprehension and memory.
Email: Jeffrey M. Zacks, jzacks@wustl.edu

1:50-2:05 (97)

The Effect of Viewpoint on Event Segmentation. KHENA M. SWALLOW, JOVAN T. KEMP and AYSE CANDAN, *Cornell University* — Perceiving, understanding, and remembering one's experience depends on dividing it into meaningful parts. The process that does this over time, event segmentation, is frequently studied by asking participants to identify meaningful events in activities that have been filmed from a third-person perspective. However, in addition to the primacy of first-person perspectives in everyday life, first-person perspectives are common in modern media (e.g, GoPro videos, first-person shooters, *Hardcore Henry*). We examined the effects of perspective on event segmentation by asking participants to segment activities filmed with stationary and head-mounted cameras. Because perspective influences the salience and availability of potential segmentation cues (e.g., motion, object interactions) we also examined whether it influences the relationship between these cues and segmentation. Despite greater segmentation frequency, segmentation patterns for first-person perspectives were similar to those for third person perspectives. Thus, segmentation may be viewpoint invariant: Despite differences in visual input, participants identified similar events.
Email: Khena Swallow, kms424@cornell.edu

2:10-2:25 (98)

Nested Events in the Dynamic Structure of Popular Movies. JAMES E. CUTTING, *Cornell University* — Popular movies have a nested event structure – scenes within acts within the whole – and that structure may go some distance in grabbing and holding our attention. One reason for this may be that a specific narrative structure has been developed and perfected over the last century. Using a corpus of 210 films released over 100 years I explore this structure and how it impacts us. Beyond the level of scenes, movies can be divided into four acts – setup, complication, development, and climax – with two optional subunits of prolog and epilog. I show that normative aspects of shot durations, shot transitions, shot scale, shot motion, shot luminance, character introduction, and distributions of conversations, music, and action shots reduce to five correlated physical and narrative dimensions of movies. In general movie

narratives have roughly the same structure as narratives in any other domain but with particular runtime constraints, cadences, and constructions.
Email: James Cutting, jec7@cornell.edu

2:30-2:45 (99)

This Improves Memory. GABRIEL A. RADVANSKY, JERRY S. FISHER and ANDREA E. KALCHIK, *University of Notre Dame* — Memory researchers have discovered a number of memory improvement effects. Most of these studies do not assess improvement beyond the experimental session. Here we outline three possible outcomes of memory improvements over time. The first is that the improvement is transitory, and the rate of forgetting is faster than baseline control conditions until performance drops down to those baseline control levels. Second is that the improvement reflects a boost in the amount of information stored in memory, but that the rate of forgetting is the same as for baseline control conditions, with the amount of benefit remaining constant throughout. Third is that the improvement reflects a consolidation benefit, and the rate of forgetting is slower than baseline, with the size of the benefit growing larger with longer periods of time. These patterns of data are compared to performance on narrative and event memory studies.
Email: G.A. Radvansky, gradvans@nd.edu

2:50-3:05 (100)

All Sorts of Autobiographical Memories: A Direct Comparison of Word-Cued Memories, Free-Recalled Memories, and Important-Event Memories. NORMAN R. BROWN, LIANGZI SHI and PHILLIP REIMER, *University of Alberta*, OLIVER SCHWEICKART, *Princeton University* — We summarize a series of six experiments (n = 717) designed to assess, in a uniform manner, the properties of a wide range of autobiographical memories. Across experiments, we collected data on: (a) word-cued memories, (b) free-recalled memories, and (c) important life-events. Vividness ratings were high for all memories regardless of how they were elicited. However, word-cued memories and free-recalled memories differed from important-event memories in many ways. For example, important-event memories were rated very high on self-relevance, goal-relevance, and transitional impact. In contrast, word-cued memories and, to a lesser extent, free-recalled memories received very low ratings on these same items. In addition, participants predicted very little future forgetting for the important events, whereas the forgetting predictions for word-cued and free-recalled memories mirrored the standard Ebbinghaus function. These findings indicate the existence of different classes of autobiographical memories and demonstrate that memorability does not necessarily depend on consequentiality.
Email: Norman R. Brown, nrbrown@ualberta.ca

3:10-3:25 (101)

Changes in Color and Location as Potential Cues of Generative Transmission in Perception of Causality. TIMOTHY L. HUBBARD, *Arizona State University*, SUSAN E. RUPPEL, *University of South Carolina - Upstate* — In the launching effect, a moving object (launcher) contacts a stationary object (target) that begins moving, and subsequent motion of the target is attributed to the launcher (Michotte, 1963). In experiments reported here, a black launcher approached a white target, and the launcher stopped before reaching the target. The spatial gap between the final location of the launcher and the initial location of the target was empty or completely filled by four stationary white gap objects. When the launcher contacted the nearest gap object, either (a) one gap object turned dark gray and adjacent gap objects successively lightened, (b) one gap object turned light gray and adjacent gap objects successively darkened, (c) all gap objects turned black, or (d) all gap objects remained white. The target then moved a short distance in the same direction as previous launcher motion. Ratings of force and of causality of the launcher were highest when all gap objects turned black and lowest when gap objects remained white or when the gap was empty. The possibility of generative transmission of causality or force from the launcher to the target (cf. White, 2016), and visual cues in perception of causality, are discussed.
Email: Timothy L Hubbard, timothyleehubbard@gmail.com

Testing Effects
Grand Ballroom, Friday Afternoon, 3:50-5:30
Chaired by Philip Higham, University of Southampton

3:50-4:05 (102)

How Can It Be Wrong When It Feels so Right? Responding Correctly on Multiple-Choice Practice Tests Can Negatively Transfer to Later Tests. PHILIP HIGHAM, LAUREN GRIFFITHS and HELEN RACKSTRAW, *University of Southampton* — Retrieval practice typically leads to better retention than restudying (testing effect). However, if retrieval practice takes the form of multiple-choice (MC) practice tests, lures can become familiar such that they are erroneously selected if the same questions are repeated on the final test (negative testing effect). In this paper, we describe how MC practice tests can sometimes be problematic even when correct answers are chosen on practice tests: To generate new exam questions, instructors may sometimes change the stems of MC practice questions whilst keeping some or all of the question alternatives the same. These alternative sets can act as strong retrieval cues for previously chosen correct answers that are now incorrect on the new exam. We describe experiments exploring the robustness of this new negative testing effect and show how just repeating a single alternative between tests can induce bias. We also describe attempts at reducing the bias.
Email: Lauren Griffiths, L.R.Griffiths@soton.ac.uk

4:10-4:25 (103)

Attention and the Testing Effect. NEIL W. MULLIGAN and ZACHARY BUCHIN, *University of North Carolina - Chapel Hill* — Memory retrieval often enhances still later memory as evidenced by the testing effect. Divided attention (DA) is known to produce different effects on encoding and retrieval, substantially disrupting the former and often producing little effect on the latter. The present experiments examine whether the mnemonic consequences of retrieval are similarly resilient in the face of distraction or if they have a similar sensitivity

to DA as study-based encoding. In several experiments, participants initially studied a set of word pairs (phase 1) then engaged in restudy of some pairs and retrieval practice of others (phase 2), followed by either an immediate or (24-hour) delayed final cued recall test (phase 3). Phase 2 restudy and retrieval practice occurred under full attention (FA) or DA. The testing effect on the final test (the difference between the retrieval and restudy conditions) was greater in the DA than FA condition. Final recall was substantially reduced by DA in the restudy condition but not in the retrieval condition. The encoding effects of retrieval appear to be more resilient in the face of distraction than the encoding effects of restudy.
Email: Neil Mulligan, nmulligan@unc.edu

4:30-4:45 (104)

Testing Can Insulate Items Against Intralist Interference: Evidence from Output Interference and Retrieval-Induced Forgetting. OLIVER KLIEGL (Member Select-Speaker Award Recipient) and KARL-HEINZ T. BÄUML, *Regensburg University* — This study sought to determine whether testing after study can reduce memories' susceptibility to intralist interference, as it is observed in output interference and retrieval-induced forgetting. Across 2 experiments, we compared the effects of testing and restudy on previously studied material with regard to these 2 forms of episodic forgetting. When study of an item list was followed by a restudy cycle, preceding recall of studied nontarget items impaired recall of the list's target items (output interference), and repeated selective retrieval of some list items attenuated recall of other nonretrieved items at test (retrieval-induced forgetting). In contrast, none of these effects arose when study of the list was followed by a test cycle. The findings are consistent with the view that retrieval can create more distinct context features for tested items than restudy does for restudied items, thus reducing items' susceptibility to interference relative to restudy cycles.
Email: Oliver Kliegl, oliver.kliegl@ur.de

4:50-5:05 (105)

Improving Self-Regulated Learning with a Retrieval Practice Intervention. ROBERT ARIEL and JEFFREY D. KARPICKE, *Purdue University* — Retrieval practice is a powerful learning tool for promoting long-term retention but students often fail to use it to learn material. When they do use it, they do so ineffectively by dropping material from learning after only one correct retrieval attempt instead of correctly recalling material multiple times. The current experiments evaluated the efficacy of a minimal intervention aimed at improving students' self-regulated use of retrieval practice. Across 2 experiments, students made decisions about when to study, engage in retrieval practice, or drop translations from learning. Most important, some students received strategy instructions about how to use a repeated retrieval practice strategy. This minimal intervention promoted more effective self-regulated use of retrieval practice compared to a control group. These students recalled translations more times during learning, had higher performance on a final criterion test, and, most importantly, spontaneously used a repeated retrieval strategy when learning new translations one week later.
Email: Robert Ariel, rariel@purdue.edu

5:10-5:25 (106)

Advancing Learning in a College Classroom: Four Semesters Investigating Frequency of Testing, the Retrieval Effect, and Transfer of Training. DONALD J. FOSS and JOSEPH W. PIROZZOLO, *University of Houston* — We conducted four semester-long studies of student performance in a college course (total N = 588). Two sections were taught each semester with systematic and controlled differences between them. Key manipulations were repeated across the four terms, allowing assessment of replicability. Variables studied included frequency and spacing of tests (e.g., 2 vs. 8 exams), the repetition of some but not other exam items (i.e., the retrieval effect), and variation of test items between the in-class exams and the final exam (e.g., identical items vs. controlled changes in items). Effect sizes for test frequency were generally robust, but were affected by the type of test. Repeated test items generally led to better performance, though this finding was moderated by whether the repetition was exact or modified. We did not observe consistent superiority for exactly repeated items over modified ones. Results are discussed in terms of memory and transfer of training models.
Email: Donald J. Foss, dfoss@uh.edu

Statistics and Methodology
Back Bay C & D, Friday Afternoon, 3:30-5:30
Chaired by Richard D. Morey, Cardiff University

3:30-3:45 (107)

The "Base Rate" Critique of Significance Testing is Flawed. RICHARD D. MOREY, *Cardiff University* — Although significance testing — as practiced in psychology — has been critiqued for many decades, in recent years these critiques appear to have reached a wider audience. One of the most popular class of critiques states that to interpret the results of a significance test, one must know something about the base rate of "true" effects. This basic idea is apparent in claims that the p value and the posterior probability are reversed conditionals, in Ioannidis' (2005) claim that most research findings are false, and in Colquhoun's (2014) advocacy of the use of the "false discovery rate" as a way of interpreting p values. These arguments are flawed from both frequentist and Bayesian perspectives, and should not be used to advocate against significance testing.
Email: Richard D. Morey, moreyr@cardiff.ac.uk

3:50-4:05 (108)

On the Usefulness of p Values for Detecting and Discriminating Effects. RICHARD B. ANDERSON, *Bowling Green State University* — There have been recent moves in psychology to replace *p* values (significance values) with alternative measures, such as effect sizes and Bayes factors. In a set of simulations, I have shown that the *p* value tracks the population effect size better than the Bayes factor does (though neither tracks the population effect size as well as the sample effect size). The *p* value is also at least as good as the Bayes factor with respect to its correlation with the presence or absence of a true effect in the population. The results suggest that, aside from whether $p = .05$ ought to have special status in statistical inference, *p* can be at least a useful as some of the candidates

for its replacement. Additional work is in progress to assess the rates of correct and incorrect statistical decisions when the *p* value, effect size, or Bayes factor is used as a decision cue.
Email: Richard Anderson, randers@bgsu.edu

4:10-4:25 (109)

Everybody Stroops: Equality and Order Restrictions in Bayesian Mixed Models of Task Performance. JULIA M. HAAF and JEFFREY N. ROUDER, *University of Missouri* (Presented by Jeffrey Rouder) — Does every individual exhibit a Stroop Effect where incongruent items are truly read more slowly than congruent ones? Are there some people, for example, who Stroop in the opposite direction where incongruent items are truly read faster than congruent ones? Does anyone truly not Stroop at all? All current models of individual differences are based on graded normal distributions where there is no special role of the direction of effects or the possibility of null effects. We introduce a set of Bayesian mixed models to capture these equality (null) and order (direction) constraints for individual differences, and develop a Bayes factor approach to compare these models. The approach differs markedly from conventional analysis. We find that: (1) Every individual has true Stroop and Simon effects in the usual direction; (2) many of the data sets are better described by models without individual differences; (3) to show individual differences, it is often necessary to collect hundreds of trials per individual and to analyze them with order-restricted models.
Email: Jeffrey N. Rouder, rouderj@missouri.edu

4:30-4:45 (110)

A Hierarchical Bayesian Approach to Adaptive Design Optimization. JAY I. MYUNG, *Ohio State University*, WOOJAE KIM, *Howard University*, HAIRONG GU, ZHONG-LIN LU and MARK A. PITT, *Ohio State University* — Accurate and efficient measurement is critical for empirical scientific inquiry, yet observations can be expensive and time-consuming to acquire (e.g., fMRI, infant research). To ensure measurement episodes are optimized for maximal inference, there has been a growing interest among researchers in adaptive design optimization (ADO) methods. In this presentation we introduce a hierarchical Bayesian approach to ADO that provides a judicious way to exploit two complementary schemes of inference, knowledge gained from both the group-level and individual-level performance, in a statistically justified manner. The new approach is demonstrated and validated through simulations and experiments in the adaptive estimation of the contrast sensitivity function in human vision.
Email: Jay Myung, myung.1@osu.edu

4:50-5:05 (111)

The EZ Diffusion Model Provides a Powerful Test of Empirical Effects: Simulations and a Many-Lab Validation Study. *CHRIS DONKIN, *University of New South Wales*, DON VAN RAVENZWAAIJ, *University of Groningen*, JOACHIM VANDEKERCKHOVE, *University of California, Irvine*, GILLES DUTILH, *University of Basel* — Evidence accumulation models for choice response time have spread through cognitive psychology like wildfire. These models have been used to identify the latent cognitive processes that underpin behavior in a range of paradigms, including perceptual discrimination, letter identification, lexical decision, recognition memory, and signal detection. In response to the growing complexity of choice response time models, Wagenmakers et al. (2007) suggested that researchers use the exceedingly simple-to-use EZ diffusion model. We present the results of a simulation study which shows that the EZ diffusion model, by virtue of its relative simplicity, will often be better able to detect experimental effects than the full diffusion model. We also present the results of a many-team project in which researchers were asked to identify effects in multiple real data sets, while blind to the actual experimental manipulations. The EZ diffusion model performs as well, if not better, than most alternative methods for detecting the cognitive processes underlying behavior.
Email: Chris Donkin, christopher.donkin@gmail.com

5:10-5:25 (112)

Can Pain Intensity Be Measured on a Ratio Scale? BRIAN P. DYRE, NICHOLAS ROOME and TRISTEN BEAUDOIN, *University of Idaho*, JUSTIN G. HOLLANDS, *Defence Research and Development Canada* — Can sensations of pain intensity be measured on a ratio scale? Using an axiomatic approach, Narens (1996, J. Math. Psych.) determined that maintenance of the commutative property in ratio productions of stimulus magnitude is necessary and sufficient for establishing that responses form a ratio scale. Here, we examined whether commutativity holds for thermally-induced pain. A thermal stimulator controlled the temperatures of two thermodes mounted on the volar forearms of participants, who adjusted the temperature of one thermode so that the associated pain stood in ratios of 1, 2, 3 and 6 times the pain produced by a second thermode. Sequential productions of pain intensity were then used to determine if 2 x 3 = 3 x 2 (commutativity) and 2 x 3 = 6 x 1 (multiplicativity). We found that commutativity generally held, though some participants' responses violated multiplicativity, suggesting that pain is perceived on a scale preserving ratio properties.
Email: Brian P. Dyre, bpdyre@uidaho.edu

Attention: Features & Objects
Republic, Friday Afternoon, 3:30-5:30
Chaired by Carrick C. Williams, California State University San Marcos

3:30-3:45 (113)

Missing Visual Information: Occlusion and Remembering What Was and Was Not Visible. CARRICK C. WILLIAMS and KYLE A. BURKLE, *California State University San Marcos* — How precise or abstract are visual long-term memories? Precise memories would emphasize detail, allowing identification of the exact images seen, whereas abstract memories would be useful identifying the same object under multiple viewing conditions. Participants encoded objects with three occlusion patterns blocking 50% of an object: solid side, alternating stripes, or checkboard pattern. On a memory test, participants chose between the previously shown image and the same object with the opposite portions occluded. The exact images of Solid

occluded objects (emphasizing detail) were remembered better than Stripe or Checker objects (emphasizing object form). Additionally, we presented the same objects at encoding and had participants choose between the opposite occlusion (not previously shown) images and non-presented occluded foils. The non-presented portions of Checker and Stripe occluded objects were remembered better than Solid occluded objects. These results indicate that visual memory is flexible, allowing different representations depending on what information is available.
Email: Carrick C. Williams, cawilliams@csusm.edu

3:50-4:05 (114)

Visual Attention Creates Flexible Structure Over Space and Time. STEVEN FRANCONERI, *Northwestern University* — Selective attention allows us to filter visual information, amplifying what is relevant and suppressing what competes. But recent work in our lab suggests another role – extracting and manipulating visual structure. I will describe four such lines of research, showing a role for selective attention in grouping objects with similar features, extracting spatial relationships between objects, imagining manipulations of objects, and maintaining object identity over time. I will also describe interactions of these processes with spatial language and highlight potential applications for improving pedagogy and displays related to math and science education.
Email: Steven Franconeri, franconeri@northwestern.edu

4:10-4:25 (115)

When Does Visual Attention Need to Be Reallocated? The Neural Correlates of Attentional Deployment to Two Sequential Targets. BRAD WYBLE and CHLOE CALLAHAN-FLINTOFT, *The Pennsylvania State University* — When subjects search for multiple targets (i.e. T1, T2) in sequence, EEG data suggests that attention is triggered by the T1 and an immediately following T2 can be encoded without a reallocation of attention. In four EEG experiments we tested the conditions under which attention needs to be reallocated to a T2 by measuring the N2pc to both targets. Sequential targets of different types (popout vs categorical target) did not produce a second N2pc. However a temporal gap of 600ms between targets elicited an N2pc to the T2 even though the targets were always in the same location. When three targets were presented in sequence there was no N2pc for the third target, in agreement with attentional blink findings of spreading of sparing. These results support a model in which the N2pc marks the beginning of an attentional episode that can contain one or more targets. The beginning and end of episodes are primarily stimulus driven, since they can be sustained by presenting a sequence of targets, but not by the expectation that T1 and T2 will be presented in the same location. The results will be discussed in the context of a computational model of stimulus driven attention and distractor inhibition.
Email: Brad Wyble, bwyble@gmail.com

4:30-4:45 (116)

Interpersonal Feature Migration: Evidence for Common Mechanisms Underlying Social and Nonsocial Event Representation. KE MA, ROBERTA SELLARO, DOMINIQUE K. LIPPELT and BERNHARD HOMMEL, *Leiden University* (Presented by Bernhard Hommel) — According to the Theory of Event Coding (Hommel et al., 2001, BBS), social and nonsocial events are cognitively represented the same way, suggesting that empirical phenomena associated with nonsocial events should generalize to social events. Research on illusory conjunctions demonstrated that features related to one object can be perceived as part of another under suitable circumstances. Here we generalize this observation to social events. Participants faced a virtual head on a monitor in front of them, which moved synchronously or asynchronously with their own head movements—assuming that synchrony facilitates feature migration from virtual agent to participant. Indeed, facing a smiling head lifted participants' mood and improved their performance in a mood-sensitive creativity task with synchrony but not with asynchrony. In a second study, we slowly morphed the virtual face into an ape face, which in the synchrony condition reduced performance in a fluid-intelligence task and increased the willingness to attribute emotions to apes.
Email: Bernhard Hommel, hommel@fsw.leidenuniv.nl

4:50-5:05 (117)

Tempus, a New Model of Learning and Attention in Categorization That Is Active, Neural and Temporal. JORDAN I. BARNES, MARK R. BLAIR, R. CALEN WALSHE and PAUL F. TUPPER, *Simon Faser University* — Existing models of category learning are not well equipped to deal with the spatial or temporal properties of the allocation of visual attention, and thus cannot be applied to much of the recent eye-tracking data collected in category learning experiments. We have developed a new model, Tempus, designed within a Dynamic Neural Field Theory framework, that combines a category learning system, a visual processing system, and a saccade initiation system to provide a unified account of visual attention and learning in the context of categorization. In the model, category knowledge develops through associations with predictive cues, and reentrant signals influence the targeting of the visual field toward useful information. Using the model's 3 free parameters, we fit Tempus to the data of human subjects from 2 category learning tasks. We found that the model provides good qualitative fits to classic category learning measures and, simultaneously, to eye-tracking measures.
Email: Mark Blair, mblair@sfu.ca

5:10-5:25 (118)

Multiple Salience Maps? GEORGE SPERLING and VERONICA C. CHU, *University of California, Irvine*, PENG SUN, *New York University* — The centroid task requires subjects to use a mouse to indicate the center of a briefly flashed cloud of, typically, dots. However, subjects can also judge the centroid of a cloud of highly diverse items. Similarly, Ss can judge motion direction in successive frames in which the only thing that changes consistently is an area defined as figure, the nature of both figure and ground changing in each new frame. The fact

that subjects can make centroid, motion direction, and other judgments that simultaneously involve the locations of highly different items defined merely as figure versus ground suggests that these computations act on a salience map that records the presence and the location of such items but is indifferent to their nature. In motion and centroid tasks, Ss can also selectively respond to attention-selected subsets of items and ignore distracter items. Here we show that, in a single brief flash of a 24-dot cloud (8 black, 8 red, 8 green, all interleaved), Ss can accurately report the centroids of all three colors. That three centroid computations can occur concurrently suggests that a reformulation of the single salience map concept is required.
Email: George Sperling, sperling@uci.edu

Decision Making II

Independence, Friday Afternoon, 3:30-5:30

Chaired by Thorsten Pachur, Max Planck Institute for Human Development

3:30-3:45 (119)

Nothing Compares to It: What Drives Learning Task Effects in Decision Making? THORSTEN PACHUR and DRIES TRIPPAS, *Max Planck Institute for Human Development* — In decision making under uncertainty, performance and strategy selection have been shown to be affected by seemingly innocuous characteristics of the task with which people learn from feedback about the probabilistic structure of the environment (Pachur & Olsson, 2012). Specifically, *direct criterion learning* promotes the use of exemplar-based strategies in a subsequent test phase; *learning by comparison* promotes reliance on cue-abstraction strategies. Learning by comparison is also associated with better generalization at test. In a series of experiments, we identify the specific features of the learning task that are responsible for these effects. The results reveal that the provision of relative as opposed to absolute feedback about an object's criterion value during training promotes subsequent reliance on cue-abstraction strategies over exemplar-based strategies. The explicit provision of continuous criterion values during learning promotes reliance on exemplar-based strategies. Our results can help design learning environments that foster good decision making. Further, they pose a challenge to current theories of strategy selection, which cannot account for the effects of feedback format.
Email: Thorsten Pachur, pachur@mpib-berlin.mpg.de

3:50-4:05 (120)

Cue-based and Exemplar-based Inference: A Drift Diffusion Approach. DRIES TRIPPAS and THORSTEN PACHUR, *Max Planck Institute for Human Development* — Research on categorization has shown that people rely on two qualitatively different types of inferential strategies depending on cognitive and environmental factors. Cue-based strategies (e.g., cue-abstraction model; CAM) assume that people linearly integrate cues and weights. Exemplar-based strategies (e.g., exemplar-based model; EBM – see also the generalized context model) assume that people respond on the basis of similarity to exemplars in memory. All research evaluating the effects of cognitive and environmental factors on strategy use has relied on the static modeling of choice data. We used simulations and fits to empirical data to develop dynamic extensions of CAM and EBM, by integrating both models with the drift diffusion model. We show that this integrative approach leads to different conclusions about the classification of some individuals as relying on cue-based or exemplar-based strategies, potentially overturning conclusions about the influence of various cognitive and environmental factors on strategy use.
Email: Dries Trippas, trippas@mpib-berlin.mpg.de

4:10-4:25 (121)

Optimal Prediction in Illness Cognition. PERNILLE HEMMER and TALIA ROBBINS, *Rutgers University* — People make accurate predictions for many real world events, e.g. human life spans (Griffiths & Tenenbaum, 2006). Accurate predictions are particularly important in the domain of health, where alignment of illness knowledge directly influences patient outcomes (e.g. Peters, 2006). To understand how well peoples' illness expectations are aligned, we asked participants to estimate durations for 9 illnesses, and compared their responses to the Bayesian optimal prediction (as determined from real-world illness duration distributions). We found that for common acute illnesses, people were able to correctly estimate both the shape and mean of the distribution, but for less common chronic illnesses, people failed to capture key parameters of the distribution (e.g. systematically overestimating duration). We discuss possible participant strategies, based on miscalibrations, such as assumptions of earlier onset or a distribution similar to lifespan for chronic illnesses. Results are discussed in terms of implications for cognition and health decision making.
Email: Pernille Hemmer, pernille.hemmer@rutgers.edu

4:30-4:45 (122)

The Eyes Have It: Can Perceptual and Moral Decisions Be Influenced by Eye Movements? BEN R. NEWELL, TOMMY TORGERSON, CHETANA SARANU and MIKE E. LE PELLEY, *University of New South Wales* — Can decisions be biased via the passive monitoring of eye gaze? We examined this question using a simple perceptual discrimination task (Experiment 1) and a more complex moral and factual decision-making task (Experiment 2). Participants' gaze was monitored and information about the location of their gaze at particular time-points in a decision trial was used to prompt responses. When there was no objective perceptual information available to a decision-maker, the timing of the prompt had a small, but detectable effect on choice (Experiment 1). However, this small effect did not scale up to more complex decisions (Experiment 2). Our results are consistent with the well-established idea that participants' choices are reflected in their eye-gaze, but do *not* support the recent bold claim of a causal link wherein the timing of a gaze-contingent response-prompt influences complex choices.
Email: Ben Newell, ben.newell@unsw.edu.au

4:50-5:05 (123)

Motor Dynamics Support a Competition Model of Number Processing. THOMAS J. FAULKENBERRY, *Tarleton State University* — Recording hand movements during number

tasks has become a powerful method for disentangling competing models of numerical representation. In two experiments, participants used a computer mouse to choose whether presented numbers were greater than or less than 5. In Experiment 1, trajectories became more curved toward the incorrect response label as target numbers approached the comparison standard 5, indicating increasing response competition. However, trajectories showed a rightward bias indicative of a direct mapping between hand movement and an ordered, spatial representation of number. In Experiment 2, I changed the bottom-to-top direction of mouse movements to a left-to-right movement. Trajectories again became more curved toward the incorrect response label as targets approached 5, but this time, there was no modulation of trajectory bias by target size or distance. The results call into question adirect mapping view and instead lend support to a competition model of response dynamics in number comparison.
Email: Thomas J. Faulkenberry, faulkenberry@tarleton.edu

5:10-5:25 (124)

Judgmental Biases in Interracial Contexts. X.T. (XIAOTIAN) WANG, KENNIDY ASCHE, JOSE RAMON DOMINGUEZ and LILLIAN KALLESTAD, *University of South Dakota* — The studies of intergroup behaviors suggest that even trivial cues and labels can activate in-group favoritism and/or out-group discrimination. However, little is known about racial perception and social judgment of biracial individuals. In this study, we tested a novel hypothesis that biracial cues serve as an indicator of intergroup alliance and cooperation. Participants observed morphed photos of biracial or monoracial faces and made racial categorization for each face. They also rated the faces on personal characteristics (e.g., intelligence, trustworthiness, health). The results showed a new type of own-race bias in racial perception (e.g., 50-50 composites were perceived as more Caucasian looking by Caucasian participants). In addition, the rating scores revealed a biracial favoritism effect in social judgment, as indicated by higher ratings of biracial faces in trustworthiness and intelligence. These results and preliminary results from Chinese samples all suggest that biracial cues indicate historical alliance between members from the two races and thus increase estimated cooperative potentials of a biracial protagonist.
Email: X.T. (Xiao-Tian) Wang, xtwang@usd.edu

Letter/Word Processing I

Back Bay B, Friday Afternoon, 3:50-5:30

Chaired by Emmanuel Keuleers, Tilburg University

3:50-4:05 (125)

Word Frequency, Diversity, and Prevalence in Crowds and Corpora. EMMANUEL KEULEERS, *Tilburg University*, PAWEŁ MANDERA and MARC BRYSBAERT, *Ghent University* — Measures of word frequency and diversity derived from text corpora have been pervasively shown to be the best predictors of isolated word identification latency. Recently, Keuleers et al. (2015) have show that prevalence, a crowd-based measure that can be expressed as the percentage of a population who know a word, is also a very strong independent predictor of word processing times. We give additional evidence that prevalence outperforms corpus-based measures of frequency and diversity on predicting lexical decision and word naming latency in different languages. More importantly, we show how different measures of frequency and diversity can be mathematically related to eachother and that ignoring these correspondences leads to spurious comparisons. Specifically, we show that, due to the nature of word frequency distributions, measures of diversity and frequency will always be very highly correlated if they are derived from the same source. Furthermore, we argue that, when these correspondences are taken into account, the reason why the prevalence measure performs so well is that it is a diversity measure that is derived from a theoretically infinite corpus.
Email: Emmanuel Keuleers, emmanuel.keuleers@gmail.com

4:10-4:25 (126)

Frequency Attenuation and Masked Repetition Priming. KENNETH I. FORSTER, *University of Arizona*, XIAOMEI QIAO, *Shanghai University of Finance and Economics* — One hoped-for advantage of the masked priming technique is an increase in the reliability and consistency of experimental outcomes. Early results indicated a constant frequency effect for primed and unprimed words, hence no frequency attenuation, but later results reported a frequency by priming interaction, with low-frequency words showing stronger priming, and hence frequency attenuation (Bodner & Masson, 2001; Kinoshita, 2006). Several experiments are reported with similar conflicting outcomes, suggesting that item differences might be responsible. A linear mixed effects regression analysis of the data from several experiments demonstrated that covariates such as imageability, neighborhood density, and concreteness had no effect on priming estimates, but age-of-acquisition (AoA) did, such that early-acquired words showed weaker priming effects, but only for high-frequency words. A subsequent factorial experiment confirmed this result. However, the same pattern was observed for L2 speakers of English, for whom all English words would have been acquired relatively late.
Email: Kenneth Forster, kforster@u.arizona.edu

4:30-4:45 (127)

The Role of Diacritical Marks in the Early Stages of Written-Word Recognition in Arabic. MANUEL PEREA, *Universitat de València*, REEM ABU MALLOUH, *Basque Center on Cognition, Brain and Language*, AHMED MOHAMMED and BATOUL KHALIFA, *Qatar University*, MANUEL CARREIRAS, *Basque Center on Cognition, Brain and Language* — A disputed question in written-word recognition is whether visual similarity plays a role in the early stages of word processing. Here we focused in Arabic because there are several groups of letters that share the basic shape and only differ in the number (or location) of diacritical points. We conducted a masked priming lexical decision experiment in which the target word was preceded by: i) an identity prime; ii) a prime in which the critical letter was replaced by a letter with the same shape that differed in the number of diacritics (SIM condition); or iii) a prime in which the critical letter was replaced by a letter with a different shape (DIS condition). Results showed a sizable advantage of the

identity condition over both the SIM and DIS conditions. Thus, diacritical marks should play an important role in the "feature letter" level of models of word recognition in Arabic.
Email: Manuel Perea (mperea@uv.es), mperea@uv.es

4:50-5:05 (128)

Is Letter Position Coding Universal? Insights from Word Processing in Korean and Artificial Languages. KATHLEEN RASTLE, CLARE LALLY and JOANNE TAYLOR, *Royal Holloway, University of London*, CHANG LEE, *Sogang University* — Research on Indo-European languages reveals that stimuli with letter transpositions (e.g. *jugde*) are perceived as very similar to their base words (*judge*). However, similar effects are not observed in Hebrew, a dense orthography with many anagrams. We report masked priming experiments from another dense orthography characterised by many anagrams, Korean Hangul. Like Hebrew, results of these experiments show no evidence that stimuli with letter transpositions facilitate recognition of their base words. We then report an experiment investigating position coding in artificial writing systems purposely designed to be sparse (i.e. few anagrams) or dense (i.e. many anagrams). Results from this experiment indicate that readers perceive stimuli with letter transpositions as similar to their base words, but that these effects are significantly reduced in the dense orthography. These results suggest that the acquisition of orthographic representations is strongly influenced by properties of writing systems, and raise questions for recent approaches to modelling reading.
Email: Kathy Rastle, Kathy.Rastle@rhul.ac.uk

5:10-5:25 (129)

Visual Search for Words in Patients Suffering from Obsessive-Compulsive Disorder. NICOLAS VIBERT, *Université de Poitiers*, FABIANO BOTTA, *Centre Hospitalier Universitaire et Université de Poitiers*, MICKAËL FRASCA, FRANÇOIS RIGALLEAU, CHRISTINE ROS and JEAN-FRANÇOIS ROUET, *Université de Poitiers*, NEMATOLLAH JAAFARI, *Centre Hospitalier Universitaire et Université de Poitiers* — This eye-tracking experiment tested how patients suffering from obsessive-compulsive disorder (OCD) searched for target words within distractor words that could be related to their main obsessions and/or compulsions, orthographically similar to the target word, semantically related to the target word or unrelated to the target word. Altogether, OCD patients needed more time than control participants to locate target words. Control participants' attention was more attracted by orthographic distractors than by the other types of distractors. In contrast, OCD patients' attention was strongly attracted by all kinds of distractors, whatever their similarity with the target, except the obsession-related ones. They made fewer fixations on obsession-related words than on other types of words when searching, as if they could identify and reject them without fixating them. These words may be so familiar for OCD patients that they might be able to identify them as soon as they enter their peripheral visual field.
Email: Nicolas Vibert, nicolas.vibert@univ-poitiers.Fr

Discourse Processing
Liberty, Friday Afternoon, 3:50-5:30
Chaired by Delphine Dahan, University of Pennsylvania

3:50-4:05 (130)

Reference Making in Unscripted Task-Oriented Dialogues. DELPHINE DAHAN and KATHRYN SOLOMON, *University of Pennsylvania* — When people talk to each other about a specific entity in the world, they must come to agree on which entity the reference identifies but also on how to talk about it. We examined this process using a referential communication task: Two participants sat on either side of an opaque barrier and took turns playing the roles of director and matcher, the former instructing the latter which one, out of a set of 16 hard-to-describe figures they both had, to select on each trial. An audio-recording of their dialogue as they worked on establishing reference on each trial was analyzed, in conjunction with a measure of their success as revealed by the accuracy of the matcher's choice of figure given the director's intention. The types of expressions participants used to refer to a given figure on its first and subsequent mentions revealed surprisingly large variability in the way individuals establish reference.
Email: Delphine Dahan, dahan@psych.upenn.edu

4:10-4:25 (131)

Those Little White Lies: Deception and Politeness in Spontaneous Conversation. FRANCO AMATI and SUSAN E. BRENNAN, *Stony Brook University* (Presented by Susan Brennan) — People often lie out of politeness. How accurately can they detect deception in the form of little white lies? Pairs of strangers prompted with cards conversed about themselves (self-oriented topics) or their partners (other-oriented topics). Afterwards, partners were interviewed separately while watching their videotaped conversation; each was asked (a) to admit to any deception and to provide reasons for it, and (b) to detect when their partner had lied. People admitted to lying 31% of the time and suspected their partners lied 37% of the time (but were rarely correct). They were more suspicious of partners' self-oriented comments (e.g., bragging) than they were of partners' other-oriented comments (e.g., flattery). Successful attempts at politeness may rest on an inability or unwillingness to identify a partner's positive (complimentary) deception, or on wishful thinking. Findings are discussed in light of Brown & Levinson's (1974) theory of positive and negative politeness and off-record speech.
Email: susan.brennan@stonybrook.edu, susan.brennan@stonybrook.edu

4:30-4:45 (132)

Which Good Outcomes Do Bad Characters Deserve? MICAH L. MUMPER, RICHARD J. GERRIG and KELSEY A. BAGELMANN, *Stony Brook University* (Presented by Richard Gerrig) — How do people assess the match between characters and outcomes? In general, such assessments appear to respect the imperative that good outcomes obtain for good characters and bad outcomes for bad characters. However, we hypothesize that certain extremely positive outcomes may be "character-resilient" (e.g., the opportunity to attend a mother's funeral),

such that people will endorse those outcomes even for very bad characters. In our experiments, participants read sentences presenting characters and outcomes. Participants judged whether the characters deserved the outcomes. Characters and outcomes varied on valence (positive vs. negative) and intensity (mild vs. extreme). Across all experiments, participants nearly unanimously wanted positive and not negative outcomes for good characters regardless of the intensity. For bad characters, participants endorsed negative over positive outcomes and more mildly negative outcomes over extremely negative outcomes. However, as predicted, participants endorsed extremely positive outcomes more than mildly positive outcomes, even for extremely bad characters.
Email: Micah L. Mumper, micah.mumper@stonybrook.edu

4:50-5:05 (133)

The Brain Dissociates Between Different Levels of Prediction During Language Comprehension. GINA R. KUPERBERG, EDWARD WLOTKO and SIMONE RILEY, *Tufts University*, MARGARITA ZEITLIN, *University of Washington*, MARIA CUNHA LIMA, *Federal University of Minas Gerais* — Comprehenders continually use context to generate probabilistic predictions. We asked whether and how these predictions influence neural processing of incoming words. Mini-discourse contexts varied in their constraint for a specific lexical item or event structure. Event-related potentials were recorded to nouns that fulfilled lexical predictions, that violated lexical predictions but were plausible, or that violated the preceding verb's selectional restrictions ('They cautioned the SWIMMERS / TRAINEES/ DRAWER' following a context about lifeguards and sharks). Semantic facilitation was reflected by a selective reduction of the N400 on predictable nouns. Plausible nouns that violated lexical predictions selectively elicited a late anteriorly-distributed positivity, whereas nouns that violated selectional restrictions elicited a late posteriorly-distributed positivity. These dissociable neural signatures of prediction violations at different levels of representation provide support for a hierarchical generative architecture in which bottom-up information is continually evaluated against top-down predictions at multiple levels of representation to support ongoing comprehension.
Email: Gina Kuperberg, kuperber@nmr.mgh.harvard.edu

5:10-5:25 (134)

Embodied Attention During Reading: Evidence From Concurrent Recordings of Eye Movements and Head Motion. JOHANNA K. KAAKINEN, *University of Turku,* UGO BALLENGHEIN, *University of Paris 8,* GEOFFREY TISSIER, *LUTIN Laboratories,* THIERRY BACCINO, *University of Paris 8* — We examined whether micro movements of the head during the course of reading reflect the relevance of information presented in text. Thirty-three participants read an expository text describing four different countries from one of two possible perspectives while their eye movements and head motion were concurrently recorded. After reading, participants summarized the main points of text. Euclidean distance between the head and screen, and the speed of head motion were computed across fixations made during reading of perspective-relevant and irrelevant text segments. The results showed that head movements during reading were associated with text relevance: during the task, distance from screen got slightly shorter and head motion slower during reading of relevant in comparison to irrelevant sentences. Total fixation durations were longer and recall performance was better for relevant than irrelevant text information. The results imply that attentional effort during reading is embodied in micro movements.
Email: Johanna K. Kaakinen, johanna.kaakinen@utu.fi

Visual Working Memory
Grand Ballroom, Saturday Morning, 8:00-9:40
Chaired by Michael S. Pratte, Mississippi State University

8:00-8:15 (135)

Iconic Memories Die a Sudden Death; They Do Not Gradually Fade Away. MICHAEL S. PRATTE, *Mississippi State University* — Iconic memory is characterized by its large storage capacity but brief storage duration, whereas visual working memory (VWM) is characterized by its small storage capacity. The limited information stored in VWM is often modeled as an all-or-none process, whereby studied information is either successfully stored or it is lost completely. This view raises a simple question: If the majority of visual information is stored in iconic memory, but one second later most of it is completely absent from VWM, what happened to it? Here we characterize how the precision and capacity of iconic memory change over time, and observe a clear dissociation: Iconic decay results from the complete loss of more and more items over time, but the precision of items retained in memory does not change. These results provide new evidence for the discrete capacity view of working memory, and a new characterization of iconic decay.
Email: Mike Pratte, prattems@gmail.com

8:20-8:35 (136)

Memory-Level Attention Is Sensitive to Visual Eccentricities. MICHI MATSUKURA and SHAUN P. VECERA, *University of Iowa* — Attention can select an object or a set of objects already stored in visual short-term/working memory (VSTM/VWM). Yet, is this "memory-level attention" sensitive to the spatial information of the objects represented in memory? Along with the classic mental imagery literature, the account that VWM is supported by the same neural mechanisms that encode the sensory information strongly predicts such sensitivity. However, the results from the existing studies (which manipulated visual eccentricities of to-be-remembered objects) suggest otherwise. In the present study, through systematic searches for possible loci of the reported lack of the eccentricity effect, we consistently observed the effect of eccentricities on memory-level attention. These results indicate that attention is sensitive to the distance information of the objects maintained in VWM, even when the observers are asked to recognize object identity (rather than location). The study concludes with identifying specific factors, which muted the eccentricity effect in the existing studies.
Email: Michi Matsukura, michi-matsukura@uiowa.edu

8:40-8:55 (137)

Clear Evidence for Item Limits in Visual Working Memory. ED AWH, KIRSTEN ADAM and ED VOGEL, *University of Chicago* — There is a consensus that working memory (WM) capacity is sharply limited, but debate persists regarding the simple question of whether subjects ever fail to store a relevant item. Zhang and Luck (2008) advanced this debate with an analytic procedure that provided strong evidence for random guessing responses, but this empirical pattern can also be described by models that assert a high prevalence of low precision memories. Here, we used a whole-report memory procedure in which subjects reported all six items in each trial, and indicated whether they were guessing with each response. Subjects had excellent meta-knowledge and self-reports of guessing precisely tracked the guessing rate estimated with mixture modeling. For about 3 of 6 responses, the response error distributions were better fit by a parameter-free model that endorses guessing than by leading models that use low precision memories to mimic guessing behaviors. Thus, both quantitative fits and subjective reports provide clear evidence of item limits in visual WM.
Email: Ed Awh, awh@uchicago.edu

9:00-9:15 (138)

Dynamic Object Tracking Reveals Both Object Specific and Non-Specific Binding of Color and Shape in Visual Working Memory. JUN SAIKI, *Kyoto University* — Saiki (2016) reported that binding of non-spatial features in visual working memory is invariant to location changes, apparently inconsistent with object file theory postulating that object continuity is critical in feature binding. The role of objects in binding was examined by investigating effects of dynamic object tracking on feature binding. A set of features was presented in a two-object memory display, followed by a single object probe. Place-holders may move during the maintenance period. Participants judged if the probe contained any features in the memory display. The RT distribution analysis revealed feature co-activation regardless of object sharing between memory and probe displays even when objects move, suggesting object non-specific binding of color and shape. However, when objects moved, object-sharing benefits and feature co-activation showed a significant correlation, suggesting the modulation of binding by object tracking. Visual working memory contains both object specific and non-specific binding representations of color and shape.
Email: Jun Saiki, saiki.jun.8e@kyoto-u.ac.jp

9:20-9:35 (139)

Short-Term Consolidation of Continuous Visual Working Memory. TIMOTHY J. RICKER, *College of Staten Island & The Graduate Center, City University of New York* — Short-term consolidation is the process through which working memories become stable and robust against forgetting. Although a consolidation process of some sort within working memory has been proposed for several decades, past evidence for the process was indirect and did not demonstrate any change in memory performance. The outcome of only having indirect evidence is that the process itself has been poorly understood. Fortunately, recent research has begun to show changes in memory performance with longer consolidation periods, allowing further understanding. It appears that short-term consolidation is separable from encoding, happens quickly, and mitigates future forgetting. Here I present new research detailing the time course of consolidation, provide some mathematical models of the process, and rule our temporal distinctiveness as an alternative explanation of the effect.
Email: Timothy Ricker, Timothy.Ricker@csi.cuny.edu

Cognitive Aging
Back Bay C & D, Saturday Morning, 8:00-10:00
Chaired by Wandi Bruine de Bruin, University of Leeds & Carnegie Mellon University

8:00-8:15 (140)

Choosing to Be Happy? Age Differences in 'Maximizing' Decision Strategies and Experienced Emotional Well-Being. WANDI BRUINE DE BRUIN, *University of Leeds & Carnegie Mellon University*, ANDREW M. PARKER, *RAND Corporation*, JONELL STROUGH, *West Virginia University* — People of all ages face decisions that potentially affect their experienced emotional well-being. Different decision strategies can be applied to making decisions. 'Maximizing' is a decision strategy that involves the systematic search of alternatives, with the goal of selecting the very best one. 'Satisficing' is less elaborate and involves choosing an option that is 'good enough.' In surveys with a large national sample, we find that older adults are less likely than younger adults to self-report maximizing tendencies on Schwartz et al.'s (2002) scale. Older adults were especially less inclined to engage in the 'alternative search' component of maximizing. Moreover, older adults' lesser maximizing and alternative search was associated with better experienced emotional well-being two years later, including more positive affect and less negative affect. These findings held after taking into account negative life events and demographic variables. Our findings suggest that older adults could possibly be opting for simple decision strategies that make them happier. We discuss implications for theories about aging and decision making, as well as interventions that aim to improve decision making.
Email: Wandi Bruine de Bruin, w.bruinedebruin@leeds.ac.uk

8:20-8:35 (141)

What Functions Does Reminiscing About the Past Serve for Nursing Home Residents, and Do They Reminisce More Than They Realize? LINDA A. HENKEL, ALISON KRIS and EMILY PETERS, *Fairfield University* — Across the lifespan, people use their autobiographical memories for different functions in different contexts, with positive cognitive and social benefits associated with reminiscing or sharing one's memories with others. This study compared the frequency, functions, and outcomes of reminiscence using both self report and observational measures in older nursing home residents and healthy young adults. Questions with structured themes drawn from models of functions on autobiographical memories (social/conversation, teach/inform, historical reflection, identity) offered opportunities for, but did not require, talking about one's past. Instances of spontaneous reminiscence were coded for memory specificity, valence, and content. Results

showed more frequent spontaneous reminiscence by older adults, with the greatest frequency occurring during the simple conversation task. No significant correlation between observed and self-reported frequencies of reminiscence were found. These findings suggest that providing nursing home residents opportunities to engage in casual conversations may increase frequencies of spontaneous reminiscence and provide a beneficial alternative to more structured and time-consuming reminiscence therapies.
Email: Linda Henkel, lhenkel@fairfield.edu

8:40-8:55 (142)

Age-Related Differences in Source Memory After Reflection on Visual, Emotional, or Associative Information. KAREN J. MITCHELL, *West Chester University of Pennsylvania*, MARCIA K. JOHNSON, *Yale University* — Age-related source memory deficits result, in part, because young and older adults attend to different information. The extent to which this occurs during perception vs reflection is not understood. We presented young and older adults with pictures of scenes (*puppy tearing a pillow*) and asked them to rate, while looking at the picture: visual vividness, emotionality, and personal associations. After each set of four pictures, they were probed to think about a random two of them and rate their mental image on one of the dimensions. Different dimensions were probed for each set. Old items were then mixed with new items, and participants decided whether each item had been seen only, seen+reflected on, or was new. In spite of similar subjective ratings during encoding, older adults showed poorer source memory, especially when the item had been seen only. The relationship between type of reflection and source memory will be discussed.
Email: Karen J Mitchell, kmitchell@wcupa.edu

9:00-9:15 (143)

Do Older Adults Have Fewer Involuntary Autobiographical Memories Than Younger Adults? Contrasting Evidence from Different Laboratory Methods. LIA KVAVILASHVILI, *University of Hertfordshire*, AGNIESZKA NIEDŹWIEŃSKA, *Jagiellonian University*, MATTHIAS KLIEGEL, *University of Geneva* — Involuntary Autobiographical Memories (IAMs) come to mind without deliberate attempt to recall them, often in response to environmental cues when engaged in undemanding activities. Although IAMs have been studied primarily with diary methods, there is a shift towards using laboratory methods where participants detect vertical lines in a stream of slides with horizontal lines while being exposed to irrelevant cue words that may trigger IAMs. Using the original version of this method (Schlagman & Kvavilashvili, 2008) where participants report IAMs themselves during the vigilance task, very large age decrements were found in Studies 1 and 2, with more than 50% of older adults not reporting any IAMs. In Study 3, where the demands of the vigilance task were significantly reduced, the age decrement was completely eliminated. The results have implications for research on age effects on spontaneous cognitive phenomena such as IAMs, mind-wandering and involuntary future thinking.
Email: Lia Kvavilashvili, L.Kvavilashvili@herts.ac.uk

9:20-9:35 (144)

Video Game Training in Older Adults: A Randomized Controlled Trial (RCT). SOLEDAD BALLESTEROS, ELOISA RUIZ, ANTONIO PRIETO, PILAR TORIL, VANESA PEINADO, JULIA MAYAS and JOSÉ M. REALES, *Universidad Nacional de Educación a Distancia* — Previous meta-analytic and intervention studies with older adults showed that computerized cognitive training enhance aspects of cognition that decline with aging. Most of these studies compared results of trained and non-contact control groups. In this ongoing RCT participate 75 older adults randomly assigned to the experimental group, which received 16 1-hr training sessions in the presence of the trainer over 10-12 weeks with video games selected from *Lumosity* or to the active-control group, which was trained with *The Sims*. Groups were similar at baseline on demographics, global cognition, and depression status. Participants were tested before and after the intervention on a series of attention (Cross-modal Oddball, Stroop, and Negative Priming) and working memory (Corsi Blocks and *N*-back) tasks. Results will clarify whether the intervention improves attention and working memory functions in older adults.
Email: Soledad Ballesteros, mballesteros@psi.uned.es

9:40-9:55 (145)

Category Learning in Older Adulthood: The Role of Age and Executive Functioning. RAHEL RABI and JOHN PAUL MINDA, *The University of Western Ontario* (Presented by John Paul Minda) — Executive functions supported by the prefrontal cortex are involved in rule-based category learning and show decrements with age, and so it is important to understand how category learning abilities change in older adulthood. We asked older and younger adults to learn category sets of varying rule complexity. Older adults performed comparable to younger adults when learning single-dimensional rule-based categories, but struggled greatly with learning complex rule-based categories, which taxed their working memory resources. A second experiment examined whether complex rule-based categorization performance could be improved in older adults by reducing task demands. Following familiarization with the category set, older adults demonstrated marked improvements in performance. The reduction of the working memory demands allowed the older adults to formulate the complex rule and to perform comparably to younger adults. Our findings suggest that age-related declines in executive functioning may be associated with difficulty learning more complex rule-based categories.
Email: Rachel R Rabi, rrabi@uwo.ca

Scene Processing

Republic, Saturday Morning, 8:00-10:00

Chaired by Melissa L.-H. Vo, Goethe University Frankfurt

8:00-8:15 (146)

The Role of "Anchor Objects" in Scenes: Electrophysiological Evidence for a Hierarchical Structure of Scene Predictions. MELISSA L.-H. VO and SAGE E. P. BOETTCHER, *Goethe University Frankfurt* — Objects in real-world scenes follow a set of rules, a "scene grammar". We propose that scene grammar

is hierarchically structured. Within that hierarchy, "anchors" might play a special role, which tend to be prominent objects that are diagnostic of a scene, e.g. the stove in the kitchen. Importantly, many other objects within that scene have defined spatial relations with regard to these anchors, e.g. a pot on a stove. In a behavioral experiment, participants read object labels ("pot") followed by the presentation of an image depicting either an anchor (stove) or another object (pan). They then indicated the object's most likely position. We found that anchors show a tighter spatial distribution of position estimates—i.e. stronger spatial predictions—compared to their object counterparts. In an EEG experiment, participants viewed 2 images: A scene (kitchen) vs. object (pot) prime followed by an anchor that was either consistent (stove) or inconsistent (shower) with the prime. We found a larger N400 for the anchor when primed with inconsistent non-anchor objects compared to scenes. This indicates that objects generate stronger predictions for anchors compared to scenes, which might imply a hierarchy of predictions within scenes.
Email: Melissa Vo, mlvo@psych.uni-frankfurt.de

8:20-8:35 (147)

Not All Objects are Created Equal: Object Frequency Effects Depend on Diagnosticity of an Object for a Scene Category. SUZETTE FERNANDES and MONICA S. CASTELHANO, *Queen's University* (Presented by Monica Castelhano) — We know from previous research that scene context can affect object processing (e.g., Friedman, 1979). In the current study, we examine how the variations in the relationship between scenes and objects affect processing. Using eye movements, we investigated the influence of how probable an object is in a scene (frequency) and how exclusive an object is to a scene category (diagnosticity) based on recently acquired contextual statistics of objects and scenes (Greene, 2013). Participants were instructed to study scenes for a later memory test. Each scene contained target objects that were high and low in frequency and high and low in diagnosticity. The results demonstrated that when diagnosticity was high, we observed the expected pattern: participants spent less time examining high frequency than low frequency targets. However, when the diagnosticity was low, no such difference was found. The weaker link between the object and scene category caused viewing times to increase for high frequency objects. This pattern of results suggests that how objects are processed depends not only on how frequently an object is encountered in a scene, but also on how strongly it is tied to that scene category.
Email: Suzette Fernandes, suzette.fernandes@queensu.ca

8:40-8:55 (148)

Predicting Eye Movement Characteristics From Working Memory, Inhibition, and Processing Speed. STEVEN G. LUKE, EMILY S. DAROWSKI and SHAWN D. GALE, *Brigham Young University* — Individual differences in working memory (WM), inhibition and processing speed are stable, related to cognitive task performance, and clinically predictive. Between-participant differences in eye movements are also highly reliable (Henderson & Luke, 2014). However, less is known about how higher order individual differences are related to these eye movement characteristics. In the present study, participants performed several individual difference tasks to measure WM Span, inhibitory control and processing speed. Participants also performed three eye movement tasks: reading, visual search and scene viewing. Across all tasks, higher WM scores were related to fewer outliers in fixation duration distributions. Higher WM scores predicted longer saccades, faster reading, more word skipping and shorter gaze durations during reading. WM and inhibition also influenced participant sensitivity to word length and predictability. Processing speed and inhibition predicted search task performance. In scene viewing, higher WM scores predicted longer fixations, and higher inhibition scores predicted larger saccades.
Email: Steven Luke, steven_luke@byu.edu

9:00-9:15 (149)

Does Film Comprehension Affect Viewers' Eye Movements? A Viewing Task at Odds With Narrative Comprehension Lessens the "Tyranny of Film." JOHN P. HUTSON, *Kansas State University*, JOSEPH P. MAGLIANO, *Northern Illinois University*, TIM J. SMITH, *Birkbeck University of London*, LESTER C. LOSCHKY, *Kansas State University* (Presented by Lester Loschky) — The current study investigated the relationship between film viewers' comprehension and their eye-movements. We previously found large differences in film viewers' comprehension produced only small differences in their eye-movements, due to high gaze similarity, which we call the tyranny of film (Loschky, Larson, Magliano & Smith, 2015). Here we investigated whether we could "turn-off" the tyranny of film by using a viewing task (the Map Task) at odds with film narrative comprehension. We compared Map Task participants, who drew a map from memory of all video locations, with a Free-viewing group. We measured comprehension by asking, "What will happen next?" at the end of the clip. Task affected both comprehension (worse for the Map group) and eye-movements, in terms of gaze similarity and fixations in regions of interest. Thus, film comprehension differences only produced differences in viewers' eye-movements when they had a task implicitly at odds with comprehending the film narrative.
Email: John Hutson, jphutson@ksu.edu

9:20-9:35 (150)

Intrinsic Memorability of Pictures in Rapid Serial Visual Presentation. NICO BROERS, *University of Groningen*, MARY C. POTTER, *Massachusetts Institute of Technology*, MARK R. NIEUWENSTEIN, *University of Groningen* (Presented by Mary Potter) — Studies of long-term recognition memory for pictures have shown that some pictures are consistently more likely to be remembered than others (Isola, Xiao, Parikh, & Torralba, 2014). Do memorable pictures take longer to perceive than less memorable pictures? Immediate memory for 128 highly memorable and 128 non-memorable pictures was tested after they were viewed in a rapid serial visual presentation (RSVP) sequence at 13 to 360 ms per picture. Recognition performance (d') for the memorable pictures was markedly better than for the non-memorable pictures at all presentation durations. For memorable pictures, d' increased steadily with increasing duration, whereas recognition of the less memorable pictures was initially low and only began to increase with durations greater than 120 ms. Thus, the memorability of an image is

largely determined by initial perceptibility: memorable pictures take less time to perceive. A picture that is hard to grasp quickly is hard to remember later.
Email: Mary C Potter, mpotter@mit.edu

9:40-9:55 (151)

Improving Human-Machine Cooperative Visual Search With Soft Highlighting. RONALD T. KNEUSEL and MICHAEL C. MOZER, *University of Colorado Boulder* (Presented by Michael Mozer) — Advances in machine learning have produced systems that attain human-level performance on certain visual tasks, e.g., object identification. Nonetheless, other tasks requiring visual expertise are unlikely to be entrusted to machines for some time, e.g., satellite and medical imagery analysis. We describe a human-machine cooperative approach to visual search, the aim of which is to outperform either human or machine acting alone. The traditional route to augmenting human performance with automatic classifiers is to draw boxes around regions of an image deemed likely to contain a target. Human experts typically reject this type of hard highlighting. We propose instead a soft highlighting technique in which the saliency of regions of the visual field is modulated in a graded fashion based on classifier confidence level. We report on experiments with both synthetic and natural images showing that soft highlighting achieves a performance synergy surpassing that attained by hard highlighting.
Email: Michael C. Mozer, mozer@colorado.edu

Eyewitness Identification
Independence, Saturday Morning, 8:00-9:20
Chaired by Chad Dodson, University of Virginia

8:00-8:15 (152)

Eyewitness Identifications: Confidence and Decision-Time Are Highly Predictive of Accuracy. CHAD DODSON, *University of Virginia* — More than 1650 black and white participants encountered same-race and cross-race faces at encoding and then completed a series of lineup identification tests. Confidence was a very strong predictor of accuracy for fast identifications of a lineup face but the predictive power of confidence diminished substantially for slower decisions. High confidence and fast decisions were over 90% accurate but high confidence and slow decisions were 50% accurate. By contrast, confidence and decision-time were not predictive at all of the accuracy of a not-present response (i.e., non-chooser accuracy). In terms of same- vs. cross-race identifications, confidence was less well calibrated with identification accuracy when participants selected a cross-race than a same-race face because of overconfidence. Finally, we measured confidence with nine different scales that varied in size (i.e., number of points on scale) and format (verbal vs. numeric) and observed a similar confidence-accuracy relationship with all scales.
Email: Chad Dodson, cdodson@virginia.edu

8:20-8:35 (153)

Simultaneous Lineups vs. Elimination Lineups: Theoretical (and Applied) Considerations. JOHN T. WIXTED and ISABELLA KILLEEN, *University of California, San Diego* — The simplest signal-detection model of lineup performance assumes that people first determine the most familiar face in the lineup and then decide whether or not that individual is the perpetrator. Here, we test whether this model accurately represents the line-up decision making process by simply instructing participants to do what the model assumes they are already doing, namely, picking the most familiar face in the lineup and then deciding whether or not that face is the perpetrator. This "elimination" lineup procedure has previously been proposed as an improvement over the standard simultaneous lineup. However, according to our ROC analysis, the elimination lineup results in lower discriminability than the simultaneous lineup. This finding is inconsistent with the idea that elimination lineups are diagnostically superior to simultaneous and lineups, and it also suggests that a more complex signal detection model is required to adequately account for the data.
Email: John Wixted, jwixted@ucsd.edu

8:40-8:55 (154)

Effect of Between-Subject Variability on Eyewitness ROC Analysis: A Theory Space Exploration Using WITNESS. RYAN M. MCADOO and SCOTT D. GRONLUND, *University of Oklahoma* (Presented by Scott Gronlund) — Receiver Operating Characteristic (ROC) analysis has been shown to be superior to previous measures used to assess eyewitness performance because previous measures conflated discriminability and response bias. But in a recent report, the National Academy of Sciences raised questions about the impact of between-subject variability on the assessment of eyewitness performance using ROC analysis (which focuses on suspect choosing). We incorporated encoding and criterial noise into Clark's (2003) WITNESS model and explored the impact of variability on simultaneous and sequential lineups, and on one-person showup ID procedures. In simultaneous and sequential lineups, encoding and criterial noise had little impact on discriminability but did affect response bias (truncating the ROC). Showups, on the other hand, showed an adverse impact of noise on discriminability, but little impact on response bias. The differential impact of variability on lineups versus showups has implications for currently debated explanations regarding why lineups have superior performance to showups.
Email: Scott Gronlund, sgronlund@ou.edu

9:00-9:15 (155)

Suspect Position in a Simultaneous Lineup Affects Eyewitness Identification. CURT A. CARLSON and ALYSSA R. JONES, *Texas A&M University - Commerce*, CHARLES A. GOODSELL, *Canisius College*, MARIA A. CARLSON, *Texas A&M University - Commerce*, DAWN R. WEATHERFORD, *Texas A&M University - San Antonio*, JANE E. BEDNARZ, *Texas A&M University - Commerce* — An item's position within a multiple-item array (e.g., a multiple-choice test) affects choosing rates (Bar-Hillel, 2015). Across three experiments, we investigated position effects for faces in simultaneous lineups. In Experiment 1, participants (N = 67) studied several targets, and after each they selected the position where police might place him in a blank lineup. We found robust position effects for both 1x6 and 2x3 arrays. In Experiment 2 (N = 128), we tested memory with target-present lineups, finding a higher hit rate for

position 3 compared to position 6 for the 1x6 array. Experiment 3 (N = 2678) included both target-present and –absent lineups, revealing several position effects regardless of a manipulation of target memory strength. SDT and ROC analysis revealed an advantage in discriminability for positions 3, 5, and 6 from a 2x3 array. We discuss theoretical and practical implications for eyewitness identification research.
Email: Curt A. Carlson, curt.carlson@tamuc.edu

Associative Learning
Back Bay B, Saturday Morning, 8:00-9:40
Chaired by Timothy J. Vickery, University of Delaware

8:00-8:15 (156)
Extraneous Associations Influence Human Choices During Reinforcement Learning Tasks. TIMOTHY J. VICKERY, *University of Delaware* — Experiential learning of stimulus-value associations plays an important role in human decisions. However, diverse environmental features are coincident with rewards in natural settings, posing a "curse of dimensionality" challenge to reinforcement learning models. Which representations should value be attached to? Laboratory studies usually skirt this issue by constraining environmental complexity. In several studies employing "N-armed bandit" tasks, we explicitly directed participants to learn and exploit values probabilistically associated with a given feature (e.g., shape), and added task-irrelevant variation (e.g., color variation or visual statistical contingencies). Analyses of choices and model comparisons reveal that while task-relevant feature-value associations predominately drive choices, humans are consistently responsive to extraneous factors, apparently inferring reward relationships where none exist. Effects persist after hundreds of trials of experience. We propose that multiple stimulus-value features of the world (even extraneous ones) are tracked in parallel, with target features imperfectly weighted at the time of a decision.
Email: Timothy Vickery, tvickery@psych.udel.edu

8:20-8:35 (157)
Rule Abstraction in Complex Conditional Discriminations: Effects of Trial Sequencing and Cognitive Reflection. EVAN J. LIVESEY, HILARY J. DON and MICAH P. GOLDWATER, *University of Sydney* — Students vary widely in their proclivity to learn and apply abstract principles, especially when solutions can be derived from shallower forms of knowledge such as associative learning. We examined rule-abstraction in an associative learning task involving the solution of patterning and biconditional discriminations. Participants learned a series of conditional discriminations that can be solved through associative learning of cue-outcome contingencies but are also well described by simple abstract relational rules. Rule- and feature-based transfer predict opposite patterns of results when participants are asked to predict the outcome following new arrangements of previously seen cues. We examined whether changing the sequencing of trials during learning could encourage rule-abstraction above the modest levels typically observed in these tasks. Interactions between trial sequencing and participants' scores on simple measure of cognitive reflection suggest that the optimal schedule for rule-abstraction depends on participants' ability and engagement relative to the difficulty of the task. These results have implications for theories of both human associative learning and relational category learning.
Email: Evan Livesey, evan.livesey@sydney.edu.au

8:40-8:55 (158)
Prospects of a Multiple Trace Theory of Temporal Preparation. SANDER A. LOS, WOUTER KRUIJNE and MARTIJN MEETER, *Vrije Universiteit Amsterdam* — In warned reaction time tasks, the warning stimulus (S1) initiates a process of temporal preparation, which promotes a speeded response to the impending target stimulus (S2). Classic theories assume that temporal preparation is under strong voluntary control, informed by the distribution of S1-S2 intervals. However, our recently developed multiple trace theory of temporal preparation (MTP) offers a more mechanistic insight into preparation, based on simple associative learning rules. Here, we present recent experiments where different groups of participants experienced either the exponential or anti-exponential distribution of S1-S2 intervals during an acquisition phase. This was followed by a test-phase where all participants received, after explicit instruction, the uniform distribution. In this phase we found highly persistent transfer effects from the acquisition phase. These long-term learning effects are hard to reconcile with classic theories of temporal preparation and provide strong support for MTP.
Email: Sander Los, s.a.los@vu.nl

9:00-9:15 (159)
Resolution of Associative Interference. JEREMY B. CAPLAN, RACHEL L. BURTON and ISABEL LEK, *University of Alberta* — Memory for associations can be challenging when two pairs share a common item, so-called AB/AC learning. AB/AC learning is at the heart of several popular experimental paradigms. Clearly, humans are well equipped to handle associative interference (e.g., bilingualism). However, the classic finding is zero-correlation, statistical independence: apparently, people never confuse a specific AB with a specific AC. The key to the interpretation is the appropriate control for independence, which can estimate spurious sources of positive correlation. When we did so, AB/AC learning of once-studied noun-noun pairs was well characterized by independence. When participants were asked to deliberately integrate A, B and C into a single visual image, a facilitory relationship was found. Although pairs sharing an item can be confusing in special conditions, even a single study trial per pair, with AB and AC studied in separate lists, may be sufficient for participants to neutralize, and even reverse, associative interference.
Email: Jeremy B. Caplan, jcaplan@ualberta.ca

9:20-9:35 (160)
Contiguity in Episodic Memory. KARL HEALEY and MICHAEL J. KAHANA, *University of Pennsylvania* — Contiguity is one of the major predictors of recall dynamics in human episodic memory. But there are many competing theories of how the memory system gives rise to contiguity,

including the suggestion that contiguity is an artifact of task-specific strategies. To help adjudicate between these theories, we present analyses of both new and archival free recall data to identify variables that modulate the magnitude of the contiguity effect. We examine 26 factors including age, individual differences, presentation rate, and semantic associations among list items. Many of these modulate contiguity but few eliminate it. Moreover, we show that contiguity is observed in a range of tasks including recognition, paired associates, and autobiographical recall and across time scales from minutes to years. The pattern of results point toward a model in which contiguity arises from fundamental memory mechanisms that encode and search an approximately time scale invariant representation of temporal distance.
Email: Karl Healey, mkarlhealey@icloud.com

Language Production and Writing
Back Bay A, Saturday Morning, 8:00-9:40
Chaired by Laurie Beth Feldman, The University at Albany, State University of New York & Haskins Laboratories

8:00-8:15 (161)
Production of Morphologically Complex Words as Revealed by a Typing Task: Keystroke Dynamics on the (Same) Stem Change With Whole Word Frequency From Affixation. LAURIE BETH FELDMAN, *The University at Albany, State University of New York & Haskins Laboratories*, DAVID W. VINSON and RICK DALE, *University of California, Merced* — Measures based on latency to initial keystroke and inter keystroke interval in the context of an online typing-to-copy task reveal the relation between motor processes to produce a word and that word's morphological structure. Our focus is how the stem-affix(es) combination influences the relative timing of keystrokes within the stem. In a production by typing task, with extraneous factors (e.g., length) controlled, measures such as latency to initial keystroke as well as mean inter keystroke interval typically vary systematically according to the word's lexical properties. Conventionally, frequency effects in production tasks get interpreted as evidence of cascaded processing between central and peripheral levels. We compare mean and dispersion of keystroke latencies within the same stem (without initial keystroke) for three semantically similar morphological relatives. In experiment 1, complex forms differ with respect to surface frequency. Examples include DEPRESS, DEPRESSION, DEPRESSIVE. In experiment 2 they differ with respect to number of affixes like SUPER, SUPERIOR, SUPERIORITY. Results provide new insights into the ways in which morphological structure can influence purportedly peripheral motor processing.
Email: Laurie Beth Feldman, lfeldman@albany.edu

8:20-8:35 (162)
On the Functional Relationship Between Language and Motor Processing in Typewriting. MICHELE SCALTRITTI, SVETLANA PINET, MARIEKE LONGCAMP and F.-XAVIER ALARIO, *CNRS & Aix-Marseille Université* (Presented by F.-Xavier Alario) — There is growing interest for understanding the functional relationship between language and motor processing during language production. We addressed this issue using event-related potentials recorded during a typewriting task. Linguistic processes were indexed by the N400 component. Motor processes were indexed by lateralized response-related potentials. In this way, we combined two time-honoured psychophysiological markers within a single innovative experiment. At stake was the relationship between the two markers. The standard N400 effect was replicated, with an attenuation of the negative going potential in the Related compared to the Unrelated condition. Response Side yielded lateralized potentials traditionally linked with motor-response preparation, consisting in negative-going components over electrodes contralateral to the responding hand, and more positive-going ones over ipsilateral electrodes. The two manipulations yielded independent effects, with no signs of statistical interaction. These results are in line with a staged account of the transition from language to motor processes during language production. The scope of this interpretation will be discussed.
Email: F.-Xavier ALARIO, francois-xavier.alario@univ-amu.fr

8:40-8:55 (163)
Online Regulation of Language Production. MICHAEL FREUND and NAZBANOU NOZARI, *Johns Hopkins University* (Presented by Nazbanou Nozari) — Many cognitive and motor tasks are subject to online regulation of control, as shown by congruency sequence effects (CSE). We examined whether language production is similarly regulated (Exp 1), and whether this regulation transfers from a non-linguistic visuospatial task (Exp 2), or a sentence-comprehension task (Exp 3) to language production. We found that (1) language production showed the same pattern of CSE previously reported in other tasks, and (2) there was no transfer of the CSE between the language production task and either of the two other tasks, when trials from each of those tasks were alternated with trials from the language production task, despite a statistically-robust CSE in the production task as a function of 2-back production trials. The reliable within-task CSE in the absence of cross-task CSE implies a dynamic regulatory mechanism in language production that is computationally similar to other tasks, but has limited domain-generality.
Email: Nazbanou Nozari, nozari@jhu.edu

9:00-9:15 (164)
The PNT and Semantic Weight Deficits in Picture Naming in Older Adults With Age-Related Cognitive Impairment. KARIN R. HUMPHREYS and L. KATHLEEN OLIVER, *McMaster University*, DEVORA GOLDBERG, *University of Toronto* — This study looks at a sample of older adults, with varying degrees of cognitive impairment, ranging from normal to severe cognitive impairment, as assessed by the Montreal Cognitive Abilities Test (MoCA). Previously, tests of picture naming accuracy have often not predicted cognitive impairment well. In these studies, however, we use the Phildadelphia Naming Test (PNT), orginally designed for use with aphasic patients (Dell, Schwartz et al. 1997). By fitting an individual's pattern of naming errors to a two-stage interactive model of language production, separate parameters for degree of phonological impairment and semantic impairment can be estimated. Our

data show that among older adults with varying degrees of cognitive impairment, the s-weight shows a strong relationship with MoCA score, but that p-weights show no relationship. Both the implications for models of language impairment in dementia, and the practical implications of picture naming as a screening tool will be discussed.
Email: Karin Humphreys, krh@mcmaster.ca

9:20-9:35 (165)

Tracking the Time Course of Lexical Access in Orthographic Production: An Event-Related Potential Study of Word Frequency Effects in Written Picture Naming. MARKUS F. DAMIAN, *University of Bristol*, QINGQING QU, *Chinese Academy of Sciences*, QINGFANG ZHANG, *Renmin University of China* — Previous studies of spoken picture naming using event-related potentials (ERPs) have shown that speakers initiate lexical access within 200 ms after stimulus onset. In the present study, we investigated the time course of lexical access in written, rather than spoken, word production. Chinese participants wrote target object names which varied in word frequency, and written naming times and ERPs were measured. Writing latencies exhibited a classical frequency effect (faster responses for high- than for low-frequency names). More importantly, ERP results revealed that electrophysiological activity elicited by high- and low frequency target names started to diverge as early as 168 ms post picture onset. We conclude that lexical access during written word production is initiated within 200 ms after picture onset. This estimate is compatible with previous studies on spoken production which likewise showed a rapid onset of lexical access (i.e., within 200 ms after stimuli onset). We suggest that written and spoken word production share the lexicalization stage.
Email: Markus F Damian, m.damian@bristol.ac.uk

Symposium III: Language by Mouth and by Hand
Grand Ballroom, Saturday Morning, 10:00-12:00
Organized by Iris Berent, Northeastern University and Susan Goldin-Meadow, University of Chicago

10:00-10:15 (166)

One Language System, Two Modalities: Evidence From the Double Identity of Doubling. IRIS BERENT and AMANDA DUPUIS, *Northeastern University*, DIANE BRENTARI, *University of Chicago*, OUTI BAT-EL, *Tel-Aviv University* — Are phonological patterns determined by sensorimotor constraints, or are some aspects of phonology amodal and abstract? To address this question, we explore the putatively universal restrictions on doubling. Across languages, doubling (e.g., *baba*, or generally, XX) gives rise to two alternative percepts. Viewed as a meaningless phonological pattern (e.g., *baba*), doubling is systematically disliked, due to a well-documented ban on phonological identity. But once doubling is assigned a morphological function (e.g., *ba*=ball, *baba*=little ball), doubling is parsed as reduplicative ({X}c, with a single X element), and its dislike shifts into a reliable preference. Here we extend this work to show that English speakers without sign language experience spontaneously apply these principles to novel signs in American Sign Language. Since the stimulus that elicits these conflicting responses remains unchanged, this shift is inexplicable by sensorimotor constraints. These results suggest the existence of abstract linguistic principles that apply broadly, across language modality.
Email: Iris Berent, i.berent@neu.edu

10:20-10:35 (167)

Signs, Emerging Signs, and Words: Exploring the (In) variance of Lexical Processing and the Lexicon. NAOMI CASELLI, *Boston University*, ARIEL COHEN-GOLDBERG, *Tufts University* — A core component of cognitive scientific theorizing is to determine for a given domain which properties are relatively invariant--that arise in generally the same way across contexts--and which properties vary systematically as a function of the input. In this talk we consider the fact that emerging sign languages, mature sign languages, and spoken languages differ along many dimensions and ask whether these differences lead to differences in the structure of the language and how it is processed. Taking American Sign Language as a reference we examine (in comparison with CTSL, an emerging sign language) whether a sign language's phonological inventory varies with age and overall iconicity and (in comparison with English) whether the organization of the lexicon varies as a function of modality. We also examine whether differences in the size of the lexicon and mode of production (sequential vs simultaneous) leads to cross-modal differences in perception and production.
Email: Naomi Caselli, nkc@bu.edu

10:40-10:55 (168)

Modality and Language Architecture: Syntax of Sign/Speech Code-Blending. DIANE LILLO-MARTIN, *University of Connecticut* — Bimodal bilinguals use both a sign language and a spoken language. Like other bilinguals, they engage in various types of language mixing, but they have an option that is unique to users of a language in the visual modality: code-blending, the simultaneous production of (parts of) an utterance in both speech and sign. Importantly, the contribution of speech and sign reflects a single proposition. I argue that they also combine into one syntactic derivation, which can be overtly expressed using two different grammatical processes only in limited ways, despite the apparent separation of hands and mouth. The constraints that permit some but not other structural combinations in code-blending are a reflection of both linguistic universals and the particular contributions of language in the visual mode. Our understanding of the architecture for language is profoundly affected by considering the nature of bimodal bilingual code-blending.
Email: Diane Lillo-Martin, diane.lillo-martin@uconn.edu

11:00-11:15 (169)

Changes in Iconic Representation in the Emerging Lexicon of Nicaraguan Sign Language. ANN SENGHAS, *Barnard College, Columbia University*, JENNIE PYERS, *Wellesley College*, EZRA PLANÇON and CAROLINE ZOLA, *Barnard College, Columbia University* — Manual gestures can reflect physical characteristics of referents, as when an object's size is depicted by the distance between the hands. Does the prevalence of such

iconicity in sign languages result from its usefulness during language creation, or because it is leveraged during learning? An emerging sign language provides an opportunity to detect the difference. Nicaraguan Sign Language (NSL) was created by sequential age cohorts of deaf children in special education programs in the 1970s and 1980s in Managua. We elicited signs for everyday concepts (e.g., bird, corn); the majority of signs exhibited handling or object iconicity. As signs were passed down from the first cohort to a second cohort, iconicity decreased overall; likelihood and degree depended partly on type of iconicity. The changes point to the different roles of adults and children, and the different mechanisms applied when lexical items are coined, as opposed to when they are maintained and perpetuated.
Email: Ann Senghas, asenghas@barnard.edu

11:20-11:35 (170)

Iconicity, Space, and Conceptual Representation in ASL-English Bilinguals. JENNIE PYERS, *Wellesley College*, PAMELA PERNISS, *University of Brighton* — In sign languages, many signs derive their phonological form from the meaning of the referent. One domain with robust iconicity of this kind is in space. Spatial signs depict salient features of the relation: the phonological form of the ASL sign ON represents a hand on another hand. We suggest that the iconic form of the sign is strongly tied to the conceptual representation. We take as our test case the ASL signs FRONT and BACK, and show that their iconic form invites a different viewpoint interpretation than is offered by the English words front and back. We show that Deaf native ASL signers interpret FRONT as English speakers interpret back. Further, this encoding of spatial viewpoint is so strong that hearing native ASL-English bilinguals reliably interpret the English words front and back with respect to their ASL meanings. The iconic form-meaning mappings in ASL have cross-language semantic effects for bilinguals.
Email: Jennie Pyers, jpyers@wellesley.edu

11:40-11:55 (171)

The Impact of Distinct Sensory-Motor Systems on the Neurobiology of Language: Signed vs. Spoken Languages. KAREN EMMOREY, *San Diego State University* — Signed languages differ dramatically from spoken languages with respect to linguistic articulators and perceptual systems required for comprehension. The study of sign languages allows us to distinguish neurobiological principles that are universal to human language from those that are modulated by the specific sensory-motor systems within which language is instantiated. Neuroimaging results indicate an invariant bilateral perisylvian language system for the comprehension of both sign and speech and for production, both engage left inferior frontal cortex. Distinct sensory-motor systems impact the neural underpinnings of spatial language (greater involvement of right parietal cortices), monitoring of linguistic output (distinct roles for visual vs. auditory feedback), and phonological implementation (distinct roles for inferior and superior parietal cortex). Language modality clearly shapes the neurobiology of human language but does not alter the core perisylvian language system.
Email: Karen Emmorey, kemmorey@mail.sdsu.edu

Metamemory/Metacognition
Back Bay C & D, Saturday Morning, 10:20-12:00
Chaired by Anne M. Cleary, Colorado State University

10:20-10:35 (172)

The Biasing Nature of the Tip-of-the-Tongue Experience: How Decisions Bask in the Glow of Tip-of-the-Tongue States. ANNE M. CLEARY and ALEXANDER B. CLAXTON, *Colorado State University* — Previous research from our lab has shown that being in a tip-of-the-tongue (TOT) state leads people to make inferences about the characteristics of the unretrieved target, such as inferring that the target is more likely to have fluent characteristics (Cleary & Claxton, 2015). The body of work presented here suggests that TOT states also lead people to infer positive qualities of the unretrieved information, and furthermore, this positivity bias extends beyond decisions about the unretrieved information to decisions that happen to occur during the warm glow of the TOT state. For example, people report believing a greater likelihood that a pictured celebrity is ethical when in a TOT state for the name than when not, and report a greater inclination toward taking an unrelated gamble when in a TOT state than when not. Results suggest that the warm glow of the TOT state may lead to unwarranted risk-taking in decision-making during uncertainty.
Email: Anne Cleary, Anne.Cleary@colostate.edu

10:40-10:55 (173)

Giving Up as a Means for Strategic Study Time Allocation Across Items. MONIKA UNDORF, *University of Mannheim*, RAKEFET ACKERMAN, *Technion--Israel Institute of Technology* (Presented by Rakefet Ackerman) — Learners often selectively allocate study time to items by their difficulty. Nevertheless, both predicted and actual memory performance are typically worse for difficult than for easier items. The resulting negative correlations between people's predictions of their memory performance (judgments of learning; JOLs) and self-paced study time (ST) are often explained by fluency underlying both JOLs and ST. However, we demonstrate robust inverted U-shaped relations between JOLs and ST that cannot be explained by fluency. Two models of strategic study time allocation may account for curvilinear JOL-ST relations. The region of proximal learning theory suggests that people stop quickly on items for which they are making no headway. Conversely, the agenda-based regulation model suggests that people strategically give up on difficult items in order to have more time for easier items. In three experiments, we created conditions under which the two models make different predictions. Results revealed that curvilinear relations between JOLs and ST were due to strategic giving up on difficult items and thus supported the agenda-based regulation model.
Email: Monika Undorf, undorf@uni-mannheim.de

11:00-11:15 (174)

How Much and What Kind of Success Influence the Remembered Success Effect? BRIDGID FINN, *ETS*, DAVID B. MIELE, *Boston College* — Research (Finn, 2010; Finn & Miele, 2015) has demonstrated that difficult study and test episodes extended with a moderate interval are preferred to

shorter episodes. The preference is based on memory for the successful experiences that accompany the extended episode (Finn & Miele, 2015). Two experiments investigating boundary conditions of the 'remembered success' effect will be presented. Experiment 1 evaluated whether the number of moderate items in an extended test impacted remembered success. Participants took a short (30-item) and an extended test of difficult math problems. The extended test was composed of 30 difficult problems plus 5, 10 or 15 moderate problems. Experiment 2 evaluated whether the ease of the moderate items impacted remembered success. The extended test was composed of 30 difficult problems plus 15 moderate or easy problems. Retrospective evaluations, future test preferences (short or extended) and their relevance to models of achievement motivation will be discussed.
Email: Bridgid Finn, bfinn@ets.org

11:20-11:35 (175)

Does the Range of a Confidence Scale Affect the Relationship Between Confidence and Accuracy? EYLUL TEKIN and HENRY L. ROEDIGER, III, *Washington University in St. Louis* (Presented by Henry Roediger III) — Researchers use a wide range of confidence scales when measuring the relation between confidence and accuracy in reports from memory (e.g., 4-point, 20-point and 100-point scales, with the highest number representing the greatest confidence). The assumption seems to be that the range of the scale has little bearing on the confidence-accuracy relationship. We investigated this assumption in two old/new recognition experiments using words lists (Experiment 1) and faces (Experiment 2) and by employing 4-, 5-, 20-, and 100-point scales. Using confidence-accuracy calibration plots, we asked whether confidence ratings would yield similar CAC plots, indicating comparability in use of the scales. The results show that, for both types of material, the different scales yield similar CAC plots, especially at the higher ranges of confidence. The scales seem convertible from one to the other, and choice of scale range is probably not affecting research into the relation between confidence and accuracy.
Email: Eylul Tekin, elifeylultekin@wustl.edu

11:40-11:55 (176)

Information-Seeking in an Echolocating Dolphin. HEIDI E. HARLEY, *New College of Florida & Disney's Epcot's The Seas*, WENDI FELLNER, *Disney's Epcot's The Seas*, FRANCES CANDICE, *New College of Florida*, AMBER THOMAS, BARBARA A. LOSCH and DAVID A. FEUERBACH, *Disney's Epcot's The Seas* — Dolphins gain information through echolocation, a publicly accessible sensory system in which dolphins produce clicks to investigate objects. We measured information-seeking behavior by counting clicks a blindfolded dolphin performing in a 3-alternative matching task directed to object sets that varied in discriminability: Indiscriminable (M=33%) vs. Easy (M>90%). The dolphin produced a similar number of clicks when first investigating each set type. Across multiple sessions, however, the dolphin emitted fewer clicks only when investigating indiscriminable (vs. easy) sets. Reduced echoic investigation with indiscriminable, but not easy, object sets was not due to overall motivation: the differential relationship between click number and object set discriminability was maintained when difficult and easy trials were interleaved and when objects from originally difficult sets were grouped with more discriminable objects. These data suggest that dolphins calibrate the effort they invest in information seeking in accordance with the information content available in their immediate environment.
Email: Heidi E Harley, harley@ncf.edu

Working Memory I
Republic, Saturday Morning, 10:20-12:00
Chaired by Lorenza S. Colzato, Leiden University

10:20-10:35 (177)

Effects of L-Tyrosine on Working Memory and Inhibitory Control Are Determined by DRD2 Genotypes: A Randomized Controlled Trial. LORENZA S. COLZATO, *Leiden University* — L-Tyrosine (TYR), the precursor of dopamine (DA), has been shown to enhance cognitive control. Given that TYR increases DA level in the brain, we investigated, whether the C957T genotypes of a functional synonymous polymorphism in the human dopamine D2 receptor (*DRD2*) gene (rs6277) contribute to individual differences in the reactivity to TYR administration and whether this factor predicts the magnitude of TYR-induced performance differences on inhibiting behavioral responses in a stop-signal task and working memory updating in a *N*-back task. Our findings show that T/T homozygotes (i.e., individuals associated with lower striatal DA level) showed larger beneficial effects of TYR supplementation than C/C homozygotes (i.e., individuals associated with higher striatal DA level) suggesting that genetically determined differences in DA function may explain inter-individual differences in response to TYR supplementation. These findings reinforce the idea that genetic predisposition modulates the effect of TYR in its role as cognitive enhancer.
Email: Lorenza S. Colzato, colzato@fsw.leidenuniv.nl

10:40-10:55 (178)

When Doing Two Things at Once Can Be Cost Free. ROBERT H. LOGIE, *University of Edinburgh* — Doing two things at once is often described as dividing attention, a concept that assumes a single overall pool of attentional capacity that can be divided among a range of concurrent tasks. However, many of the studies adopting this assumption focus on bottlenecks during initial perception/encoding, or during the production of responses that compete for output. Attention in these cases refers to how the cognitive system interacts with the immediate environment, and to the limitations that arise when attempting to deal with multiple, similar types of information, or similar actions. An alternative approach considers how the cognitive system handles concurrent cognitive operations that are required for remembering and/or processing material that has already been encoded, where the task requirements are dissimilar, and where there is no, or minimal, competition among possible responses. This paper will review established and recent studies in which demanding dual-task cognitive requirements are not confounded by task similarity or input and output conflicts, and which result in little or no dual task cost.
Email: Robert H Logie, rlogie@staffmail.ed.ac.uk

11:00-11:15 (179)

Symbol Familiarity Interacts With Working Memory Demands During Mathematical Problem-Solving. ZHANGFAN SHEN, *Southeast University, China*, LYNNE M. REDER, VENCISLAV POPOV and ANITA DELAHAY, *Carnegie Mellon University* (Presented by Lynne Reder) — Participants solved simple algebra problems that required one or two transformations. Half of these problems included two Chinese characters that required substitutions with previously associated digits in order to solve the equations. The Chinese characters were familiarized in a visual search task, trained for three hours per week over four weeks. Half of these characters were exposed 20 times more frequently than the other half. The math tests appeared at the start of each week, beginning with week two. Each math trial began by assigning different integers to two Chinese characters from the same frequency class. Performance was better for one-step than two-step problems and when substitution was not required. Importantly, mathematical problem solving was particularly challenged when the to-be-substituted symbols were less familiar and participants were most challenged with two transformations and substitutions. The working memory demands of component skills should be considered when designing math instruction.
Email: Lynne Reder, reder@cmu.edu

11:20-11:35 (180)

Oculomotor Measures of Learning Attentional Templates. ARTEM V. BELOPOLSKY and CHRISTIAN N.L. OLIVERS, *Vrije Universiteit Amsterdam* — Visual selection is served by attentional templates - memory representations of task-relevant information. We investigated if the oculomotor system can provide useful markers of attentional learning. Participants first received a cue as to which target to look for in a subsequent search display. The same target was repeated for another six trials, as was the cue. Crucially, the cues were presented lateralized and too small to discern covertly. If learning leads to a shift from WM to LTM, reduction in cue-directed saccades is expected. In three experiments in which the cue was identical to the target, symbolic or uninformative, saccade rates to the cue hardly decreased. Instead, repetition of the cue led to a decrease in fixation duration. The results indicate that fixation duration is a more reliable marker of cue-based attentional learning while saccadic orienting may be used to retrieve learned memories, using the cue as an "external pointer".
Email: Artem Belopolsky, a.belopolskiy@vu.nl

11:40-11:55 (181)

Does Refreshing Operate Through Retrieval From Long-Term Memory? VALERIE CAMOS, *Université de Fribourg*, GEROME MORA, *Universite de Bourgogne*, VANESSA LOAIZA, *University of Essex*, ANNE-LAURE OFTINGER, *Université de Fribourg*, EVIE VERGAUWE, *Université de Genève* — Attentional refreshing, a mechanism to maintain information in working memory, is receiving growing interest in the literature. However, its functioning is still ill-defined and among several proposals, McCabe (2008) suggested that refreshing operates by retrieving displaced memory traces from secondary memory to bring them back into primary memory. Accordingly, factors known for affecting retrieval from long-term memory, such the word-frequency and the lexicality effect, should interact with manipulation of the duration available for refreshing and affect the speed of refreshing. Finally, increasing the duration available for refreshing should favour the creation of retrieval cues in secondary memory, and improve recall in a delayed recall test. Three series of experiments tested each of these predictions. All evidence speaks against the assumption that refreshing operates through retrieval from long-term memory. We discuss alternative assumptions as well as the role of long-term memory in working memory tasks.
Email: Valerie Camos, valerie.camos@unifr.ch

Recognition II
Independence, Saturday Morning, 9:40-12:00
Chaired by Bennett L. Schwartz, Florida International University

9:40-9:55 (182)

Influences of Effort and Fluency on Memory for Written Music. ZEHRA F. PEYNIRCIOĞLU, *American University*, BENNETT L. SCHWARTZ, *Florida International University* (Presented by Bennett Schwartz) — Given the complexity of musical notation, our question was whether memory for written music would be influenced more by processing effort or fluency. We gave pianists, other musically-literate individuals, and musically-illiterate individuals short single-line pieces to learn. Half the pieces depicted melody lines and the other half bass lines. All participants saw the notation, and pianists also fingered the notes on a silent keyboard, half of the time with the conventional hand (e.g., melody with the right hand), and half of the time with the unconventional hand (e.g., melody with the left hand). Lines played with the conventional hand were expected to cause more fluent processing, whereas those played with the unconventional hand were likely to cause more effortful processing. During a two-alternative recognition test, pianists remembered more overall but showed a decrement in the conventional-hand conditions, providing evidence in favor of effort over fluency in influencing memory.
Email: Bennett Schwartz, schwartb@fiu.edu

10:00-10:15 (183)

Recognition Forced Choice and Oddity Judgments Due to Skewed Target Familiarity. RICHARD M. SHIFFRIN, ROBERT N. NOSOFSKY and RUI CAO, *Indiana University* — After study of a word list, participants can be asked to choose the target, the foil, or the odd one out from three words presented simultaneously. Accuracy is the same for target and foil judgments and better than oddity judgments, but odd foils are better than odd targets. Response times are faster for targets than foils. Several variants of a parallel race model account for these various findings if the distribution of familiarity for targets is positively skewed. This assumption is justified by the fact that targets but not foils are studied. Study produces variable strengths of memory storage. We show that the models account both for the present results and those from prior forced choice studies that used two or four choices and a prior oddity study with three choices. In the basic model the racers for each

choice are independent and start simultaneously. In a plausible variant the racers start at offset times, possibly due to an order of reading or attention.
Email: Richard Shiffrin, shiffrin@indiana.edu

10:20-10:35 (184)

Dual Recollection Theory. C. J. BRAINERD, C.F.A. GOMES, *Cornell University*, R. MORAN, *Tel AvivUniversit,* and VALERIE REYNA, *Cornell University* — Recollection has long been modeled as a univariate process, but actually, there are two processes that parallel the figure-ground and part-whole distinctions of perception: target recollection and context recollection. Whereas mainstream recognition research focuses on context recollection, target recollection is the centerpiece of false memory studies. We provide some demonstrations that memory tests can (a) vividly reinstate contextual details of a study trial when the target component cannot be remembered and (b) vividly reinstate the target component when contextual details cannot be remembered. The former is the basis for realistic spontaneous false memories (as in the DRM paradigm), while the latter is the basis for realistic implanted false memories (as in the misinformation paradigm). Dual recollection theory explains a puzzling pattern of findings wherein some manipulations that increase reports of recollective experience (e.g., R responses in Remember-Know) suppress false memory, but others increase it.
Email: C. J. Brainerd, cb299@cornell.edu

10:40-10:55 (185)

Modeling Biases and Response Times in Recognition Memory. JEFFREY J. STARNS and QIULI MA, *University of Massachusetts Amherst* — For decades, memory researchers have fit models to receiver operating characteristic (ROC) data to determine if information retrieved from memory is continuous or discrete. Modeling response time (RT) data provides a potentially more effective method for discriminating these possibilities. Response bias manipulations are often used to generate ROC functions. For example, a researcher might manipulate the probability of seeing a studied item at test to promote liberal use of the "studied" response when the probability is high and conservative use when it is low. These manipulations have a large effect on RT data as well, with lower RTs for responses consistent with the bias condition. An RT extension of the discrete-state approach predicts that these bias effects on RTs must be much larger for errors than for correct responses, whereas continuous RT models predict similar effect sizes for errors and corrects. We ran experiments using a trial-by-trial bias-cueing manipulation to test these specific predictions as well as the general ability of the models to accommodate RT distributions.
Email: Jeffrey Starns, jstarns@psych.umass.edu

11:00-11:15 (186)

The Electrophysiological Signature of Remember-Know Judgments May Represent Mnemonic Strength. YONATAN GOSHEN-GOTTSTEIN, NOAM BREZIS, ZOHAR BRONFMAN and GALIT YOVEL, *Tel-Aviv University* — Behavioral, neuropsychological and brain studies have suggested that recognition memory is supported by two dissociable processes: recollection and familiarity. Conversely, however, recollection and familiarity may map onto a single continuum of mnemonic strength. Previous electrophysiological studies found marked dissociations between Remember and Know (RK) judgments, thus corroborating the dual-process account. Can a strength interpretation apply for these findings? We describe an event-related potentials (ERP) study, using a modified RK procedure, which allowed us to control for mnemonic strength. We find that ERPs of high and low mnemonic strength mimicked the electrophysiological distinction between R and K responses, in a lateral posterior component (LPC), 500-1000 ms post stimulus onset. Critically, when contrasting strength with RK experience, by comparing weak R to strong K responses, the electrophysiological signal mapped onto to strength, yet not onto subjective RK experience. Invoking the LPC as support for dual-process accounts may, therefore, be amiss.
Email: Yonatan Goshen-Gottstein, goshengott@gmail.com

11:20-11:35 (187)

Summary Statistical Representation in Long Term Recognition Memory. CHAD DUBÉ, HOLLY WESTFALL and EMILY BAUER, *University of South Florida* — Models of recognition memory often assume that statistical information, such as means and variances of memory strength, provide the basis for decisions. Such models can be traced back to the equal-variance signal detection theory (SDT) developed by Fechner. Though the success of the model in describing recognition memory implies a memory strength variable with properties similar to those of magnitude perception, evaluation of this core idea has typically been restricted to the analysis of receiver operating characteristics. We discuss findings in visual psychophysics and computational neuroscience to detail some properties that memory strength should have if in fact it is represented statistically, i.e. as a distribution that can be described using summary stats like mean and variance. We show that two interrelated patterns that have been linked to statistical representation, nonlinear saturation and magnitude averaging, can be clearly detected in individual participants' estimates of their own long-term memory strength for words. The results support the core assumptions of SDT-based memory models.
Email: Chad Dubé, chaddube@usf.edu

11:40-11:55 (188)

Toward a Comprehensive Account of Memory Across Items, Tasks, and Individuals. AMY H. CRISS and GREG COX, *Syracuse University*, WILLIAM AUE, *Purdue University*, PERNILLE HEMMER, *Rutgers University*, JACK WILSON, *Syracuse University* — Models of memory tend to focus on a single task, in part because empirical effects are often task-dependent. This approach has led to a rich understanding of specific tasks at the expense of understanding how tasks interrelate and how item properties affect memory across separate tasks. Taking a different approach, we collected data from hundreds of participants across single item recognition, associative recognition, cued recall, free recall, and lexical decision tasks, post-cued. We analyzed the structural relationships across tasks and item properties using multiple methods. We found that while episodic recognition, recall, and knowledge access have

distinct elements, they lie along a single continuum. Episodic memory for words depends strongly on semantic characteristics (and to a lesser extent on orthographic properties). This suggests that the focus on single tasks is perhaps misleading and some task-dependent effects may be due to treating item properties as categories. This research represents progress on the road toward developing comprehensive models that provide a broad account of the relationship between perception, knowledge access, and episodic memory.
Email: Amy H. Criss, amy.criss@gmail.com

Spatial Cognition
Back Bay B, Saturday Morning, 10:00-12:00
Chaired by Jennifer E. Sutton, Brescia University College at the University of Western Ontario

10:00-10:15 (189)
Self-Guided Exploration of a Novel Environment Results in a More Accurate Cognitive Map Than Learning Via Route Integration. JENNIFER E. SUTTON, *Brescia University College at the University of Western Ontario*, MEGHAN VOLLEBREGT, *University of Western Ontario*, BAILEY GROGAN, *Brescia University College at the University of Western Ontario* — Research on how people form mental representations of new environments often employs the route integration method, where participants' exposure to an environment is limited to pre-determined routes. This method of learning imposes constraints that may either facilitate learning by dividing the environment into smaller, more manageable chunks, or impede it by reducing decision-making and other processes that are engaged when people freely control their own exploration. In the current study, participants learned the locations of 8 buildings in the Silcton virtual environment, either via route integration or free exploration. They then completed direction estimation and map-building tasks based on their memory of Silcton, as well as the Spatial Orientation Test (SOT) of spatial perspective-taking and a spatial n-back test of spatial working memory. Hierarchical regression showed that variance in map-building performance was significantly predicted by exploration method and perspective-taking but not sex or n-back performance. Participants who learned via free exploration were more accurate than those in the route integration condition, suggesting that route integration likely underestimates at least some individuals' spatial ability.
Email: Jennifer E. Sutton, jennifer.sutton@uwo.ca

10:20-10:35 (190)
Can Disoriented Humans Determine Their Location Without External Cues? NAOHIDE YAMAMOTO, *Queensland University of Technology*, ALLEN CHEUNG and OLIVER BAUMANN, *Queensland Brain Institute, University of Queensland*, JOEL MACZKOWIACK, *Queensland University of Technology* — Cheung (2014, PLOS Computational Biology) proposed a computational model in which disoriented navigators can recover their location from idiothetic self-motion cues alone, once they know the geometry of an enclosing space that is one-fold rotationally symmetric. Here, we empirically tested this model. Human participants were first exposed to a room-sized square arena with or without one-fold rotational symmetry (created by adding inner boundaries in the arena), and then blindfolded and disoriented. Subsequently, they were guided in the arena without external cues and asked to estimate their current locations as they walked. Participants' accuracy in self-location estimation was statistically above chance when the arena had one-fold rotational symmetry. This finding is consistent with the Cheung model and suggests that idiothetic cues play an important role in establishing orientation during navigation, and interact with spatial memory information even in the absence of external sensory inputs such as vision or wall contact.
Email: Naohide Yamamoto, naohide.yamamoto@qut.edu.au

10:40-10:55 (191)
Preschoolers' Spatial Memory for Briefly-Presented Photographs. HELENE INTRAUB, AMANDA LY, ELIZABETH VLACHOS and STEVEN BEIGHLEY, *University of Delaware* — Preschoolers (4-5 years old) exhibited greater boundary extension (BE) than adults when, on each trial, a 15-s photograph was followed by a 2-alternate-forced-choice (2AFC) between the identical view versus either a closer or wider view after a 2-s delay (Kreindel & Intraub, 2016). In the present study, 4-5-year-olds (N=24) and adults (N= 24) saw the same photographs as in Kreindel & Intraub, but presentation duration was reduced to 250-ms or 1000-ms, followed by a 2-s mask and the same 2AFC. Now, adults exhibited robust BE, but children's responses were at chance (both durations). Perceptual identification (verbal) of the briefly-presented scenes by other children (N=19) argues against a perceptual explanation. Results may reflect limitations on preschoolers' working memory for briefly presented scenes; alternatively, it may be that young children's BE (a source monitoring error) is so great at these brief durations that neither choice closely matched memory, leading to chance performance.
Email: Helene Intraub, intraub@udel.edu

11:00-11:15 (192)
Examining Language and Gesture in Spatial Reasoning. HILARY E. MILLER and VANESSA R. SIMMERING, *University of Wisconsin - Madison* — Spatial skills are an important predictor of achievement in math and science, which has led to increased interest in understanding how spatial skills develop. Studies show that children's spatial reasoning is predicted by both knowledge and production of spatial words, but the mechanisms underlying these links remain a source of debate. We investigated how spatial words might support spatial skills by testing 4.5- to 6-year-old children (n = 32) and adults (n = 18) in two disparate spatial reasoning tasks, Spatial Analogies and Mental Transformations, asking them to explain how they arrived at their answers in each task. Children selected the correct answer significantly more often in Mental Transformations than Spatial Analogies (p = .003; adults performed at ceiling), and their performance was not significantly correlated with age (MT: r = .32, p = .08; SA: r = .23, p = .20). Preliminary analyses indicated that the number and types of words adults' produced varied across tasks, and that children infrequently produced the same words as adults.

Video and audio recordings allow for coding of both the words and gestures produced in children's explanations (coding and analysis underway).
Email: Vanessa Simmering, simmering@wisc.edu

11:20-11:35 (193)

The Mechanisms of Conditional Discrimination: When Is a Stimulus More Than a Stimulus? KENNETH J. LEISING, LAUREN M. CLELAND, TARA SHANAHAN, ELLE REPETA and JOSH E. WOLF, *Texas Christian University* — Stimuli present while problem solving become associated with potential solution behaviors and their outcomes. During a feature-positive conditional discrimination, a response to stimulus A is rewarded only when A is paired with another stimulus, X (e.g., XA+, A-). There are many mechanisms that support a solution to this discrimination problem; attending to only X and ignoring A, XA may be attended to as a single configural stimulus distinct from X and A alone, or attending to X as a modulator of the subsequent response to A. I will review the literature and identify factors that influence which mechanism is utilized. Furthermore, I present data from a spatial task used in my laboratory. Participants were trained that the direction of a target location relative to a landmark (A) was dependent on the color of the monitor display (X or Y). These data indicate that the same factors influence spatial and non-spatial behavior.
Email: Ken Leising, k.j.leising@tcu.edu

11:40-11:55 (194)

Sex Differences in Visual-Spatial Working Memory: A Meta-Analysis. DANIEL VOYER and SUSAN D. VOYER, *University of New Brunswick*, JEAN SAINT-AUBIN, *University of Moncton* — Although some accounts of the male advantage in spatial abilities rely on a sex difference in visual-spatial working memory, the presence of such a sex difference has yet to be demonstrated and quantified. Accordingly, we conducted a meta-analysis to quantify the magnitude of sex differences in visual-spatial working memory and to examine variables that might moderate them. The meta-analysis used a set of 180 effect sizes drawn from 98 samples and it combined multilevel and mixed-effects models to provide a comprehensive assessment of the data. Results showed a small but significant male advantage overall ($d.$ = 0.155) as well as in all the tasks sampled, except in memory for location, showing a female advantage. In sum, the results support the existence of a male advantage in visual-spatial working memory that is moderated by age and specific task. Implications for clinical applications, cognitive model building, and experimental research are discussed.
Email: Daniel Voyer, voyer@unb.ca

Animal Learning and Cognition
Back Bay A, Saturday Morning, 10:00-12:00
Chaired by Michael K. McBeath, Arizona State University

10:00-10:15 (195)

Humans and Dogs Join the Rat Race: Development of a Common Metric for Defining and Comparing Behavioral Memory Capacity Across Species. MICHAEL K. MCBEATH and CLIVE D.L. WYNNE, *Arizona State University*, PRESCOTT BREEDEN, *Society for the Promotion of Applied Research in Canine Science*, SOPHIE RAYMOND, *Arizona State University*, LESLIE C. BAXTER, *Barrow Neurological Institute*, HEATHER A. BIMONTE-NELSON, *Arizona State University* — Past research examining working memory capacity across species differs in both methodology and how memory is defined. We developed a common, translational metric to predict and compare behavioral performance across species and groups, independent of strategies used. Our mathematical model transforms the pattern of errors in radial arm mazes (RAMs) into an estimate of behavioral memory capacity, measured in bits. The model assumes each species or group has a discrete memory capacity for a number of traversed maze arms, minus a strategy load penalty. We examined human performance (N=157) in a 15-meter diameter, 11-arm RAM; and dogs (N=71) in a 6-meter diameter, 8-arm RAM; and compared them to rats in standard 8-arm RAM. We found a strong model fit, with R^2 for each group typically over 0.9. Overall, human behavior revealed a memory capacity of 7±2 bits (ranging from 4 bits for those with no strategy to 9 bits for those with multiple strategies). Dog behavior revealed a 5 bit capacity (diminishing to 3½ bits for old dogs), while rat behavior revealed a 4 bit capacity. The overall pattern confirms that our memory model provides an excellent fit for predicting behavior with a common metric that translates well across groups and species.
Email: Michael K. McBeath, Michael.McBeath@asu.edu

10:20-10:35 (196)

Prospective Memory: Young Rats "Remember to Remember" But Old Rats "Forget to Remember". JONATHON D. CRYSTAL, MATTHEW J. PIZZO and SPENCER KANN, *Indiana University*, A. GEORGE WILSON, *University of Kentucky* — Event-based prospective memory involves forming a representation of a future action, subsequently inactivating the representation, and ultimately reactivating it when a target event occurs. Prospective memory in humans is impaired with age. Young rats have been shown to use event-based prospective memory (Wilson et al. 2013, *Current Biology*). Here we asked if prospective memory in rats declines with age. Rats completed an ongoing temporal-discrimination task while waiting for a large meal. To promote the use of event-based prospective memory, an event provided information that the meal could be obtained soon. Event onset and offset and meal onset were unpredictable in time (exponentially-distributed delays). Young adult rats (~9 months) showed prospective memory as documented by the decline in ongoing-task performance after the event, with excellent performance on other occasions at the equivalent timepoints. In old rats (~2 years), prospective memory was eliminated. Because prospective memory is documented by a deleterious effect on ongoing performance, the old rats exhibited a relative sparing of performance. Our model provides a framework for exploring factors that protect memory from cognitive decline associated with aging.
Email: Jonathon D. Crystal, jcrystal@indiana.edu

10:40-10:55 (197)

Cognitive Flexibility in a Mid-Session Reversal Task. JEFFREY S. KATZ, *Auburn University*, THOMAS A. DANIEL, *Westfield State University*, MARTHA R. FORLOINES, *Auburn*

University, ROBERT G. COOK, *Tufts University* — In mid-session reversal tasks that switch contingencies from matching (MTS) to nonmatching (NMTS), pigeon behavior is controlled by temporal factors showing a gradual shift of task switching over a session. This shift occurred because pigeons learn item-specific rules that are bound to the session's time-course (Daniel, Cook, & Katz, 2015). To test the cognitive flexibility of the pigeons, we examined the effect of stimulus mapping whereby stimuli were variably mapped (VM) to both portions of a session (MTS and NMTS) or consistently mapped (CM) to one portion of the session. Pigeons learned CM stimuli at a higher accuracy and rate than the VM stimuli. CM stimuli resulted in no timing confusion and showed much less anticipatory and perseverative errors. VM stimuli were bound to time and showed task switching modulation. Pigeons' demonstrated cognitive flexibility by simultaneously learning CM and VM stimuli.

Email: Jeffrey Katz, katzjef@auburn.edu

11:00-11:15 (198)

Magpies Show Abstract-Concept Learning Superior to Primates and Pigeons. ANTHONY A. WRIGHT, *University of Texas McGovern Medical School at Houston*, JOHN MAGNOTTI, *Baylor College of Medicine*, JEFFREY KATZ, *Auburn University*, KEVIN LEONARD, ALIZÉE VERNOUILLET and DEBBIE KELLY, *University of Manitoba* — The ability to learn abstract concepts is a critical component of intelligence. Among the most fundamental abstract concepts is the ability to distinguish *same* from *different* relationships between two (or more) stimuli. We trained 7 magpies (highly social birds) with pairs of pictures (objects, scenes, etc.) and tested them with novel (transfer) pictures following learning. Initially, a small training set (8 pictures) was used, but was systematically doubled in size. Following learning the expanded training sets, novel stimulus trials were tested (intermixed with training trials) to measure transfer and abstract-concept learning. Their set-size transfer function was compared to other species similarly trained and tested. Magpies were similar to nutcrackers (food-storing birds), superior to pigeons at every stage, and even superior to two monkey species (rhesus, capuchins) at early stages. Thus, magpies are far from the 'bird brain' label, even surpassing some nonhuman primates in this abstract form of relational processing.

Email: Anthony wright, anthony.a.wright@uth.tmc.edu

11:20-11:35 (199)

A Signal Detection Approach to the Analysis of Categorization by Pigeons. SHEILA CHASE, *Hunter College* — Pigeons trained with pairs of light/sound compounds to choose between two alternatives, when tested for generalization in the presence of new stimuli on both continua divide the decision space so as to optimize the probability of making the decision that is most likely to be correct. The weight given to each dimension in the presence of generalization test stimuli reflects the relative information available on each dimension from complete control by one of the dimensions to equal control by both. In contrast, humans in tasks in which verbalization is possible fail to show such subtle sensitivity to variations in the information provided. It remains to be determined whether these differences reflect basic difference in cognition or use of verbal coding by humans.

Email: Sheila Chase, schase@hunter.cuny.edu

11:40-11:55 (200)

Piagetian Liquid Conservation in Grey Parrots (*Psittacus Erithacus*). IRENE M. PEPPERBERG, *Harvard University*, SUZANNE L. GRAY, *Tufts University*, JUSTIN S. LESSER, *Northeastern University*, LEIGH ANN HARTSFIELD, *Phoenix Landing* — An understanding of Piagetian liquid conservation was investigated in four Grey parrots (*Psittacus erithacus*), their ages ranging from initially less than one year old to 18 yrs old. They were tested in several conditions: on the ability to choose between (1) identical containers filled with a greater or lesser quantity of a desirable liquid to see if they would reliably take the larger amount; (2) equal quantities of liquid that were (a) visibly or (b) invisibly transferred from identical containers to different-sized containers to examine their abilities with respect to conservation. Invisible transfers examined the extent to which birds chose based on perceptual evaluations of quantity and the effects of task order on their decisions. Adult birds succeeded on all or most aspects of the tests; the extremely young bird was unable or unwilling to choose between the smaller and larger quantities in the first stage of testing but later succeeded in all aspects of the tests. Grey parrots thus demonstrate some understanding of liquid conservation.

Email: Irene M. Pepperberg, impepper@media.mit.edu

Lunchtime Workshop: Non-Academic Careers
Public Garden (5th Floor), Saturday Noon, 12:00-1:30
Chaired by Robert Rauschenberger, Exponent, Inc.
(by advance reservation only)

12:00-1:30 (201)

This workshop will provide an unbiased look at the obstacles psychologists face in transitioning out of academic research, and offer some advice from those who have successfully made the transition, on how to overcome those impediments. A panel comprising former academic psychologists now working in user experience, on defense contracts, and in the gaming industry will share their personal experiences and then make themselves available for questions from the audience. An introductory presentation will talk about how to identify and apply for suitable non-academic positions.

Email: Robert Rauschenberger, rrauschenberger@exponent.com

Leading Edge Workshop

Symposium IV: The Evolutionary and Psychological Significance of Play
Grand Ballroom, Saturday Afternoon, 1:30-3:30
Chaired by Lance Miller, Chicago Zoological Society - Brookfield Zoo

1:30-1:40 (202)
Introduction. LANCE MILLER, *Chicago Zoological Society - Brookfield Zoo* — Similar to other areas of science such as language, defining a complex behavior such as play is quite challenging. Given the diversity of types of play including but not limited to pretend play, rough and tumble play, board games, locomoter and social play, it may not be possible to have one definition that extends across all types. However, a process has been proposed to help guide the field of play research forward to help better understand the function of this complex behavior. Sixteen experts in the field of play identified criteria that help to define the many of the components of play. These criteria will not map onto all forms of play but will help define the similarities and differences that exist. Moving the field forward, controlled experiments with sound science as well as comparative analysis will be critical to understand play and its psychological and evolutionary significance.
Email: Lance Miller, Lance.Miller@CZS.org

1:40-2:00 (203)
To Play Is to Play: Examining Play Across Taxa. HEATHER M. HILL, *St. Mary's University* — Play is notoriously difficult to define but "easy" to see. Whether a raven, a dolphin, a crocodile, a horse, a cow, a pig, or a primate, play shares many of the same characteristics including age of play, categories of play, signals used, and rules followed. Despite these similarities, tremendous variation exists in frequency, degree of complexity, and proposed functions. Is play an opportunity to test physical skills, to grow stronger, to increase cognitive flexibility, to navigate various social tasks, such as getting along with others and establishing bonds with others, to alleviate boredom, to train for the unexpected, or simply a byproduct of excess energy and/or time? To better understand the consequences of play, we must first identify the elements of play using cross-species, developmental, and experimental approaches.
Email: Heather Hill, hhill1@stmarytx.edu

2:00-2:20 (204)
Play: Movement, Neuroscience, Communication and Welfare. SERGIO M. PELLIS, *University of Lethbridge* — There is a network of interconnected properties that make play, play. The particular interconnections that make one form of play similar to another form of play remain to be determined. For instance, the neurobiology of social play has been mapped out in some species. But what elements of this neural circuitry are similarly engaged in locomotor play? Irrespective of the degree of overlap, there are functional implications. For social play, while the neural circuits needed to produce play are subcortical, the experience of play in the juvenile period influences the development of cortical regulatory circuits. The subtle communication needed to sustain social play, may be critical to such feedback. Both locomotor and social play can sometimes be useful markers of wellbeing. However, there can be a dark side. Play can sometimes be used to torment peers and the short-term gain in wellbeing can lead to long-term detrimental effects.
Email: Sergio Pellis, pellis@uleth.ca

2:20-2:40 (205)
Cultural Transmission, Cognitive Transfer and Emotional Coping in Play. ALEX DE VOOGT, *American Museum of Natural History* — Board games have been instrumental in studies of cognition and in particular in our understanding of expertise. They are found across cultural and geographic boundaries as well as across time periods. The cognitive skills relevant to expertise in playing board games have been studied for chess and a few games outside the Western world. Recent research shows that the cognitive skills in these games do not transfer to other cognitive domains. Rather, expertise in games is game-specific. In contrast games and, more generally, play do have a role in understanding human interaction. They serve as social lubricants from resolving conflict between cultures to facilitating coping mechanisms in children. In these contexts play ranges from pretend play to rule-based board and card games. These insights suggest that play and games do not define culture but help to navigate cultural and emotional challenges; and, that they do not transfer cognitive skills but transmit as specific game practices across time and space.
Email: Alex de Voogt, adevoogt@amnh.org

2:40-3:00 (206)
Pretend Play in Early Childhood. ANGELINE S. LILLARD, *University of Virginia* — Pretend play, the paradigmatic case of play early childhood, involves mapping an imagined situation onto a real one. Key questions are how children negotiate the pretend-real boundary, and whether pretending changes children's development in any way. Imaginary companions are devised by children and are inserted into real contexts, perhaps to enlarge social circles or handle difficulties. Other pretend play can involve altering both context and content. How do toddlers know a context is pretend, thereby not confuse pretend with real? Studies reveal that parents change their behaviors in ways that cue toddlers; this social cuing might sensitize children to attend to social information and undergird theory of mind. Cross-cultural research has confirmed these cues and their import. Further study of cross-cultural and non-paradigmatic cases of childhood play will further our understanding of play's psychological and evolutionary significance.
Email: Angeline Lillard, asl2h@eservices.virginia.edu

3:00-3:30 (207)
Questions & Answers.

Recall I
Back Bay C & D, Saturday Afternoon, 1:30-3:10
Chaired by Klaus Oberauer, University of Zurich

1:30-1:45 (208)
Does Rehearsal Help Immediate Serial Recall? KLAUS OBERAUER and ALESSANDRA SOUZA, *University of Zurich* — The assumption that articulatory rehearsal is beneficial for immediate serial recall of verbal materials has been virtually taken for granted. Correlational evidence suggests that cumulative rehearsal in particular is beneficial for serial recall (Tan & Ward, 2008). Yet, there is no experimental evidence supporting a beneficial causal effect of rehearsal on immediate serial recall. Simulations with a generic model of serial recall revealed that a mechanistic implementation of rehearsal as a maintenance mechanism protecting representations from decay is elusive (Lewandowsky & Oberauer, 2015). We present two experiment that manipulate the frequency and the schedule of rehearsal, one with a simple-span and one with a complex-span task. Participants were instructed to remember a list of words in serial order and engage in cumulative rehearsal. They were instructed to rehearse overtly so their rehearsal could be monitored. The instruction increased the prevalence of cumulative rehearsal in comparison to a control condition in which participants were free to rehearse as they wished. Instructed cumulative rehearsal led to better recall of words from the beginning of the list at the expense of words at the end of the list. Nevertheless, participants did not recall more words overall in the instructed-rehearsal condition than in the control condition, showing that cumulative rehearsal does not improve performance in serial recall.
Email: Klaus Oberauer, k.oberauer@psychologie.uzh.ch

1:50-2:05 (209)
Cognitive Load Effect on Free Recall. PIERRE BARROUILLET, ANDREJ S. O'MURCHU and ISABELLE DAGRY, *University of Geneva* — It has been repeatedly observed that recall performance in working memory (WM) complex span tasks is a function of cognitive load (*CL*) conceived as the proportion of time during which processing distractors occupies attention. The present study explored the effect of CL on free recall. Participants studied lists of 12 words for further free recall while adding 1 to digits presented successively on screen after each word. The CL of this addition task was varied by manipulating the number of digits presented after each word and the time available to process them. As it has been observed in complex span tasks, free recall performance linearly decreased as *CL* increased. However, the CL effect that was pronounced for the first serial positions smoothly decreased as serial position increased and disappeared in the recency portion of the serial position curve. Analysis of forward ordering at recall strongly suggested a process of cumulative refreshing or rehearsal of the words presented in the first serial positions in low *CL* conditions. The implications of these findings for theories of WM and free recall are addressed.
Email: Pierre Barrouillet, Pierre.Barrouillet@unige.ch

2:10-2:25 (210)
Is Automatic Retrieval Context-Dependent? STEVEN M. SMITH, *Texas A&M University*, JUSTIN D. HANDY, *Stress and Motivated Behavior Institute*, ALAN HERNANDEZ, *Texas A&M University*, LARRY L. JACOBY, *Washington University* — At Psychonomics in 2015 we presented several experiments that found context-dependent performance on indirect memory measures, including anagram solving and word fragment completion. According to post-test questionnaires, however, most participants claimed to be aware that test solutions were encoded words, and many claimed to have intentionally recollected encoded words at test. Now, we present further evidence of context-dependent automatic retrieval with an oppositional memory task (Smith & Tindell, 1997). Word fragments (e.g., A_L_ _GY) orthographically similar to encoded words (e.g., ANALOGY) are tested; participants are (correctly) told not to recollect encoded words because they are all wrong answers to test fragments. Encoding negative prime words with background video contexts resulted in a significant decrease in fragment completion, relative to the unprimed condition, and this negative priming effect was greater when encoding contexts were reinstated on the fragment completion test. These results provide additional evidence that automatic retrieval is context-dependent.
Email: Steven M. Smith, stevesmith@tamu.edu

2:30-2:45 (211)
Retrieval-Induced Forgetting of Spatial Information for Items With Equal Strengths. BRIDGET L. MCCONNELL (Member Select-Speaker Award Recipient) and JIAYIN ZHENG, *James Cook University Singapore* — In two experiments, we demonstrated the retrieval-induced forgetting (RIF) effect in a spatial task. In Experiment 1, participants learned the location of four items in each of three contexts. They practiced retrieving the locations for half the items in two contexts and did not practice retrieving the location for any items in a third context. We observed impaired recall for the location of items that did not receive retrieval practice but belonged to a practiced context (RP-) relative to items that did not receive retrieval practice and belonged to an unpracticed context (NRP). We also demonstrated facilitated recall of the location for items that were practiced (RP+) relative to NRP items. In Experiment 2, we demonstrated the RIF effect after the strengths of the RP+ and RP- representations were equated. We used a procedure analogous to cross-category RIF, and we made the stimulus identities for RP+ and RP- items the exact same. They differed only in their locations in the context. We observed an even stronger RIF effect, which is indicative of increased inhibition being needed to suppress the more similar competitors during retrieval practice. Results are discussed in consideration of forgetting, inhibition, and interference.
Email: Bridget L. McConnell, bridget.mcconnell@jcu.edu.au

2:50-3:05 (212)
When Distraction Benefits Memory Through Semantic Similarity. MACIEJ HANCZAKOWSKI, *Cardiff University*, PHILIP BEAMAN, *University of Reading*, DYLAN M. JONES, *Cardiff University* — The between-sequence semantic similarity effect refers to the impairment in memory performance

observed when visually presented words are accompanied by semantically related auditory distracters. In the present study, we consider the possibility that processing the relationship between target words and distracters may convey category information which could disambiguate category membership of to-be-remembered words, benefitting memory for these words at recall. In the series of experiments the between-sequence semantic similarity effect is reversed and we show that related distracters can improve memory performance when multiple-category lists are presented for study and a category-cued recall test is used to assess memory for studied words. The results indicate not only that irrelevant speech distracters are routinely processed for meaning, but also that semantic information gleaned from this supposedly unattended stream is retained until recall of the memoranda is cued. The data are consistent with a revised interaction-by-process framework.
Email: Maciej Hanczakowski, HanczakowskiM@cardiff.ac.uk

Speech Perception III
Republic, Saturday Afternoon, 1:30-3:10
Chaired by Robert E. Remez, Barnard College, Columbia University

1:30-1:45 (213)
Effect of Temporal Perturbation and Asynchrony on Auditory Perceptual Organization. ROBERT E. REMEZ, REBECCA E. GIGLIO and EMILY F. THOMAS, *Barnard College, Columbia University* — Perceptual integration of the acoustic constituents of speech spans seven octaves, and approaches the duration of a syllable when spectrum is rich. In studies of modulation sensitivity independent of shortterm properties of speech, measures indicate a far narrower temporal window of integration, approaching 50 ms. New studies reported here calibrated intrinsic temporal distortion, achieved by temporal reflection of brief acoustic segments, combined with desynchrony distortion. Participants listened to sine-wave sentences with intrinsic temporal distortions of 25 ms and 50 ms applied to a single tone component; this tone was presented relative to the remaining tone pattern at temporal offsets of 0 ms and 50 ms. Intrinsic temporal distortion of a single tone component harmed intelligibility as much as distortion applied to a complete tone pattern of a sentence. And, the combined effects of intrinsic distortion and desynchrony of a single tone, typically harmful to intelligibility, were not found to be additive. The exquisite temporal sensitivity of the auditory system makes speech vulnerable to temporal distortion even when the majority of the spectrum is temporally veridical. [Supported by NIDCD.]
Email: Robert E. Remez, remez@columbia.edu

1:50-2:05 (214)
Phonological Constraints From the Lexicon: Top-Down Lexical Processes Drive Phonotactic Preferences Between Unattested Forms. DAVID W. GOW, *Massachusetts General Hospital*, SEPPO AHLFORS, *Athinoula A. Martinos Center for Biomedical Imaging* — Native speakers have strong intuitions about the wellformedness (grammaticality) of unfamiliar wordforms. This observation is central to the claim that abstract, language-specific rules or constraints shape phonology. While preferences for attested consonant clusters over unattested ones (e.g. /bl_/> */bn_/) might be attributable to comparison with known words (e.g. *blue*), reliable preferences for some unattested patterns over others (*/bn_/>*/bd_/) seem to require abstract principles. In this study we applied Granger causality analysis to high spatiotemporal resolution multimodal functional imaging data collected during a 2ACF phonological wellfordness judgment task with spoken nonwords. These analyses showed that brain structures implicated in lexical representation influenced acoustic-phonetic regions during this task, and that the strength of this influence reflected judgments of wellformedness (/bl_/ >*/bn_/>*/bd_/). This result is consistent with analyses showing a systematic mapping between the distribution of feature patterns in the lexicon and such judgments, suggesting that judgments reflect lexical, rather than rule/constraint-based processing.
Email: David W. Gow, gow@helix.mgh.harvard.edu

2:10-2:25 (215)
Long-Term Priming Effects of Embedded Words. ARTHUR G. SAMUEL, *Basque Center on Cognition, Brain, and Language* — The great majority of polysyllabic English words have at least one other English word embedded within them (e.g., "acroBAT", "CANcel"). Prior studies have demonstrated transient activation of the embedded words when their carrier words are heard. A series of long-term repetition priming experiments tested more enduring effects of this activation. Subjects selected an auditorily presented target word from displays of four pictures that in some cases included depictions of both a carrier word (e.g., "acrobat") and an embedded word (e.g., "bat"). In a lexical decision test 10 minutes after exposure, there was robust priming of the embedded words; priming was just as strong for "bat" if the target word during the picture exposure had been "acrobat" as for "bat" itself. Subsequent experiments assessed the consequences of the dynamic interaction between carrier words and their embedded words. The results are consistent with models that include lexical-lexical interactions.
Email: Arthur Samuel, a.samuel@bcbl.eu

2:30-2:45 (216)
Acoustic Determinants of Stress in Speech Perception. PETROULA BETTY MOUSIKOU and KATHLEEN RASTLE, *Royal Holloway, University of London* — Perceiving lexical stress is critical for mapping speech onto meaning. However, the acoustic stress cues that people are sensitive to are not well understood. In the present study, we made use of a new large database of disyllabic nonwords with a variety of characteristics that were read aloud naturally and in isolation. These spoken productions were presented to one hundred listeners who made 915 stress judgements each, yielding a total of around 90,000 observations. We investigated the influence of several cues on English listeners' perception of stress and observed that vowel duration, pitch, and loudness, as well as measures that reflect the combinatory effect of all basic acoustic cues to stress are significant predictors of stress perception in English.

Importantly, the size of the obtained dataset further allowed us to examine how each of the acoustic parameters influenced the consistency of stress judgments across listeners.
Email: Betty Mousikou, mousikou@mpib-berlin.mpg.de

2:50-3:05 (217)

Capacity Measures of the McGurk Effect for Focused and Divided Attention. NICHOLAS A. ALTIERI, *Idaho State University*, JENNIFER LENTZ and JAMES T. TOWNSEND, *Indiana University*, MICHAEL J. WENGER, *University of Oklahoma* — The McGurk effect is a fascinating illusion explored by multisensory speech researchers for four decades. There remain two major facets of the illusion that require further exploration before the scientific community can arrive at a unified picture of speech integration. First, temporal processing issues must be addressed: We may ask how assessments of efficiency, such as capacity in the response-time domain (Townsend & Nozawa, 1995), differ for congruent versus incongruent "McGurk" speech signals. Secondly, there is the issue of attention: To what extent do attentional manipulations differentially affect integration? We addressed these questions by assessing capacity when attention was divided across modalities, and when attention was restricted to the auditory. This was done for congruent and incongruent speech stimuli. Results showed that McGurk stimuli adversely affected response-times in both the divided and focused attention conditions; interestingly, the adverse influence of the incongruent visual signal was stronger when attention was divided.
Email: Nicholas Altieri, altinich@isu.edu

Bilingualism I

Independence, Saturday Afternoon, 1:30-3:10

Chaired by Debra Jared, University of Western Ontario

1:30-1:45 (218)

Parafoveal Preview Benefits in Russian-English Bilinguals. DEBRA JARED, *University of Western Ontario*, OLESSIA JOURAVLEV, *McGovern Institute for Brain Research, Massachusetts Institute of Technology* — Two experiments investigated cross-language parafoveal preview benefits in Russian-English bilinguals. Participants read English sentences containing a Russian preview word that was replaced by an English word when the participant's eyes crossed an invisible boundary just before the preview. In Experiment 1, the use of English and Russian allowed us to manipulate orthographic and phonological preview effects independently. A parafoveal preview benefit was observed on all fixation duration measures when Russian previews shared either orthography or phonology with English targets. Experiment 2 investigated cross-language semantic preview benefits using cognate translations, noncognate translations, and interlingual homograph translations. A semantic preview benefit was observed only for cognate and interlingual homograph translations on early eye fixation measures, and for noncognate translations on later measures. The experiments provide evidence that both languages are activated when reading in one, and indicate that bilinguals integrate information across eye fixations, even when this information comes from different languages.
Email: Debra Jared, djjared@uwo.ca

1:50-2:05 (219)

Can Bilinguals Independently Control the Languages Used for Production and Comprehension? AURELIU LAVRIC, *University of Exeter*, DEBBIE CLARKE, *University of Helsinki*, STEPHEN MONSELL, *University of Exeter* — Bilinguals alternated (in predictable 3-trial runs) the language in which they named visually presented numbers, whilst also categorizing the meaning of intermittent auditory (in some experiments) or visual (in other experiments) word "probes" whose language alternated in 50-trial blocks. Categorization performance was superior if the language of the probe matched that of the naming run, but no such "language congruency effect" was found for naming – which might suggest that production interferes with comprehension but not vice-versa. However, when in a subsequent experiment the frequency of the two tasks was reversed (categorization runs with intermittent naming), this also flipped the locus of the congruency effect – now only present in the naming task. In the final experiment, naming and categorization were equiprobable. To ensure favourable conditions for the independent control of production and comprehension, the language for each task remained constant throughout 81-trial blocks, changing only between blocks. Despite the stability of the required language settings, there were language congruency effects in both tasks, suggesting bilinguals do not seem able to set themselves independently for production and comprehension.
Email: Aureliu Lavric, a.lavric@exeter.ac.uk

2:10-2:25 (220)

Automatic American Sign Language (ASL) Activation in Parafoveal Vision During Reading in ASL-English Deaf Bilinguals. NATHALIE N. BÉLANGER, *San Diego State University*, RYAN BREDERSON, *University of California, San Diego*, JILL P. MORFORD, *University of New Mexico* — Bilinguals activate words in both languages when reading in their L1 or their L2. Recently, this effect has been found across modalities (spoken vs. signed) in languages that don't share input/output modalities and that have distinct phonological/structural components. When reading English print, ASL-English bilinguals activate ASL, even though these languages are unrelated. We further probed the extent of co-activation with an invisible boundary paradigm using preview/target pairs of unrelated English words. The ASL translations of the stimuli were either related (sharing several phonological parameters, e.g.: *voice/stuck*) or unrelated (no overlap at all between the two ASL translations; e.g.: *month/stuck*). The targets were embedded in sentences such that participants fixated the targets after processing the previews in parafoveal vision. Eye movement measures on the targets suggest that ASL was activated by the English preview stimulus in deaf ASL-English bilinguals but not in hearing monolingual controls.
Email: Nathalie N. Bélanger, nbelanger@mail.sdsu.edu

2:30-2:45 (221)

Genetic and Language History Factors Influence Cognitive Control in Spanish-English Bilinguals. ARTURO E. HERNANDEZ, KELLY A. VAUGHN and BRANDIN MUNSON, *University of Houston* — How is cognitive control influenced by the use of two languages? Recent work in the literature has focused on whether bilinguals possess some advantage over monolinguals but paid much less attention to the particular factors that might mediate these differences. In the present talk, work that has begun to look at the potential role of genetics and language history in bilinguals will be presented. A first study revealed that bilinguals relative to monolinguals have a higher proportion of individuals carrying the A1 allele of the Taq1A polymorphism which has been associated with better task switching performance. A second study found evidence that carrier status of this gene as well as language history factors are associated with different patterns of brain activity in bilinguals. Taken together results from these studies suggest a complex and dynamic relationship between age of acquisition, language proficiency and cognitive control in this group of bilinguals.
Email: Arturo E. Hernandez, aehernandez@uh.edu

2:50-3:05 (222)

Neither Bilingualism, nor Self-Control, nor Impulsivity Predict Flanker, Simon, or Stroop-Like Interference: Gender Does. KENNETH R. PAAP, ROMAN MIKULINSKY, SHIGEAKI MASUDA and REGINA T. ANDERS, *San Francisco State University* — More than 110 university students (60% bilinguals) completed four computer-controlled tasks reputed to measure different types of inhibitory control (flanker, Simon, spatial-Stroop, vertical Stroop), the self-control scale developed by Tangney, Baumeister, & Boone (2004), and three of the UPPS impulsive-behavior subscales (premeditation, urgency, perseverance) developed by Whiteside et al. (2001). As usual there is little convergent validity between the measures of inhibitory control derived from the computerized tasks and the pattern is only somewhat consistent with standard taxonomies regarding S-S versus S-R compatibility. Neither bilingualism, nor self-control, nor impulsivity predicted the interference scores in the computerized tasks. In contrast gender, frequency of playing video games, ability in team sports, and frequency of working-out did predict the interference scores. Men were much faster on incongruent trials, but only slightly faster on congruent trials. Other failed predictors include music training, music performance, SES, mindfulness, meditation, immigrant status, and attitude toward distraction.
Email: Ken Paap, kenp@sfsu.edu

Consciousness

Back Bay B, Saturday Afternoon, 1:30-3:10

Chaired by Eve A. Isham, University of California, Davis

1:30-1:45 (223)

Consciousness and Decision Complexity. EVE A. ISHAM, CAMILLE MEJIA and KRYSTAL WULF, *University of California, Davis* — The current study examines the role of consciousness in relation to decisional complexity. Previous work has suggested that an effortful, deliberative decision requires consciousness whereas a simple choice is automatic and unconscious. We asked our participants to make simple and difficult choices by pressing a button ("motor response"; MR) and to report the earliest moment they became aware of their decisions (time "W" for will or intent). We asked: a) How long does it take from this moment of intent to the time in which a motor response occurs (i.e., the period between W and MR), and b) what function(s) might this period serve. If consciousness were unnecessary for simple decisions, we would expect the W-MR to be shorter. Contrarily, our data show W-MR was *longer* for the simple decisions than deliberative ones. Our results suggest that consciousness may play more roles in simple decision-making than previously thought.
Email: Eve A. Isham, eaisham@ucdavis.edu

1:50-2:05 (224)

The Role of Personal Concerns in Mind Wandering Experiences Across the Adult Life Span. MEGAN L. JORDANO, MICHAEL J. KANE and DAYNA R. TOURON, *University of North Carolina at Greensboro* (Presented by Dayna Touron) — While executive control abilities decline with age, older adults report fewer task-unrelated thoughts (TUTs) than do younger adults (e.g., McVay, Meier, Touron, & Kane, 2013). The Control Failures x Current Concerns framework (McVay & Kane, 2010) proposes that mind-wandering involves both executive control capabilities and the degree to which the context primes *current concerns*. We tested this framework by systematically priming personal current concerns in younger, middle-aged, and older adults. The use of a continuous adult age sample allows us to more precisely examine age-related variation in mind wandering. Participants completed a n-back task containing thought probes. Finding increased TUTs and diminished age differences in proportion of TUTs among participants primed for current concerns compared to control participants would support the CF × C account. We also examine the contribution of other factors expected to influence mind wandering, including mood, everyday activity, task interest, and task motivation.
Email: Dayna R. Touron, Ph.D., d_touron@uncg.edu

2:10-2:25 (225)

Mind-Wandering and Flow: Are They Two Sides of the Same Coin? YANA WEINSTEIN and MIKO M. WILFORD, *University of Massachusetts Lowell* — Mind-wandering describes the diversion of attention away from the focal task. This phenomenon has been studied extensively, primarily using the "probe-caught" paradigm in which participants are stopped throughout a task and asked to report their thought-state. In contrast to mind-wandering, flow describes a state of absorption, enjoyment, and interest in a task. Although these two states appear to mirror each other, they have never been simultaneously investigated within the same experiment. Here we asked participants ($N = 96$) to intermittently report whether they were mind-wandering or experiencing flow during a reading task. Participants read a 12-minute passage, and read it again 5 minutes later. Each reading included 10 thought probes (mind-wandering or flow). Replicating previous research, we

found that mind-wandering increased over time, and upon re-reading. The novel finding we report is that the experience of flow may not simply reflect the absence of mind-wandering.
Email: Yana Weinstein, yana_weinstein@uml.edu

2:30-2:45 (226)

Attentional Enhancement of Unconscious Processing in Hearing-Impaired Individuals. RAMESH K. MISHRA, *University of Hyderabad*, GOURI PATIL, *Ali Yavar Jung National Institute for the Hearing Handicapped*, SEEMA PRASAD, *University of Hyderabad* — Deaf individuals possess enhanced visual and attentional abilities compared to the normal-hearing, particularly in the visual periphery. We investigated whether this increased sensitivity to visual information also extends to subliminally presented stimuli and as a consequence influences conscious action. Deaf and normal-hearing participants were asked to respond to targets either freely ("free" trials) or by instruction ("fixed" trials). Masked primes either congruent or incongruent with the response were presented briefly before the targets. On free trials, all participants chose the response congruent with the prime more often. On both free and fixed trials, participants were faster responding to a congruent response compared to an incongruent response. Crucially, the priming effects (on both free and fixed trials) were larger in deaf compared to normal-hearing. Additionally, deaf and normal-hearing did not differ on the prime visibility measures. This suggests that higher priming effect in the Deaf is not due to greater visibility of the primes in the Deaf individuals. Thus, we show that enhanced attentional abilities in the Deaf strengthen unconscious activations leading to a greater influence of the prime, even during voluntary action.
Email: Ramesh Kumar Mishra, rkmishra@uohyd.ac.in

2:50-3:05 (227)

Process-Dissociation Assumptions Are Violated in Implicit Sequence Learning. CHRISTOPH STAHL, MARIUS BARTH and HILDE HAIDER, *University of Cologne* — In the debate on the role of consciousness in learning, a central finding was Destrebecqz & Cleeremans' (2001) demonstration, using a process-dissociation (PD) approach, that implicit (i.e., unconscious) knowledge contributed to sequence learning in the serial reaction time task (SRTT) independently of conscious knowledge. Recent findings suggest that this result may reflect violations of PD's fundamental assumptions (i.e., independence, invariance). We investigated the validity of PD when applied to the generation task and found the invariance assumption violated: Explicit knowledge affected generation performance to different degrees under inclusion and exclusion conditions. In addition, guessing processes distorted PD estimates, requiring an extension of PD equations; furthermore, independence between guessing and explicit knowledge was violated in such an extended model. In sum, the present findings substantially threaten the validity of the PD approach to separating the contributions of implicit and explicit knowledge to generation performance. Conclusions based on PD about the independent contribution of conscious and unconscious processes in sequence learning must be treated with caution.
Email: Christoph Stahl, christoph.stahl@uni-koeln.de

Cognitive Skill Acquisition
Back Bay A, Saturday Afternoon, 1:30-3:30
Chaired by Erik M. Altmann, Michigan State University

1:30-1:45 (228)

Practice Increases Procedural Error After Task Interruption. ERIK M. ALTMANN and DAVID Z. HAMBRICK, *Michigan State University* — Positive effects of practice are ubiquitous in human performance, but a finding from memory research — the ratio rule — suggests that negative effects are possible also. In the present study we found that errors in selecting the correct step of a procedure after an interruption increased between sessions of practice on the procedure, even as response time (RT) and other kinds of errors decreased. Selecting the correct post-interruption step required recalling the pre-interruption step, and we attribute the increase in errors to a decrease in the ratio of RT per step to the retention interval represented by the interruption. The results are evidence for a novel kind of speed-accuracy tradeoff in which practice interacts with operating principles of memory to make remembering past performance more difficult. In practical terms, the results suggest that training can be a risk factor for procedural error in task environments with frequent interruptions.
Email: Erik M. Altmann, ema@msu.edu

1:50-2:05 (229)

Improved Dual-Task Performance After Practice Due to Efficient Task Instantiation. TILO STROBACH, *Medical School Hamburg*, TORSTEN SCHUBERT, *University of Halle* — Practice of two simultaneous dual tasks results in an improvement of dual-task performance. The present study investigates the underlying cognitive mechanisms responsible for this improvement: The efficient instantiation of information of two component tasks in working memory at the beginning of each dual-task trial. This instantiation is the consequence of dual-task practice, but it is not the consequence of separate practice of two tasks in single tasks. While previous studies did not provide evidence for an efficient instantiation after dual-task practice with a combination of both, highly complex and highly difficult tasks, we analyzed dual-task performance with (1) less complex/ less difficult tasks, (2) highly complex/ less difficult tasks, as well as (3) less complex/ highly difficult tasks at the end of dual-task and single-task practice. Under conditions of less complex/ less difficult tasks as well as highly complex/ less difficult tasks, we found advantageous dual-task performance after dual-task in contrast to single-task practice. There was no such advantage with less complex/ highly difficult tasks. These results are consistent with the assumption that improved dual-task performance after dual-task practice is the consequence of an efficient instantiation of information of two component tasks in working memory under the specified conditions.
Email: Tilo Strobach, tilo.strobach@medicalschool-hamburg.de

2:10-2:25 (230)

Different (Key)Strokes for Different Folks: How Standard and Nonstandard Typists Balance Fitts' Law and Hick's Law. GORDON D. LOGAN, JANA E. ULRICH and DAKOTA R.

B. LINDSEY, *Vanderbilt University* — Fine motor skills like typing require solving a mapping problem that trades Fitts' law against Hick's law. Eight fingers have to be mapped onto 26 keys. Movement time increases with distance, so Fitts' law is optimized by recruiting more fingers. Choice difficulty increases with the number of alternatives, so Hick's law is optimized by recruiting fewer fingers. Hick's law bends with consistent practice, so skilled typists achieve a balance the laws through learning. We tested this hypothesis by comparing *standard typists* who use the standard QWERTY mapping consistently with *nonstandard typists* who use fewer fingers less consistently. Standard typists were faster and more accurate than nonstandard typists, especially when visual guidance was reduced by covering the keyboard. Standard and nonstandard typists showed similar degrees of hierarchical control in *word priming*, which measures parallel activation of keystrokes, *keyboard recall*, which measures explicit knowledge of letter locations, and *hand cuing*, which measures explicit knowledge of which hand types which letter. Thus, nonstandard typists type as automatically as standard typists, despite their suboptimal balance between Fitts' law and Hick's law.
Email: Gordon Logan, gordon.logan@vanderbilt.edu

2:30-2:45 (231)

What's Your Game? Game Playing Strategy Interacts With Video Game Learning and Cognitive Gains in Older Adults. CHANDRAMALLIKA BASAK and MARGARET A. O'CONNELL, *University of Texas at Dallas*, KAORU NASHIRO, *University of Southern California*, SHUO QIN and EVAN SMITH, *University of Texas at Dallas* — Cognitive training using complex video games need to account for individual differences in game playing strategies, because strategies adopted during the game play may affect the magnitude of training-related cognitive gains. The current study investigated how individual differences in strategies and learning during game play interacted with cognitive gains in older adults. Participants were randomly divided into two groups: Active control (N=27) and real-time strategy video game training (N=25). Results suggest that individual differences in measures of game play affected cognitive gains and interacted with game playing strategy. For example, individuals winning at a faster rate showed greater gains in response latency in a working memory updating task (r=-.46, p=.03). Furthermore, two different strategies could be adopted during game play: wonder vs. combat. Results suggest that individuals who adopted the wonder strategy, compared to the combat, benefited in a reasoning task, but the combat strategy resulted in greater gains in memory functioning (both working memory and episodic memory), compared to the controls and the wonder strategy.
Email: Chandramallika Basak, cbasak@utdallas.edu

2:50-3:05 (232)

Searching Not Under the Lightpole But Where We Dropped Our Keys: Using Changepoint Detection to Shine the Light on Periods of Strategy Invention and Change. WAYNE D. GRAY and MARC DESTEFANO, *Rensselaer Polytechnic Institute* — In complex task domains students may exceed their teachers. Such tasks afford diverse means to tradeoff one type of performance for another, combining task elements in novel ways to yield method variations and strategy discoveries that, if mastered, might produce large or small leaps in performance. For the researcher interested in the development of extreme expertise, the problem posed by such tasks is "how to know, where to look". In this talk we introduce the "changepoint detection" family of statistical techniques. We argue that these techniques serve as "flashlights" that enable us to shine our light where periods of change are most likely to have occurred. Although they provide no guarantee that we will find what we are looking for (i.e., periods of exploration and experimentation with new methods) they are a lot better than the alternative; namely, searching under the lightpole.
Email: Wayne D. Gray, grayw@rpi.edu

3:10-3:25 (233)

Beyond Just the Surface Content: How Semantic Schemas Affect Categorization of Probability Word Problems. CHENMU XING and JAMES E. CORTER, *Columbia University Teachers College*, DORIS C. ZAHNER, *Council for Aid to Education* (Presented by James Corter) — We investigated how the surface and deeper semantic content of probability word problems affects problem understanding and categorization, and whether these effects vary with statistical training. Undergraduate and graduate students (N=51) were asked to sort probability problems into groups by similarity of solution. The problems varied by relevant probability principle, by type of semantic schema, and by cover-story surface content. Results showed that both less-trained students and more-trained students tended to sort problems by relevant probability principle, but students with more statistics training did this more consistently. Both groups of students tended to be affected in the sorting task by semantic schema, defined here as intermediate-level abstractions of the problem structure, even though these aspects of the problem are not relevant to formal solution procedures. Surface content of the problems affected less-trained participants to some degree, more-trained students not at all.
Email: Chenmu Xing, xing@tc.columbia.edu

Attention: Capture II
Grand Ballroom, Saturday Afternoon, 3:50-5:30
Chaired by Adam Reeves, Northeastern University

3:50-4:05 (234)

Crowding and Visual Attention. ADAM REEVES and JEFF NADOR, *Northeastern University* — 'Crowding', a deficit in peripheral target identification induced by surrounding 'flanker' stimuli, is reduced by attracting *exogenous* attention to the target by blinking it (Greenwood et al., 2014). But does crowding also depend on *endogenous* attention? A central cue (an 'L' or 'R') to attend right or left occurred unpredictably in an RSVP stream of letters. Target Gabors appeared at 4 or 8deg eccentricity, one left and one right, throughout each trial. Target-flanker spacings were ¼, ½, or ¾ eccentricity. Observers shifted attention to evaluate the tilt of the cued target. Crowding was independent of target-flanker spacing, violating "Bouma's bound" that only flankers within ½ target eccentricity crowd, as if the attended region expands >18deg during an endogenous

shift. Target blinks hindered (not helped) identification at near spacings just after the shift, as if all stimuli in the attended region –flankers as well as targets- were facilitated.
Email: Jeff Nador, jeff.nador@gmail.com

4:10-4:25 (235)

Converging Evidence for Suppression of Attentional Capture by Salient-but-Irrelevant Stimuli. NICHOLAS GASPELIN (Member Select-Speaker Award Recipient) and STEVEN J. LUCK, *University of California, Davis* — Researchers have long debated whether salient stimuli, such as color singletons, can automatically capture visual attention. In the current study, we investigated one possible reconciliation called the signal suppression hypothesis. According to this hybrid model, all salient stimuli generate a bottom-up salience signal .that attempts to guide attentional allocation, but this salience signal can be actively suppressed. In the current study, we tested this account using eyetracking, a novel capture-probe behavioral technique, and event-related potentials (ERP). The results demonstrate that, when color singletons fail to capture attention, they are suppressed below baseline processing levels. Importantly, we found that behavioral suppression effects were accompanied by the P_D ERP component, providing a key link between the behavioral suppression and an electrophysiological signature of suppression. We conclude that any viable theory of attentional capture must account for these observed suppression effects.
Email: Nicholas Gaspelin, ngaspelin@ucdavis.edu

4:30-4:45 (236)

Deviant Sounds Yield Distraction Irrespective of the Sounds' Informational Value. FABRICE B. R. PARMENTIER, *University of the Balearic Islands* — Oddball studies show that rare and unexpected changes in an otherwise repetitive sequence of task-irrelevant sounds (deviant vs. standard sounds) ineluctably break through attentional filters and yield longer response times in an ongoing task. While generally viewed as an adaptive phenomenon, recent studies questioned this view by reporting that deviance distraction disappears when sounds do not predict the occurrence of a target stimulus (uninformative sounds). Here I challenge this contention and demonstrate that the apparent absence of deviance distraction with uninformative sounds results from two opposite effects: Deviance distraction when the previous trial involved a target and required responding, and facilitation by deviant sounds following trials involving no target and requiring the withholding of responses. Data from a new experiment, new analyses of the data from three earlier studies, and the modelling of these data, all converge in suggesting the existence of deviance distraction impervious to the sounds' informational value.
Email: Fabrice Parmentier, fabrice.parmentier@uib.es

4:50-5:05 (237)

A Perceptual Habituation Account of the Attentional Blink. PATRICE RUSCONI, *University of Surrey*, DAVID E. HUBER, *University of Massachusetts, Amherst* (Presented by David Huber) — The Attentional Blink (AB) is a temporary deficit for a second target (T2) after a first target (T1) in rapid serial visual presentation. Current AB theories suppose this deficit reflects attentional gating but here we examined whether the AB can be explained without reference to changes in attention. On our account, the AB reflects neural habituation for the perceptual representations that detect the appearance of a target. The nROUSE model of Huber and O'Reilly (2003) explains perceptual priming deficits through neural habituation and we examined whether this model can also explain the AB. In two experiments, we examined the interaction between repetition priming and the AB with pre-T2 and post-T1 repetition priming (Experiment 1) and with repeated distractors (Experiment 2). Using default parameters, the nROUSE model predicted these results, as well as the 'spread of sparing' and the elimination of this effect reported by Chen and Zhou (2015).
Email: David E. Huber, dehuber@psych.umass.edu

5:10-5:25 (238)

Topological Influence on Visual Attention in the Visual Field: Observations From Inhibition of Return Effect. YAN BAO, LANG YANG and WENFENG CAI, *Peking University*, ERNST PÖPPEL and TAOXI YANG, *Ludwig-Maximilians-Universität München* — Inhibition of return (IOR) has been extensively studied with respect to many stimulus and response related factors. However, the topological properties of stimuli has not been considered yet. Using a spatial cueing paradigm, the present study investigated whether the topological properties of the cues and the targets influence the magnitude of IOR. Considering the suggested functional dissociation of IOR in the perifoveal and peripheral visual field from recent studies, we examined this issue in both perifoveal and peripheral visual field. The topological manipulation of the stimuli was accomplished by using a solid or hollow cue (i.e., a square) and a solid or hollow target (i.e., a circle) in a double-cue IOR detection task. The IOR effect in the cue-target consistency condition (i.e., both the cue and the target are solid or hollow) was compared to the inconsistency condition (i.e., one is solid, one is hollow). The results showed a significant topological influence on IOR, but only in the perifoveal region and not in the periphery. These observations confirmed again a functional dissociation of IOR between the perifoveal and the peripheral visual field, and suggest that topological influence may only occurs in an area that is sensitive to object perception where topological feature plays an important role.
Email: Yan BAO, baoyan@pku.edu.cn

Human Learning and Instruction II
Back Bay C & D, Saturday Afternoon, 3:30-5:30
Chaired by Robert Goldstone, Indiana University

3:30-3:45 (239)

The Encoding of Characteristic and Diagnostic Properties During Interleaved and Blocked Category Learning. PAULO CARVALHO and ROBERT GOLDSTONE, *Indiana University* (Presented by Robert Goldstone) — A property is characteristic of a category if most of the members of the category have the property — the probability of the property, given the category, is high. A property is diagnostic for a category if the probability

of the category, given the property, is high. We find that when different categories to be learned are presented in an interleaved fashion, participants are much less sensitive to characteristic features than when categories are blocked such that several members of a single category are presented successively. Interleaved and blocked presentations lead to equally strong encodings of diagnostic properties. The influence of example sequencing on encodings of characteristic and diagnostic properties is well accounted for by a computational model that emphasizes properties of an example that are shared with the preceding example when the two examples come from the same category, and properties of an example that differ from the preceding example when they come from different categories.
Email: Robert Goldstone, rgoldsto@indiana.edu

3:50-4:05 (240)

The Sequence of Items in Category Learning: Modeling and Eye-Tracking Data. SAFA ZAKI, *Williams College*, ALEXANDER RICH, *New York University*, STEPHANIE STACY, *Williams College* — Sequence effects, in which the particular order of presentation of exemplars affects the learning of a category, have recently received considerable attention in the literature. We tested the theory that some of these effects may be caused by changes in attention allocation that result from comparisons between temporally juxtaposed exemplars. In Experiment 1, we tested this idea in a task in which we manipulated presentation order during learning such that exemplar comparisons were predicted to draw attention to a target dimension. Critically, in this task, all dimensions were equally diagnostic for categorization. However, fits of the Generalized Context Model to participants' data suggested that participants tended to heavily weight the target dimension. In Experiment 2, we conducted an eye-tracking version of the first experiment, which provided converging evidence of increased attention to the target dimension as a result of the sequencing of exemplars.
Email: Safa Zaki, szaki@williams.edu

4:10-4:25 (241)

High-Dimensional Category Representations. ROBERT NOSOFSKY, BRIAN MEAGHER and CRAIG SANDERS, *Indiana University Bloomington*, MICHAEL LEE, *University of California, Irvine* — We conduct extensive similarity-scaling and dimensions-ratings studies to characterize the high-dimensional structure of the natural-science categories of rock types. Alternative models of similarity (continuous spatial, discrete clustering, and hybrid) are compared on their ability to characterize the observers' similarity judgments. The derived similarity-scaling representations are also used in combination with formal exemplar and clustering models of human classification learning to help guide the search for teaching techniques that result in effective learning and generalization of the rock-category instances. The long-term goal of the project is to translate progress in formal models of similarity representation and human category learning to the real-world science classroom.
Email: Robert Nosofsky, nosofsky@indiana.edu

4:30-4:45 (242)

Investigating and Explaining the Potency of Successive Relearning for Enhancing Long-Term Retention. KATHERINE A. RAWSON, *Kent State University*, KALIF E. VAUGHN, *Northern Kentucky University*, MATTHEW WALSH, *Carnegie Mellon University*, JOHN DUNLOSKY, *Kent State University* — Suppose that a simple learning technique could improve students' long term retention of course material by 2-4 standard deviations, but teachers did not know about it, students did not use it, and researchers did not study it. Just such a case exists: successive relearning (i.e., practicing until some level of mastery is reached in each of multiple learning sessions that are distributed over time) is a highly potent learning technique that is underutilized in educational practice and underinvestigated in memory research. Here, we advocate for a shift in educationally relevant memory research to systematically investigate and explain the benefits of successive relearning. Two experiments document the potency of this technique for achieving meaningful levels of durable learning, and we introduce and formally test the first computational model of relearning effects.
Email: Katherine Rawson, krawson1@kent.edu

4:50-5:05 (243)

The Role of Awareness of Repetition During the Development of Automaticity. CRAIG P. SPEELMAN and EMMA SHADBOLT, *Edith Cowan University* — The current study examined whether being aware of the repetitive nature of a simple numerosity task could aid the development of automaticity, and whether participants were aware of when automaticity developed for them via a post-test interview. The numerosity task used in this study was a simple counting task like that used in Lassaline and Logan (1993). Thirty-four participants were randomly allocated to an experimental (n=17) or a control (n=17) condition, and completed 30 blocks of 18 trials on the numerosity task. Participants in the experimental condition were informed that the stimuli would be repeated many times, whereas participants in the control condition were given no such information. There was no evidence that awareness affected the way automatic processing developed, nor whether participants were aware of when the transition from controlled to automatic processing developed. These results are broadly consistent with the account provided by Lassaline and Logan of the transition from controlled to automatic processing in the numerosity task.
Email: Craig Speelman, c.speelman@ecu.edu.au

5:10-5:25 (244)

Individual Differences in Learning Efficiency. KATHLEEN B. MCDERMOTT, CHRISTOPHER L. ZERR and JEFFREY J. BERG, *Washington University in St. Louis* — We explore the psychometric properties of a task designed to measure learning efficiency in healthy young adults (Nelson et al. 2015). Participants (N=281) studied 45 Lithuanian-English word pairs and then took an initial cued recall test (Test 1) with feedback. A dropout procedure was used whereby recalled items were dropped from subsequent test phases, and nonrecalled items were repeatedly tested (with feedback) until recalled. The process repeated until all 45 words had been recalled once

(Trials to Criterion), and subjects then took a final test. For each participant, the three metrics (Test 1, Trials to Criterion, Final Test) were combined into a composite learning score. The entire process was repeated (with new items) 24 hours later. Learning scores are highly reliable. In a smaller sample, validity was assessed with numerous cognitive batteries. This task is a reliable, valid index for assessing learning efficiency in healthy young adults.
Email: Kathleen McDermott, kathleen.mcdermott@wustl.edu

Psycholinguistics II
Republic, Saturday Afternoon, 3:30-5:30
Chaired by Sascha Schroeder, Max Planck Institute for Human Development

3:30-3:45 (245)
Eye-Movements in Children and Adults Reading in a Second Language: Similarities and Differences. SASCHA SCHROEDER, *Max Planck Institute for Human Development*, TUOMO HÄIKIÖ, *University of Turku*, ASCEN PAGAN, *University of Oxford*, JUKKA HYÖNÄ, *University of Turku*, SIMON P. LIVERSEDGE, *University of Southampton* — Eye-tracking studies have shown that adults make more and longer fixations when reading in their L2 than in their L1. This behavior is similar to that of children who are reading in their L1. In this study, six groups of adults with different L1-L2 combinations read sentences in three languages: English, Finnish, and German. We compared their data with that from monolingual adults and 4th grade children who read the same sentences in their L1. Results show that the effects for adult L2 readers were similar to the effects observed for children reading in their L1. After controlling for participants' vocabulary skills,children showed longer mean fixation times and adult L2 readers showed higher regression rates than adult L1 readers. We will discuss our findings with regard to models of reading development and bilingualism.
Email: Sascha Schroeder, sascha.schroeder@mpib-berlin.mpg.de

3:50-4:05 (246)
Syntactic-Spatial Interactions for Hands, not Feet. TIMOTHY W. BOITEAU, CAMERON M. SMITH and AMIT ALMOR, *University of South Carolina* — Several studies have found a relationship between comprehending transitive sentences and spatial processing (Chatterjee; 2001; Maas & Russo, 2003), showing that images depicting the agent of an action to the left of the patient are responded to faster than images with the opposite arrangement. Extending these observations, Boiteau and Almor (2016) demonstrated that after reading a sentence, identifying a word which appeared earlier as the agent is faster on the left than the right, but only for left-hand responses (i.e., the syntax-space effect). A subsequent study found that crossing the hands weakens the left-hand effect (Boiteau & Almor, 2015). The present study tested whether this effect is specific to the hands or if it is also found in other lateralized responses, having participants respond with hands and feet. Hands again produced an effect, while feet did not. Thus, the syntax-space effect appears to be effector specific.
Email: Amit Almor, almor@sc.edu

4:10-4:25 (247)
Phonetic Convergence Differs Across Conversational Interaction and Speech Shadowing Tasks. JENNIFER S. PARDO, ADELYA URMANCHE, SHERILYN WILMAN and JACLYN WIENER, *Montclair State University* — Phonetic convergence has been examined in speech shadowing tasks and in conversational interaction across different studies. The current study examines phonetic convergence in both settings across the same talkers. A set of 96 talkers (48 female) completed speech shadowing and paired conversational tasks in same- and mixed-sex pairings. Overall, phonetic convergence was highly variable in both shadowing and conversational tasks, was greater in speech shadowing than in conversational interaction, and there were effects of talker and pair sex. Female talkers converged more in mixed-sex pairings than in same-sex pairings, while males converged equally across both contexts. Furthermore, there was no relationship between shadowing and conversational convergence for female talkers, and a modest relationship for males. Taken together, these findings indicate that basic mechanisms supporting phonetic convergence during speech shadowing do not automatically evoke convergence in conversational settings, and that social factors play a role in phonetic convergence regardless of the setting.
Email: Jennifer Pardo, pardoj@mail.montclair.edu

4:30-4:45 (248)
Beat Gesture Alters How Pitch Accenting Affects Discourse Memory: Evidence for Top-Down Use of Talker Expectations. LAURA M. MORETT (Member Select-Speaker Award Recipient) and SCOTT H. FRAUNDORF, *University of Pittsburgh* — Beat gesture and contrastive pitch accenting can be used to add emphasis to co-occurring speech. Previous research examining the effects of these two cues separately indicates that they each enhance memory; however, it is unclear whether and how they interact.
In this study, we examined how beat gesture and contrastive pitch accenting interact by manipulating their presence on key words in stories. We then tested memory using a two alternative forced choice recognition task. In stories containing key words with beat gestures, key words that also had a contrastive pitch accent were recalled more accurately than key words without a contrastive pitch accent. By contrast, in stories without beat gestures on key words, recall was equivalent regardless of contrastive pitch accenting. These results complement previous work (Fraundorf, Watson, & Benjamin, 2010) showing that contrastive pitch accenting enhances memory when beat gesture is never present. Together, these findings indicate that the presence of beat gesture alters the impact of contrastive pitch accenting on memory for spoken discourse. Specifically, when comprehenders encounter a speaker who sometimes uses one salient cue to emphasis (beat gesture), the effects of a second cue to emphasis (contrastive pitch accents) disappear

when that first cue is no longer present. This pattern suggests that language comprehension entails modeling how speakers map intended meaning onto generated forms.
Email: Laura Morett, morett@pitt.edu

4:50-5:05 (249)

Visual-Spatial Working Memory Resources Constrain Audio-Visual Sentence Comprehension. STEPHANI M. FORAKER, LEANNA KALINOWSKI and CALEY WEKENMANN, *Buffalo State College, State University of New York* — We investigated bimodal audio-visual sentence comprehension, and how individual differences in visual-spatial and verbal WM resources affect it. We predicted that phonologically difficult tongue twisters would show improved comprehension with bimodal input, compared to audio-only, and compared to control sentences and syntactically difficult garden paths. We found that comprehension time was shorter with audio-visual input for tongue twisters, with a silent or noisy background, and for control sentences in noise. Comprehension time for garden paths was unaffected by bimodal input. Visual-spatial WM resources (measured with symmetry span) modulated comprehension time in a specific way: those with higher WM benefitted only when faced with audio-visually presented tongue twisters in a noisy background. Those with lower visual-spatial WM were slower with bimodal input in noisy conditions. In comparison, higher verbal WM resources (reading span) supported higher accuracy for all sentences, particularly garden paths, but did not interact with input mode or background type.
Email: Stephani M Foraker, forakesm@buffalostate.edu

5:10-5:25 (250)

The Unbounded Productivity of (Sign) Language: Evidence From the Stroop Task. IRIS BERENT and AMANDA DUPUIS, *Northeastern University* — Upon hearing *baba*, and *dada*, speakers routinely generalize the reduplicative pattern to novel items, even if their phonological elements are novel (e.g., *xaxa*). Here, we examine whether similar generalizations also apply to sign language. Participants (Deaf ASL signers) were presented with monochromatic video-clips of novel disyllabic signs––either reduplicative (XX) or nonreduplicative controls (XY). Given that XX signs are better formed, we expected novel XX signs to exert greater interference with color naming. To gauge the scope of these generalizations, we compared X syllables whose features were either all native, or partly novel. We found no effect of reduplication for signs with native features, a result we attribute to the similarity of these items to ASL color names. Remarkably, signers were highly sensitive to reduplication of signs with novel features. We conclude that unbounded productivity is a design feature of the language faculty that applies irrespective of input modality
Email: i.berent@neu.edu, i.berent@neu.edu

Memory and Beliefs
Independence, Saturday Afternoon, 3:30-5:30
Chaired by Mark L. Howe, City University London

3:30-3:45 (251)

The Behavioral Consequences of Autobiographical Belief and Recollection. MARK L. HOWE, *City University London*, HENRY OTGAAR, JANE WANG and GEORGIANA MOLDOVEANU, *Maastricht University* — We present findings from several experiments related to the behavioral effects of undermining belief for true and false memories. Participants received DRM-wordlists and a recognition task. Next, participants' belief was undermined by giving them feedback about true and false items. We succeeded in eliciting nonbelieved true and false memories. Then, participants were involved in different problem-solving tasks (e.g., compound remote association task). We found that belief *or* recollection impacted the performance on these problem-solving tasks. These differences were related to whether belief or recollection was undermined for a true versus a false memory. We discuss the implications of these findings in terms of the consequences of beliefs for memory.
Email: Dr. Mark L. Howe, drmarkl.howe@gmail.com

3:50-4:05 (252)

Nonbelieved Autobiographical Memories: Characteristics, Consequences, and Implications. ALAN SCOBORIA, *University of Windsor* — Nonbelieved memories (NBMs) are autobiographical memories that are characterized by weakened veridicality in the presence of sustained recollection. In this talk I provide an update on the state of knowledge about the characteristics, subtypes, and personal impact associated with naturally occurring NBMs. I discuss implications of NBMs for distinguishing between appraisals of event occurrence, recollection (vivid episodic imagery accompanied by the sense of reliving the past), and accuracy of the contents of recollective mental representations. Finally, I review research that explores decision making processes that result when vivid memories are confronted by salient disconfirmatory evidence during naturalistic social exchange.
Email: Alan Scoboria, scoboria@uwindsor.ca

4:10-4:25 (253)

When Memories and Beliefs Conflict: Behavioral Consequences. GIULIANA MAZZONI, *University of Hull* — Typical non-believed memories (NBMs, Mazzoni et al (2010)) are very vivid and detailed personal memories that have been disavowed because representing events later considered not to have happened. This creates a cognitive conflict in which ease of access and vividness of details in the memory representation conflict with the belief that the event did not happen. Here I will explore at a behavioural level some consequences that occur when selection and choices are determined by NBMs. In a number of studies spontaneous NBMs were collected or created, and selection/choice assessed in different tasks. In all studies results showed that choice/selection was driven by belief only, suggesting that information coming from the memory is discounted. Response times, however, were still influenced

by the memory representations. These results are discussed in terms of the theoretical approach (Mazzoni & Kirsch, 2002) on metacognitive decisions involved in memory and their influence on behavior.
Email: Giuliana Mazzoni, giulianamazzoni3@gmail.com, g.mazzoni@hull.ac.uk

4:30-4:45 (254)

Beliefs About Memory in the Police, Public, and Memory Experts. MARTIN A. CONWAY, SHAZIA AKHTAR and KATRIN HOHL, *City University London* — In a survey the UK police, general public and memory experts indicated their agreement with statements about memory, some designed to fit scientific evidence and some that ran counter to it. Consistent with other recent surveys the most commonly held belief in the general public was that memory was like a video. This belief was fairly common in the police, but not held by memory researchers. A range of other erroneous beliefs about the effects of emotion on memory and the nature of traumatic memories were also found in the general public but not in the other groups.
Email: Martin A. Conway, martinconway1@mac.com

4:50-5:05 (255)

Source Confusion or Source Skepticism When Under Stereotype Threat. AYANNA K. THOMAS and AMY SMITH, *Tufts University*, MARIE MAZEROLLE, *Université de Poitiers* — Although the effects of stereotype threat on older adult memory is well-established, the exact mechanism by which threat affects memory continues to be debated. In the present study, we examined the effects of stereotype threat on memory in the context of the misinformation paradigm. This paradigm is particularly useful in examining source memory in the context of a complex event. After watching a video that depicted a crime, participants when presented with a written narrative of the event in which information consistent and inconsistent with the original event was presented. Following the narrative, half of the participants were presented with information designed to activate negative stereotypes about aging. Generally, older adults under threat were more likely to withhold information presented across two sources. This occurred in forced cued recall as well as source free memory testing. The results suggest that threat encourages older adults to exercise caution in responding.
Email: Ayanna K. Thomas, ayanna.thomas@tufts.edu

5:10-5:25 (256)

Misinformation Corrections and the Worldview Backfire Effect. ULLRICH K. H. ECKER, *University of Western Australia* — Misinformation continues to influence memory, reasoning, and judgments even after credible corrections. Corrections that violate a person's pre-existing attitudes can be particularly ineffective because people tend to defend their worldviews; such corrections can thus even produce ironic backfire effects. However, the conditions under which this "worldview backfire effect" (WBE) occurs are unclear, as evidence has been mixed. In this talk, I discuss factors that might mediate the occurrence of the WBE; these factors include the generality of the incorrect claim (i.e., whether misinformation relates to a one-off event or a generic claim), the nature of the pre-existing attitude (e.g., if the to-be-defended worldview is a conservative or liberal political view), and the confidentiality of responses (e.g., whether belief ratings are confidential or disclosed to peers).
Email: Ullrich Ecker, ullrich.ecker@uwa.edu.au

Neural Mechanisms of Cognition
Back Bay B, Saturday Afternoon, 3:30-5:30
Chaired by Keith B. Lyle, University of Louisville

3:30-3:45 (257)

Bimanual Coordination Positively Predicts Episodic Memory: A Joint Behavioral and Neuroimaging Investigation. KEITH B. LYLE and BRENDAN E. DEPUE, *University of Louisville*, BRYNN A. DOMBROSKI, *Platinum Solutions*, ANDREW E. SWITALA, ROBIN F. HOPKINS and MARCUS L. LEPPANEN, *University of Louisville* — On many tests of episodic memory, individuals who strongly prefer one hand over the other (i.e., those with strong manual lateralization) are outperformed by individuals with relatively weak hand preference. Because handedness has known neuroanatomical and neurofunctional correlates, handedness-based memory differences may shed light on neural underpinnings of individual variation in memory performance. Here, for the first time, we examined episodic memory as a function of performance on a classic measure of manual dexterity: the Purdue Pegboard Test. Bimanual coordination was positively related to episodic recall. Furthermore, both bimanual coordination and episodic recall were positively related to cortical surface area in right dorsolateral prefrontal cortex. These findings suggest that bimanual coordination, which has been linked to weak hand preference, may be a marker for superior episodic memory and may be so due to anatomical differences in right dorsolateral prefrontal cortex.
Email: Keith B. Lyle, keith.lyle@louisville.edu

3:50-4:05 (258)

Dissociating Medial Temporal and Striatal Memory Systems With a Same/Different Matching Task: Evidence for Two Neural Systems in Human Recognition. ARNOLD L. GLASS, *Rutgers University*, NEHA SINHA, *Rutgers University - Newark* — The medial temporal lobe and striatum have both been implicated as brain substrates of memory and learning. Here, we show dissociation between these two memory systems using a same/different matching task, in which subjects judged whether four-letter strings were the same or different. *Different* RT was determined by the left-to-right location of the first letter different between the study and test string, consistent with a left-to-right comparison of the study and test strings, terminating when a difference was found. This comparison process results in *same* responses being slower than different responses. Nevertheless, *same* responses were faster than *different* responses. *Same* responses were associated with hippocampus activation. *Different* responses were associated with both caudate and hippocampus activation. These findings are consistent with the dual-system hypothesis of mammalian memory and extend the model to human visual recognition.
Email: Arnold Glass, aglass@rutgers.edu

4:10-4:25 (259)

The Circadian Regulation of Cognition in Humans: Differences Between Men and Women. NAYANTARA SANTHI, *University of Surrey*, ALPAR S. LAZAR, *University of Cambridge*, PATRICK J. MCCABE, *University of Surrey*, JUNE C. LO, *Duke-NUS Graduate Medical School*, JOHN A. GROEGER, *University of Hull*, DERK-JAN DIJK, *University of Surrey* — Our sleep-wake cycle interacts with an endogenous circadian clock to generate a rhythm of deterioration and recovery in cognitive capacity over the day and night, respectively. Whether this differs between men and women is an open question. We measured the circadian and time awake effects on subjective and objective measures of cognition in 34 healthy young men and women, in a Forced Desynchrony protocol. Circadian and time awake effects were observed in the cognitive performance of both men and women. However, the amplitude of the circadian modulation was larger in women in 11 out of 39 performance measures such that their performance was more impaired in the early morning hours. These sex differences in cognition could not be explained by sex differences in the circadian amplitude of plasma melatonin and electroencephalographic slow-wave activity. The data establish the impact of circadian rhythmicity and sex on waking cognition, with implications for understanding the regulation of brain function.

Email: Nayantara Santhi, n.santhi@surrey.ac.uk

4:30-4:45 (260)

Neural Mechanisms of Hierarchical Timing Control: Expertise and Aging. RALF T. KRAMPE, *University of Leuven*, NICOLE WENDEROTH, *ETH Zurich*, STEPHAN SWINNEN, *University of Leuven* — The hierarchical timing control (HTC) model assumes that novices control complex temporal movement patterns (rhythms) at low-level timing, sequencing, and task-set control levels. We investigated the neural underpinnings of these control processes in young (in their 20s) and older (in their late 50s and early 60s) novices and expert musicians, who performed different rhythm tasks while lying in an fMRI scanner. Low-Level timing (e.g. tapping series of identical target intervals) activated a typical sensorimotor network, but also IFG, cingulate, and Insula regions. With higher rhythmic complexity novices, but not experts increasingly activated cerebellar Crus, IPS, and MFG. At the behavioral level we found a clear dissociation of expertise-related and domain-general processes: older experts outperformed young novices in rhythm tasks, but they showed typical age-related declines as novices in processing speed, working memory, and task-set control measured through a GoNoGo task. In line with the HTC model rhythmic timing in novices activated regions known to reflect task-complexity in non-motor tasks. Task complexity was also reflected in bi-hemispheric recruitment in novices. Despite comparable activation levels in these regions and excessive hyper-activation in others older novices did not reach the same level of performance as their young counterparts.

Email: Ralf Krampe, Ralf.Krampe@kuleuven.be

4:50-5:05 (261)

Learning Localist Representations in PDP Models of Perception. IVAN I. VANKOV, *New Bulgarian University*, JEFFREY S. BOWERS, *University of Bristol* (Presented by Jeffrey Bowers) — It is widely assumed that Parallel Distributed Processing (PDP) networks learn distributed representations. Previously we have shown that PDP models often learn localist representations when trained to co-activate multiple items at the same time in short-term memory (Bowers, Vankov, Damian, & Davis, 2014). Here we show that PDP models often learn localist codes when trained on arbitrary input-output mappings one-at-a-time. This extends the conditions in which PDP models learn localist representations, and may provide insight into why some neurons respond to complex information in a highly selective manner. Bowers, J. S., Vankov, I. I., Damian, M. F., & Davis, C. J. (2014). Neural networks learn highly selective representations in order to overcome the superposition catastrophe. *Psychological review*, *121*, 248-261

Email: Jeff Bowers, j.bowers@bristol.ac.uk

5:10-5:25 (262)

Multiple Routes to Implicit Statistical Learning? A Dual-System Perspective. CHRISTOPHER M. CONWAY, JOANNE A. DEOCAMPO and GRETCHEN N.L. SMITH, *Georgia State University* — Despite decades of research on implicit and statistical learning, there is still a lack of consensus about the cognitive and neural mechanisms that support learning. In particular, two unresolved issues are 1) to what extent learning is supported by domain-specific versus domain-general mechanisms, and 2) to what extent learning proceeds automatically or requires controlled attention. We review current findings that suggest there may be two primary cortical systems supporting learning: an anterior-based, "executive" network involving brain regions such as the inferior frontal gyrus that is more attention-dependent and necessary for the learning of complex patterns over relatively long time-scales, and a posterior-based, perceptual-motor network that is less dependent on attention and is used to learn modality-specific perceptual units or chunks over shorter time-scales. We suggest that this dual-system perspective provides the beginning of an integrated framework that can help resolve a number of apparent inconsistencies in the literature.

Email: Christopher M. Conway, cconway@gsu.edu

Embodied Cognition

Back Bay A, Saturday Afternoon, 3:50-5:30

Chaired by Sarah H. Creem-Regehr, University of Utah

3:50-4:05 (263)

Judging Affordances From Other Viewpoints: A Role of Perspective Taking? MICHAEL N. GEUSS, *Max Planck Institute for Biological Cybernetics*, SARAH H. CREEM-REGEHR, *University of Utah*, BETTY J. MOHLER, *Max Planck Institute for Biological Cybernetics* (Presented by Sarah Creem-Regehr) — Perspective taking and judging affordances share similar functional goals when determining whether an action is possible from a location dislocated from one's current viewpoint. We tested the relationship between the two by

measuring reaching affordances made from imagined locations around a table. We manipulated imagined self-location, target distance, and presence and length of an avatar arm, using an immersive virtual environment. First, in conditions without an avatar arm, we aimed to establish a baseline for reaching affordance judgments made from other perspectives, and include a novel assessment of response time for affordance judgments. Second, by manipulating visual arm length, we asked whether a change in body capabilities would influence affordance judgments from perspectives other than one's own, suggesting a role for embodied perspective taking. Initial results suggest that reaching affordances were overestimated more from one's physical location compared to imagined locations and response time varied with imagined location and distance of target.
Email: Sarah Creem-Regehr, sarah.creem@psych.utah.edu

4:10-4:25 (264)

Readers Do Not Simulate the Auditory Perception of Story Characters. ALBRECHT W. INHOFF, JULIE GREGG and CYNTHIA CONNINE, *Binghamton University* — Three experiments sought to determine whether readers simulate the auditory perception of their story characters' voices. Participants read a story that consisted mainly of female-male dialogue. Eye-movement-contingent presentations of speech were used to present a complete spoken dialogue segment or a selected dialogue word in a gender-matching or -mismatching voice during the silent reading of corresponding dialogue. Eye movements during dialogue reading were influenced by the hearing of speech, but there were only short-lived differences between the gender-congruent and -incongruent auditory conditions. Overall, the results suggest that readers do not routinely simulate the speech of their talking story characters. Short-lived gender-mismatch effects could be due to story-character uncertainty rather than to mismatches between simulated and perceived voices.
Email: Albrecht Inhoff, inhoff@binghamton.edu

4:30-4:45 (265)

Action Representations Evoked by Imperative Statements. MICHAEL E. J. MASSON and DANIEL N. BUB, *University of Victoria* — We show that immediately after hearing an imperative statement describing a functional action (*use the cellphone*) or a volumetric action (*lift the cellphone*) with the intention to comply, only the action representation corresponding to the mentioned action is evoked, but not other actions that could be applied to the object. Under comprehension instructions, without an intent to act, however, both functional and volumetric action representations associated with the mentioned object are evoked with equal strength, regardless of the stated action type. When instructed to hold the stated action in working memory for later rather than immediate execution, evocation of functional and volumetric action representations followed a pattern indicating sensitivity to the typical sequence of lifting an object while intending later to use it. This variation in evoked action representations constitutes a significant challenge to embodied accounts of language processing in which mental simulation of action is a fundamental component of comprehension. Clearly, the particular action representations evoked by an imperative statement are determined by the comprehender's intentions and not by a generic, literal simulation of the stated action.
Email: Michael Masson, mmasson@uvic.ca

4:50-5:05 (266)

Action Compatibility Effects: Evidence for Automatic Activation of Motor Responses? RENE ZEELENBERG and DIANE PECHER, *Erasmus University Rotterdam* — Recent studies seem to suggest that pictures of objects potentiate motor actions that are compatible with the grasping actions that would be performed on a real object. For example, responses to stimulus properties, such as color or upright/inverted orientation, are faster if the response hand is on the same side as the object's graspable part than if it is on the other side. Likewise, responses are faster when the required response grip (e.g., precision grip) matches the grip that would be used on the object than when it does not match. These findings have traditionally been interpreted as providing evidence for the view that object perception results in the automatic activation of specific actions associated with the object. An alternative interpretation is that these effects are driven by competition at the response level. In this talk we will review recent evidence from our lab that is consistent with this latter interpretation.
Email: Rene Zeelenberg, zeelenberg@fsw.eur.nl

5:10-5:25 (267)

In the Eye of the Beholder: Affect as Well as Object Properties Impact Measurement Estimations. MAGDA L. DUMITRU, *University of Liege* — The probability of perceiving two objects as being similar is a negative exponential function of the distance between them in an internal psychological space (Shepard 1987). Our experimental studies showed that this distance and hence the similarity between objects in the same category is modulated by their size, frequency, and manipulability. Our experimental work also revealed that object properties evoked by digit-word expressions modulate numerosity estimations such that "8 elephants" were judged to be more numerous than "8 ants", for instance. These findings extend the literature on human perceptual biases (Binet 1890) by showing that words instantly access rich mental representations. Our latest experimental findings established that various emotional states significantly impact measurement estimations.
Email: Magda L Dumitru, magda.dumitru@gmail.com

Business Meeting
Liberty BC, Saturday Afternoon, 5:10-6:00
Cathleen Moore, University of Iowa, Chair, Governing Board
Presentation of the 2016 Best Article Awards

Letter/Word Processing II
Grand Ballroom, Sunday Morning, 8:00-9:40
Chaired by Albert F. Smith, Cleveland State University

8:00-8:15 (268)

Effects of Flanking Bigrams on Lexical Decision Performance. AMY M. PALINSKI and ALBERT F. SMITH, *Cleveland State University* (Presented by Albert Smith) — Some word-

identification models suppose visual-system units responsive to letter pairs not adjacent in a letter-string stimulus. In a lexical decision task in which targets were flanked by pairs of bigrams, Grainger, Mathot, and Vitu (*Acta Psychologica,* 2014) found, for words, better performance when flanking bigrams contained target-string letters (e.g., BI BIRD RD; RD BIRD BI; IB BIRD DR; DR BIRD IB) than when they did not (e.g., CE BIRD NT); better performance when flanking bigrams contained letters ordered as in the target (e.g., BI BIRD RD; RD BIRD BI) than switched (e.g., IB BIRD DR; DR BIRD IB); and that bigram order relative to the target did not affect performance. In Experiment 1, we replicated the results of Grainger et al. In Experiment 2 we added nonadjacent-letter bigram conditions (e.g., BR BIRD ID; ID BIRD BR; RB BIRD DI; DI BIRD RB). For words, performance was better when flankers contained target-string letters than when they did not. Performance was better when flanking bigrams contained letters ordered as in the target (e.g., BI BIRD RD; RD BIRD BI; BR BIRD ID; ID BIRD BR) than switched (e.g., IB BIRD DR; DR BIRD IB; RB BIRD DI; DI BIRD RB); this did not depend on whether bigrams were adjacent-letter or open.
Email: Albert F. Smith, a.f.smith@csuohio.edu

8:20-8:35 (269)

No Lexical Engagement Without Memory Consolidation: Behavioural and Electrophysiological Evidence From Masked Priming and Reicher-Wheeler. NICOLAS DUMAY, *University of Exeter,* STÉPHANIE MASSOL, *Basque Center on Cognition, Brain and Language* — We exploited the prime lexicality effect and the Reicher-Wheeler paradigm to determine whether newly learnt words need to consolidate in order to engage in lexical activities. Skilled readers learnt made-up orthographic neighbours ('huspital' for 'hospital') via repeated cycles in letter detection and string completion. They were then tested immediately or after seven days. Masked priming showed that learning reduced the facilitation by related primes, and its N400 correlate, only in seven-day participants. In Reicher-Wheeler, the attraction exerted by the new neighbour (when itself or its baseword was flashed) doubled over the course of the week. If initially this effect transpired as a reduced P150 to new neighbours, after seven days it appeared as a larger negativity to their basewords in the 150-250 window. In view of these non-linear changes, and contrary to recent claims (Kapnoula et al., 2015), memory consolidation *is* what creates lexical representations out of new wordlike objects.
Email: Nicolas Dumay, nicolas.dumay@gmail.com

8:40-8:55 (270)

Lexicality, Frequency, and Regularity Effects in the Stroop Color Naming Task. SACHIKO KINOSHITA, *Macquarie University*, DENNIS NORRIS, *MRC Cognition and Brain Sciences Unit* — In reading aloud, effects of lexicality (words are read faster than pseudowords e.g., self < telf), frequency (e.g., start < stash), and regularity (e.g., debt > deem) are firmly established benchmark effects. Current models of reading aloud (e.g., DRC, Coltheart et al., 2001; CDP++, Perry et al., 2010) model these effects as the time taken to generate a sequence of phonemes from a string of letters, without regard to the speech production processes involved in realizing a sequence of phonemes as an articulatory program. We examine the lexicality, frequency, and regularity effects in the read-aloud and Stroop color naming tasks and find that despite the robust effects on the former, none of these effects are found in the Stroop task. However greater color-naming interference is observed with these letter strings than unpronounceable string of consonants (e.g., yjnsj), and a row of Xs. We consider the implication of these results for modeling reading.
Email: Sachiko Kinoshita, sachiko.kinoshita@mq.edu.au

9:00-9:15 (271)

The Perceptual Structure of Multisyllabic Printed Words: New Evidence From Silent E Words. ALAIN CONTENT and FABIENNE CHETAIL, *Université libre de Bruxelles* — In previous studies we have proposed that the CV pattern, that is, the organization of consonant and vowel letters, determines the parsing of letter strings into perceptual units, with each vowel or group of adjacent vowels delineating one unit. Here we provide further evidence based on silent letters. French skilled readers were presented with words including a silent E between two consonants (e.g., gobelet), thus entailing three orthographic vowel groups. Control words were matched in number of letters. Participants had to estimate either the number of units or the physical extent of the stimuli. Silent E words were consistently estimated to be longer than controls, both in the visual modality and in the auditory modality. However, no effect was found in beginning readers, confirming the orthographic nature of the bias and also the influence of spelling on spoken word processing. The implications for theories of orthographic representations will be discussed.
Email: Alain Content, alain.content@ulb.ac.be

9:20-9:35 (272)

Orthographic Units in the Absence of Visual Processing: Evidence From Sublexical Structure in Braille. SIMON FISCHER-BAUM and ROBERT ENGLEBRETSON, *Rice University* — Reading relies on the recognition of units larger than single letters and smaller than whole words. Previous research has linked sublexical structures in reading to the parallel processing of letters that the visual system enables. But is the visual system essential for this to happen? We investigate braille, a writing system that relies exclusively on the tactile modality. We show that adult readers of (English) braille are sensitive to sublexical units, namely the processing of multi-cell contractions as single orthographic units and the recognition of morphemes within morphologically-complex words. Therefore, we conclude that the recognition of sublexical structure is not exclusively tied to the visual system. However, our findings also suggest that there are aspects of sublexical processing on which braille and print readers differ, and that these differences may, crucially, be related to reading using the tactile rather than the visual sensory modality.
Email: Simon Fischer-Baum, sjf2@rice.edu

Decision Making III
Back Bay C & D, Sunday Morning, 8:00-9:40
Chaired by Thomas L. Griffiths, University of California, Berkeley

8:00-8:15 (273)
Connecting Rational Models and Heuristics by Considering Cost of Computation. THOMAS L. GRIFFITHS, *University of California, Berkeley* — Psychologists often treat rational models and heuristics as completely distinct theoretical frameworks for making sense of human behavior. Rational models assume unlimited computational resources and find ideal solutions, while heuristics are simple but error-prone. I will present an alternative way of thinking about the connection between these frameworks, showing that several of the heuristics identified by psychologists can be derived as optimal solutions to problems of judgment and decision-making once computational cost is taken into account. This "resource rational" approach provides a precise way to characterize a subset of the heuristics that human minds seem to use, and suggests that they may be adaptive strategies rather than idiosyncratic "kluges".
Email: Tom Griffiths, tom_griffiths@berkeley.edu

8:20-8:35 (274)
Modeling Changing Information in Perceptual Decision-Making. *JENNIFER TRUEBLOOD and WILLIAM R. HOLMES, *Vanderbilt University*, ANDREW HEATHCOTE, *University of Tasmania* — When we make decisions, we are often faced with complex, changing information. Any reasonable decision-making process should be able to adjust to and integrate new information, yet little is known about how this is done. Most past decision research has been devoted to understanding stationary decisions where a choice is made on the basis of fixed, unchanging information. In this talk, I will discuss how piecewise sequential sampling models (including piecewise versions of the diffusion model and linear ballistic accumulator model) can be used to infer evidence accumulation properties before and after changed information in perceptual decision-making tasks. I will also discuss how these models, which often cannot be characterized analytically, can be fit to data using state-of-the-art Bayesian methods.
Email: Jennifer Trueblood, jennifer.s.trueblood@vanderbilt.edu

8:40-8:55 (275)
Beyond Shannon Entropy: A Unified Mathematical Framework for Entropy and Its Importance for Understanding Human Active Learning. JONATHAN D. NELSON, *Max Planck Institute for Human Development*, VINCENZO CRUPI, *Universitiy of Turin*, BJÖRN MEDER, *Max Planck Institute for Human Development*, GUSTAVO CEVOLANI, *University of Turin*, KATYA TENTORI, *University of Trento* — Some of the most important decisions are about which test (or experiment) to conduct next. Test selection can often be predicted with the idea that people have the goal of reducing entropy (uncertainty) about the possible states of the world. Shannon entropy is predominant in psychology. But other entropy metrics (Hartley, Tsallis, Rényi, Arimoto, Quadratic) are popular in different fields. We show that many entropy and information gain measures arise as special cases of the Sharma-Mittal family of entropy measures. Using mathematical analyses, analysis of earlier human behavioral data, and simulations, we address: (1) What insight can we obtain by considering individual entropy models within this unified framework? (2) What is the psychological plausibility of each entropy model? (3) What important new questions for empirical research arise from these analyses?
Email: Jonathan D Nelson, jonathan.d.nelson@gmail.com

9:00-9:15 (276)
A Framework for Analyzing Single-Cue Judgment Heuristics. OZGUR SIMSEK and JAN MALTE LICHTENBERG, *Max Planck Institute for Human Development*, GREGORY WHEELER, *University of Munich*, KONSTANTINOS KATSIKOPOULOS, *Max Planck Institute for Human Development* (Presented by Konstantinos Katsikopoulos) — There is evidence that people frequently base their judgments on a single cue, which can be domain-specific, or domain-general such as availability and recognition. In terms of performance, single-cue judgment heuristics compare very well with mathematically sophisticated benchmarks from statistics and machine learning. The existing theoretical framework does not provide a full answer to why this is the case. We present, for the first time in heuristics research, an integrated framework for studying why, and under which conditions, single-cue heuristics are accurate. We analytically derive a decomposition of single-cue accuracy, which relates in a surprisingly simple way two characteristics of judgment problems: predictability and redundancy. We test the decomposition quantitatively and qualitatively in a large collection of natural data sets and contrast the results with those of the existing framework. The results corroborate our theory. We discuss how this approach can be extended to other analyses of judgment, decision-making, and more broadly to the study of cognition.
Email: Konstantinos Katsikopoulos, katsikop@mpib-berlin.mpg.de

9:20-9:35 (277)
Improving the Quality of Quality Judgment. SHENGHUA LUAN and JOLENE TAN, *Max Planck Institute for Human Development*, LAEL J. SCHOOLER, *Syracuse University* (Presented by Lael Schooler) — Judging an object's quality based on relevant cues (or attributes) is a challenging task. We propose a simple method to improve judgment accuracy: Instead of seeing all available cues related to an object's quality simultaneously and providing an estimate afterwards, individuals view cues sequentially, one after another, and make and adjust their estimation at each step. We hypothesize that the sequential procedure could alleviate multiple computational difficulties in cue information integration, leading to higher judgment accuracy. The hypothesis was tested in two real-world tasks, in which participants were asked to judge either the price of diamonds or the fuel economy of cars. Two studies with professional jewelers and car salespeople show that most participants indeed judged more accurately by switching from the simultaneous to the sequential procedure, and the lower a

participant's accuracy under the simultaneous procedure, the more the improvement. Another study with college students further supports the finding.
Email: Shenghua Luan, shluan@mpib-berlin.mpg.de

9:40-9:55 (278)

Divide and Conquer: Preschool Children Assign the Hardest Task to a Helper. MICHAEL J. BERAN, *Georgia State University*, ANDREW J. KELLY, *Georgia Gwinnett College*, BONNIE M. PERDUE, *Agnes Scott College*, WILL WHITHAM, MELANY LOVE, PEGGY LUK and VICTORIA KELLY, *Georgia State University*, AUDREY E. PARRISH, *The Citadel* — Preschool children (3 to 5 years of age) completed a spatial memory task in which 3 of 48 locations in a grid were baited with a hidden marble. Children were taught that a toy "helper" could be given one location to remember, allowing them to only need to remember the other two locations. Older children but not younger children preferentially assigned the helper to the objectively most difficult locations to remember as defined by their spatial location in the grid. Then, eight more tests were given to each child, assessing counting, size discrimination, item naming, and word reading abilities, for which each task had objectively easier and harder stimuli or tasks. Children again could assign some work to the helper, and children at all ages consistently assigned the objectively most difficult stimuli or question to the helper in most tasks. These results highlight metacognitive monitoring and control processes in young children across task types.
Email: Michael J. Beran, mberan1@gsu.edu

Recognition III
Republic, Sunday Morning, 8:00-9:40
Chaired by Jonathan I. Flombaum, Johns Hopkins University

8:00-8:15 (279)

Exploiting Core Knowledge for Visual Object Recognition. JONATHAN I. FLOMBAUM and MARK W. SCHURGIN, *Johns Hopkins University* — Humans recognize thousands of objects with relative tolerance to variable retinal inputs. This remains an ability for which artificial systems have yet to surpass people. We investigated the process of object learning through the association of inputs that co-occur over short periods of time. Specifically, we tested the hypothesis that object kinematics are exploited in order to limit the scope of association to inputs that are likely to have the same token as a source. The experiments involved incidental exposure to images of objects followed by a surprise recognition test. Using motion, we manipulated whether successive exposures to an image happened through kinematics that implied the same or a different token as a source. Across seven experiments memory performance was better for images previously encountered with kinematics that implied a single token. A model-based analysis further supported the interpretation that images seen through continuous kinematics evoked stronger memory signals. These results suggest that constraints from physics are built into the mechanisms that support learning about objects. Such constraints —often called 'Core Knowledge'— are known to support cognition broadly, even in young infants. But they have never been considered as a mechanism for learning with respect to recognition.
Email: Jonathan Flombaum, flombaum@jhu.edu

8:20-8:35 (280)

Re-Examining Single-Process and Dual-Process Models of Memory Development. BRETT K. HAYES, *University of New South Wales,* JOHN C. DUNN, *University of Adelaide*, AMY JOUBERT and ROBERT TAYLOR, *University of New South Wales* — It is often claimed that memory development is driven by two separate processes; an automatic familiarity-based process that develops early and a slower-developing recollection process. This claim was tested in a visual recognition study with 6-7-year-olds, 9-10-year-olds and adults. All were presented with a list of pictures under shallow or deep encoding and then made recognition and confidence judgments about a test list containing old and new items. Hit rates increased from 6- to 10-years of age, with larger age changes following deep encoding. Formal versions of the dual-process high threshold model and several single-process models (equal variance signal detection, unequal variance signal detection, mixture signal detection) were fit to the data. The unequal variance and mixture models produced the best fit. A state-trace analysis found evidence for only one underlying memory process across ages. The results show that certain single-process memory models are viable alternatives to dual-process models for explaining memory development.
Email: Brett Hayes, B.hayes@unsw.edu.au

8:40-8:55 (281)

Using an Experience Sampling Approach to Distinguish Distance Versus Location Based Strategies in Memory. SIMON DENNIS, *University of Newcastle*, VISHNU SREEKUMAR, *National Institutes of Health*, NATHAN EVANS and PAUL GARRETT, *University of Newcastle* — Friedman (1993, 2004) argued that people typically use direct retrieval, order-based, location-based or distance-based strategies to isolate the time at which an event occurred, with the later two being most common. Location-based processes rely on the retrieval of information associated with the cues that can be used to draw inferences about the timing of an event. Distance-based strategies rely on some quality of the memory that changes as a function of time such as strength. Strong memories would be judged as having occurred more recently. Participants wore a smartphone, which collected GPS, audio, accelerometry and image data, in a pouch around their necks for a period of two weeks. After a retention interval of one week, they were asked to judge the specific day on which each of a selection of images was taken. GPS, audio and accelerometry were found to be significant predictors of participants' memory judgements, while images were not. A hierarchical Bayesian model is developed that is capable of estimating the contributions of the distance-based and location-based strategies to memory decisions.
Email: Simon Dennis, simon.dennis@newcastle.edu.au

9:00-9:15 (282)

Retrieving Inhibition of Semantic Information Due to Retrieval Requirements: When Testing Word Location Hinders Semantic Activation. LEONEL GARCIA-MARQUES, PEDRO MARQUES and DIANA ORGHIAN, *Faculdade de Psicologia da Universidade de Lisboa* — Test structure has been shown to guide (qualitatively) further encoding in subsequent study episodes of new but similar information. On two experiments, participants played a modified version of the Concentration (Pairs) game, studying word pairs (same-category members) behind the cards, but being tested either with a semantic requisite or a location requisite over four study-test cycles. While for the 'semantic' participants a meaning-based relational type of encoding favored their performance, for the 'location' participants a more perceptual-based and shallow encoding was the strategy that benefited the most their performance. When, on a final test, the requisites switch after the study phase (Experiment 1; N=88), the strategies that helped their performance now are shown to hinder it. Also, when asked to verbally generate free-associates to words that were just tested and new words (Experiment 2; N=68), participants in the semantic condition show faster responses to old vs. new word. In contrast, response times to old and new words was the same for participants in the location condition, suggesting that previous repeated testing for location guided encoding strategies semantic information became inhibited.
Email: Leonel Garcia-Marques, garcia_marques@sapo.pt

9:20-9:35 (283)

Temporal Compression in Short-Term, Long-Term and Prospective Memory. INDER SINGH and MARC W. HOWARD, *Boston University* (Presented by Marc Howard) — We present results from three experiments using different paradigms and time scales that suggests participants scan through a compressed temporal representation to support performance. In the judgment of recency (JOR) task subjects are required to choose which of two probes from a list was presented more recently. In a short-term JOR experiment, response time (RT) depended sub-linearly on the lag to the more recent probe, but not on the lag to the less recent probe, consistent with a serial self-terminating scanning model. A continuous recognition task using highly-memorable pictures showed RT differences that depended on lag. Critically, RT distributions were shifted with lag suggesting a scanning account; again RT increases were sub-linear suggesting a compressed temporal representation. Using a novel judgement of imminence task, we saw similar results in temporal order judgements for the future. Taken together these results suggest that short-term and long-term and prospective memory all have access to a foreshortened timeline.
Email: Marc Howard, MarcWHoward777@gmail.com

Cognitive Control II
Independence, Sunday Morning, 8:00-10:00
Chaired by Adam T. Biggs, Naval Medical Research Unit Dayton

8:00-8:15 (284)

How Can Cognitive Psychologists Help Military Aviation Become Safer? ADAM T. BIGGS, TODD SEECH, ERIC LITTMAN and J. LYNN CALDWELL, *Naval Medical Research Unit Dayton* — Although military aviation presents numerous unique and complex challenges, aviation tasks have strong and direct links to laboratory-based, cognitive experiments. Unfortunately, cognitive scientists constitute an underutilized asset in improving flight operations and safety, which is likely due to a perceived knowledge gap in military operations. This presentation is intended to bridge this gap by describing several basic cognitive elements involved in aviation. The discussion will begin by outlining the tasks undertaken by an aviator during pre-flight, in-flight, and landing operations and their associated cognitive domains. Next, the discussion will move to several well-documented problem areas in modern military aviation (e.g., spatial disorientation, hypoxia, fatigue) that involve direct links between cognitive deficiencies and operational performance. Finally, the discussion will conclude with possible future steps that cognitive scientists can take to become involved in aviation-based human performance studies. With this information, cognitive scientists can begin a conversation with military institutions and funding agencies to harness the underutilized potential of cognitive science for military aviation.
Email: Adam T. Biggs, adam.biggs.1@us.af.mil

8:20-8:35 (285)

Sensory Discrimination, Working Memory, and Fluid Intelligence. TYLER L. HARRISON, KENNY L. HICKS, CHRIS DRAHEIM, JASON TSUKAHARA and RANDALL W. ENGLE, *Georgia Tech* (Presented by Randall Engle) — The question of the relationship between intelligence and sensory discrimination is over a hundred years old. It has recently been shown that there is a quite strong relationship between general discrimination ability (GDA) and working memory capacity (WMC) and also with fluid intelligence Gf). In a large scale structural equation modeling study we showed that GDA had correlations of .7 and .74 with WMC and Gf respectively. However, in an attempt to understand the cause of this relationship we also studied executive attention (EC). The relationship between GDA, WMC, and Gf was totally driven by executive attention - the ability to focus and maintain attention.
Email: Randall W. Engle, randall.engle@gatech.edu

8:40-8:55 (286)

Effects of Stimulus and Response Probability on Forced-Choice and Go/No-Go Performance. J. TOBY MORDKOFF, ILONA DEWALD and MARINA STEWART, *University of Iowa* — In forced-choice tasks, the number of different responses has been found to have a larger effect on response time than the number of different stimuli, at least when each are separately manipulated. In order to extend these findings to go/no-go tasks, we manipulated the probability of a response being required

separately from the probability of each specific stimulus. We also repeated the experiment using forced-choice, to allow for comparisons across methodology. In contrast to forced-choice, we found that stimulus probability has a much larger effect than response probability on go/no-go response time. At the same time, however, response probability has a much larger effect than stimulus probability on response accuracy. Most notable: when the probability of a response being required is increased, the rate of false-alarms increases while the speed of responses is barely affected.
Email: J. Toby Mordkoff, jonathan-mordkoff@uiowa.edu

9:00-9:15 (287)

Joint Performance Without Co-Representation: Deconfounding the Proportion Effect From the Sequence Effect in the Joint Simon Task. MOTONORI YAMAGUCHI, HELEN J. WALL, *Edge Hill University,* and BERNHARD HOMMEL, *Leiden University* — Actors sharing a single task are said to co-represent the shared task context. The present study examined this co-representation in the joint Simon task. The proportions of compatible and incompatible trials were varied across blocks for one actor (inducer actor) but remained constant and even for the other actor (diagnostic actor). If the task context is shared, the trial proportion for the inducer should affect the Simon effect of the diagnostic actor. To deconfound the effect of trial proportion from that of trial sequence, the former was examined separately on trials following the inducer's trial and on trials following the diagnostic actor's trial. The proportion effect was evident for the inducer, regardless of the actor performing the preceding trial, but it disappeared on trials following the diagnostic actor's trial for which the sequence effect was excluded. The results indicate that the actors did not co-represent the shared task context.
Email: Motonori Yamaguchi, yamagucm@edgehill.ac.uk

9:20-9:35 (288)

Perceptual and Conceptual Priming of Cue Encoding in Task Switching. DARRYL W. SCHNEIDER, *Purdue University* — Transition effects in task-cuing experiments can be partitioned into task switching and cue repetition effects by using multiple cues per task. In this presentation, I will show that cue repetition effects can be partitioned into perceptual and conceptual priming effects. In two experiments, letters or numbers in their uppercase/lowercase or word/numeral forms, respectively, served as cues for perceptual categorization tasks. Some cues represented the same concept but had different percepts, allowing nominal repetitions to occur across trials. Conceptual priming effects were measured by comparing relational repetitions with nominal repetitions, whereas perceptual priming effects were measured by comparing nominal repetitions with physical repetitions. Large conceptual and perceptual priming effects on response time were observed. Implications of the results for understanding cue encoding in task switching situations will be discussed.
Email: Darryl W. Schneider, dws@purdue.edu

9:40-9:55 (289)

Can We Prepare to Attend to One of Two Voices? STEPHEN MONSELL and AURELIU LAVRIC, *University of Exeter* — We can selectively attend to one of two voices sharing an apparent location. Can we tune this attention setting in advance? There is evidence that cuing which of several voices to attend to by gender is completely ineffective in reducing the cost of switching between genders. And evidence from task-cuing experiments indicates that "inertia" in the attentional component of task-set can contribute significantly to "residual" task-switch costs. In our experiments, each participant heard just one male and one female voice. On each trial a digit name was spoken by each voice, preceded by a cue specifying which voice's digit to classify as odd/even. With maximally familiar voices (the participants' parents'), advance cueing reduced, by about half, a substantial RT cost of switching voice from trial to trial, whether the voice onsets were simultaneous or offset in time. We report further exploration of the importance of voice familiarity.
Email: Stephen Monsell, s.monsell@exeter.ac.uk

Reading II

Back Bay B, Sunday Morning, 8:00-9:40

Chaired by Timothy J. Slattery, Bournemouth University

8:00-8:15 (290)

Effects of Reading and Spelling Skill on Word Skipping During Reading: Evidence From Eye Movements. TIMOTHY J. SLATTERY, *Bournemouth University*, MARK YATES, *University of South Alabama*, ADAM PARKER, *Bournemouth University* — Readers don't fixate every word they read. Word skipping saccades are programmed based on coarse parafoveal information and contextual predictions. Short and/or predictable words are skipped more often than long and/or unpredictable words. Rayner, Slattery, Drieghe and Liversedge (2011) reported predictability effects on word skipping for even long words (10-13 characters). Using their items, we explored whether reading and spelling skill interact with word length and predictability to impact word skipping rates in an eye movement experiment with 92 participants. Skipping rate was not influence by a reader's effective reading rate. However, we found that target word skipping likelihoods were significantly predicted by spell ability. Despite significant main effects of word length and predictability, we found no evidence for interactions of between any of these variables. These effects are discussed in relation to the lexical quality hypothesis and eye movement models of reading.
Email: Timothy J. Slattery, tslattery@bournemouth.ac.uk

8:20-8:35 (291)

Distributional Effects of Interword Spacing on Eye Fixations During Reading. HEATHER SHERIDAN, *University at Albany, State University of New York* — To explore the role of spaces during reading, I compared distributions of eye fixation durations in an unsegmented text condition and a normal text condition, using a large dataset with 104 participants and an average of 1336 fixations per participant per condition. Survival analyses revealed an early effect of text condition on distributions of fixations, and Ex-Gaussian fitting revealed that removing

spaces increased both the mu and sigma parameters. Removing spaces also increased the tau parameter, but this effect was only present for second pass fixations, and not for first pass fixations (i.e., first-fixation, single fixation). Also, replicating past work, the unsegmented text condition produced a wide range of deficits relative to the normal text condition, including slower reading rates, shorter saccades, and disruptions to first-fixation landing locations. I discuss the implications of these results for understanding the mechanisms underlying unsegmented text deficits, and for models of eye movement control during reading.
Email: Heather Sheridan, hsheridan@albany.edu

8:40-8:55 (292)

Dissociating Influences of Parafoveal and Foveal Information on Reading: Forced Fixations and Comprehension. ELIZABETH R. SCHOTTER, *University of South Florida*, MALLORIE LEINENGER, *Denison University* — We (2016-JEP:HPP) reported *reversed preview benefit* (shorter fixations on an unrelated higher-frequency than an identical preview) and explained it via *forced fixations* (shortened fixations on the target caused by pre-initiation of saccades based on preview information, regardless of similarity to the target). We replicated reversed preview benefit in two experiments and tested a prediction of our account: for forced fixations on or skips over the target, do readers encode the preview rather than target word? In E1, comprehension questions probed which word was encoded; the preview was reported more often when readers skipped or made a short fixation (< 150 ms) on the target and did not return (~75%) than if they fixated it for longer (10%). In E2, the sentence ended with a disambiguating region that made either the preview or target implausible. Regressions out of pre-disambiguation regions were influenced by display changes whereas regressions out of the disambiguating region were influenced only by implausibility of the target word. Results suggest that preview information has an immediate but short-lived effect on reading (skips and forced fixations) but the understanding of the sentence is mainly based on fixated words.
Email: Elizabeth R. Schotter, liz.schotter@gmail.com

9:00-9:15 (293)

Modeling of Lexical and Sublexical Consequences of Letter Perception Timing. JAMES S. ADELMAN, *University of Warwick* — Contemporary dual route models of reading aloud (Coltheart et al., 2001; Perry et al., 2006) use a perceptual front-end that is an extension of the IAC model, in which letters relentlessly increase in activation at the same rate. Letter activity feed lexical processing (LP) directly, but a letter-by-letter delay affects sub-lexical processing (SLP) producing "serial" effects. It is not necessarily clear, however, why SLP could not be done in parallel, like LP. Meanwhile, Grainger and Ziegler (2011) argue that SLP requires precise order information to form meaningful chunks, but for LP "the most efficient means of obtaining a fast guess at word identity is to compute order and identity information for the most visible letters." Bigram coding (Grainger & van Heuven, 2003) is cited as such a LP strategy, but this model does not identify words using the "most visible" letters. The LTRS model (Adelman, 2011) does, perceiving letters and their positions at randomly distributed times affected by visibility. Moreover, precise position is perceived later than identity and vague position. The former is needed for SLP, but the latter suffices for lexical candidate selection. Simulations of the relevant serial effects are presented.
Email: James S. Adelman, J.S.Adelman@warwick.ac.uk

9:20-9:35 (294)

Applying Principles of Learning to Reading: How Principles of Variability, Blocking and Overlap Influence Children's Acquisition of Sound/Spelling Correspondence. BOB MCMURRAY, TANJA C. ROEMBKE, MICHAEL V. FREEDBERG and RICHARD E. HAZELTINE, *University of Iowa* — In real-world-sized learning problems, training all items en masse may be infeasible. Principles like blocking/interleaving could enhance learning, but it is unclear how principles scale to problems like reading where hundreds of grapheme-phoneme-correspondences (GPCs) are acquired. Prior work shows children learn vowel GPCs better with variable consonants (Apfelbaum, et al, 2012), suggesting variability blocks irrelevant associations. We extended this, investigating how items are grouped during training and if this moderates the variability benefit, by teaching 1st graders 6 vowels with controlled training. Consistent with associative accounts, Experiment 1 (N=279) showed overlapping GPCs (e.g., OA and EA learned together) were more difficult initially, but surprisingly showed better learning. Experiment 2 (N=401) found poor learning with blocks of non-overlapping vowels, but excellent learning for fully interleaved. Overlapped blocks showed excellent learning, but only with consonant variability. Thus, items' features (both irrelevant and relevant) and how items are grouped conspire to predict learning.
Email: Bob McMurray, bob-mcmurray@uiowa.edu

Action

Liberty, Sunday Morning, 8:00-10:20

Chaired by James T. Enns, University of British Columbia

8:00-8:15 (295)

We Read the Body to Reveal the Mind. JAMES T. ENNS and ANA C. PESQUITA, *University of British Columbia*, CRAIG S. CHAPMAN, *University of Alberta* — Studies of social perception report acute human sensitivity to *where* another's attention is aimed. Here we ask whether humans are also sensitive to *how* the other's attention is deployed. Observers viewed videos of actors reaching to targets without knowing that those actors were sometimes choosing to reach to one of the targets (endogenous control) and sometimes being directed to reach to one of the targets (exogenous control). Experiments 1-2 showed that observers could respond more rapidly when actors chose where to reach, yet were at chance when guessing if the reach was chosen or directed. This implicit sensitivity to attention control held when either actors' faces or limbs were masked (Experiment 3), and when only the earliest actor's movements were visible (Experiment 4). Individual differences in sensitivity to choice correlated with an independent measure of social aptitude. We conclude that humans are sensitive to attention control through an implicit kinematic process linked

to empathy. The findings support the hypothesis that social cognition involves the predictive modeling of other's attentional states.
Email: James Enns, jenns@psych.ubc.ca

8:20-8:35 (296)

Action Recognition During Continuously Changing Perspective. DANIEL I. BROOKS, MUHAMMAD A. J. QADRI and ROBERT G. COOK, *Tufts University* (Presented by Robert Cook) — The identification and categorization of actions are important to understanding human and animal behavior. Actions are composed of both static pose cues and dynamic motion cues. To extract the contribution of the actor's movement from motion in general, we investigated if pigeons could discriminate actions when viewed from continuously moving camera perspectives. Pigeons were taught to discriminate between two classes of stimuli containing a rendered digital actor. In the dynamic condition the actor engaged in a long sequence of different actions, while in the pose condition the actor demonstrated a randomly selected single pose from the same action sequence, remaining rigid for the duration of the display. The camera's perspective continuously moved for both conditions. The rapid acquisition of this moving versus "static" discrimination, its generalizability, and its robustness to simple visual feature manipulation suggested the pigeons separately detected the shape deformations of the actor from the concurrent motion of the camera.
Email: Robert Cook, Robert.Cook@tufts.edu

8:40-8:55 (297)

The Visual Control of Foot Placement During Walking Over Complex Terrain. BRETT R. FAJEN, SEAN L. BARTON and SCOTT T. STEINMETZ, *Rensselaer Polytechnic Institute*, JONATHAN S. MATTHIS, *University of Texas at Austin* — When humans walk over complex terrain, they have many options about where to step. Not surprisingly, walkers prefer footholds that minimize changes to the ongoing gait cycle. Oftentimes, however, possible footholds for a given step become visible at different points in time. A walker may initially perceive that the only foothold for a given step is one that is incongruent with the normal gait cycle, requiring a change to step length or width, but then detect an alternative, more congruent foothold for that step. If the alternative, congruent foothold is not detected until the walker is about to land on the incongruent foothold, there may not be sufficient time to switch. Interestingly, however, walkers rarely switch to the congruent foothold when it is detected around toe off of the step, even though they are capable of landing on that foothold if necessary. It is only when the congruent foothold is detected well before heel strike of the previous step that walkers consistently switch. The findings reflect an energetically efficient strategy for negotiating complex terrain by using visual information to initialize the upcoming step so the body can move ballistically along its natural pendular trajectory to the next target.
Email: Brett R Fajen, fajenb@rpi.edu

9:00-9:15 (298)

Target Utilization Predicts Movement Endpoint Location. ANDREW B. SLIFKIN, JEFFREY R. EDER, ABHISHEK DEY and PATRICK J. BYRNE, *Cleveland State University* — According to theories of motor control, speed and accuracy are optimized when 1) the amount of movement endpoint variability matches the variability permitted by the target and 2) the endpoint distribution center is located at the target center. Experiment 1 tested those predictions. Participants made targeted hand movements to each of five target widths (5-80 mm) within each of three movement amplitudes (80-320 mm). According to the results, it was only at very small target widths that the variability produced matched the variability permitted and endpoint distribution centers were located at the target center; as width increased, endpoint variability increasingly underestimated the variability permitted and distribution centers increasingly fell below (undershot) target centers. Further, increases in the difference between the size of the target and the amount of endpoint variability—i.e., the amount of unused target space—strongly predicted the degree of target center undershooting. That relation was explored further in Experiment 2. The results suggest that participants have precise knowledge of their variability relative to the variability permitted, and such knowledge is used to minimize the travel distance to targets.
Email: Andrew B. Slifkin, a.slifkin@csuohio.edu

9:20-9:35 (299)

Bootstrapping Sensed Agency: How Control-Relevant Information Influences Action Selection. BARUCH EITAM, *University of Haifa* — Defining agency as 'the degree that one's actions have an effect on the environment', I will present evidence showing that agency — visual and auditory action-effects —however trivial, modifies people's speed and frequency of responding. Specifically, responses are both sped-up and selected more often when they are followed by perceptual events obeying the criteria by which the mind determines self-authorship. I will also present data that differentiates the dynamics of this 'motivation from control' from the more familiar 'motivation from outcomes'. Finally, I will present evidence showing that sub-cortical structures perform key computations in the process of transforming perceived agency into action selection.
Email: Baruch Eitam, beitam@psy.haifa.ac.il

9:40-9:55 (300)

Compatibility Effects Due to Intended and Unintended Action Effects in a Continuous Control Task. J. SCOTT JORDAN, JIUYANG BAI and DANIEL S. SCHLOESSER, *Illinois State University* — Research reveals that *intended* and *unintended* effects of discrete actions become paired with the action planning that produced them (Hommel et al., 2001). We tested this idea with a continuous control task. Participants kept a circular stimulus inside a rectangle by pressing the A and L keys, which produced *intended* rightward and leftward movements, respectively. For half of the participants, key presses also produced an *unintended* change in the background color. In a subsequent RT task, participants pressed the A or L key in response to an A or an L presented simultaneously with

a moving circle (i.e., intended effect) or a change in screen color (i.e., unintended effect). Results revealed that i*ntended* action effects (i.e., moving stimuli) produced more robust compatibility effects, and the effects were smaller if an *unintended* action effect was present during training, indicating that intended and unintended action effects interact dynamically and contingently during training.
Email: J. Scott Jordan, jsjorda@ilstu.edu

10:00-10:15 (301)

Perception and Action in the Control of Throwing a Ball. JOHN J. RIESER, *Vanderbilt University*, KRISTIN E. DAVIS, *Emory University*, NICK WEAVER, *University of Cincinnati*, NGOC-THOA KHUU, *University of California Irvine*, DAVID JOHNSON, GAYATHRI NARASIMHAM and AYSU ERDEMIR, *Vanderbilt University* — People calibrate the forces and directions of ballistic actions to fit environmental targets. What features of their actions do they control and how do they know how to how to control them? Across three experiments adults saw or heard targets that varied from 1-16m in distance and tossed light or heavy balls to land at the target. They could not see or hear the ball's landing. Results show adults generate forces by varying the ball's release speed while holding the release angles near the optimal value. They increase the number of swing points for longer throws and heavier balls. The kinematics, not the dynamics, are actively controlled. How is it that adults know how to control the main features of their ballistic actions? Do they figure it out through learning with feedback? Or instead is it an intrinsic feature of the system so it comes to be known without the benefit of action-specific feedback? Studies with congenitally blind persons are underway to understand whether these controlled features of throwing actions are learned through feedback or intrinsic to the system.
Email: John Rieser, j.rieser@vanderbilt.edu

Visual Search II

Grand Ballroom, Sunday Morning, 10:00-12:00
Chaired by Andrew B. Leber, Ohio State University

10:00-10:15 (302)

Strategic Control of Goal-Directed Attention. JESSICA L. IRONS and ANDREW B. LEBER, *The Ohio State University* (Presented by Andrew Leber) — Considerable evidence demonstrates that individuals establish attentional control settings to prioritize processing of goal-relevant features, but little is known about how individuals strategically choose their control settings. We have proposed that such choice depends on the competing drives to maximize performance and minimize effort. We tested this using an "adaptive choice" visual search, which allows participants to choose between multiple search targets. By varying the search environment across trials, we manipulated which target was most optimal and measured participants' consequent strategy adjustments. Results yielded evidence for both performance maximization and effort minimization, although these factors varied considerably across participants. In the current study, we ran multiple sessions and found that individual strategy profiles were reliable across sessions. However, we also found that rewarding fast performance prompted individuals to shift their strategies toward performance maximization. We conclude that the strategy profiles governing goal-directed control are jointly supported by stable trait and flexible state variables.
Email: Andrew Leber, leber.30@osu.edu

10:20-10:35 (303)

Knowing When to Quit Searching for Information. HAYWARD J. GODWIN, GEMMA FITZSIMMONS, MARK WEAL and SIMON P. LIVERSEDGE, *University of Southampton*, MICHAEL C. HOUT, *New Mexico State University*, TAMARYN MENNEER, *University of Southampton* — Searching for information to answer a specific question is a commonplace activity, such as searching passages of text online or in published papers. Here we established the basic principles of 'information search', focusing on quitting behaviour. Participants read passages of text while their eye movements were tracked. They were either given a question before each passage, or after each passage. On half of the trials, the answer was absent from the passage. Participants who saw the question in advance quit searching once they had read the sentence containing the answer to the question (as in target-present visual searches). When participants did not know the question in advance, or when the answer was absent, they read through the entire passage (as in target-absent visual searches). Our results help to establish the quitting rules for information searches, connecting the study of information search with visual search and reading.
Email: Hayward Godwin, hg102@soton.ac.uk

10:40-10:55 (304)

Exploring the Utility of Online Feedback During Visual Search. TRAFTON DREW, *University of Utah* — Errors during visual search can be life threatening, as when the target of the search is a malignant tumor in radiology, or an undetected threat in a military setting. Eye-tracking has shown that errors are often caused by simply not fixating the location of the target. Moreover, recent research has demonstrated that we typically have a very poor representation for where we have looked during search (Vo et al., 2016). From this perspective, online eye-tracking feedback holds great promise to help searchers do a better job of evaluating the scene before terminating search. In 4 preliminary experiments designed to evaluate the utility of this technique, I manipulated target prevalence, scene type, reward system, and method of conveying feedback. While online feedback was successful in increasing overall coverage of the scenes, it also tended to increase the amount of time spent on each scene and did not lead to improve accuracy.
Email: Trafton Drew, trafton.drew@psych.utah.edu

11:00-11:15 (305)

Factorial Manipulation of Target Detectability Reveals Sequential Accumulation Processes in Both ERPs and RTs. ARIEL GOH, STEFAN BODE, DANIEL BENNETT and DANIEL R. LITTLE, *The University of Melbourne* (Presented by Daniel Little) — We utilized two methods for examining the timing of decision making during a complex visual search task: The first method involved using Systems Factorial Technology

to identify model architectures by factorially manipulating the difficulty of identifying one of two objects (presented in a field of distractors) as a target. The second method involved recording neural activity using EEG and examining the variation in the ERP components across all factorial manipulations of the first-search and second-searched objects. We found that the levels of the easy and hard decisions are reflected in the amplitude of each component of the process (in the N2pc and later components), rather than the in latency of the components, supporting the notion that these components reflect the accumulation of evidence at each serial stage. This work represents a step toward synthesizing Systems Factorial Technology with EEG methods that allow us to see the entire time course of processing.
Email: Daniel R. Little, daniel.little@unimelb.edu.au

11:20-11:35 (306)

Identities Are Processed Faster Than Locations in the Flanker Task. RICARDO MAX, *New York University*, HAYLEY E.P. LAGROIX, THOMAS M. SPALEK and VINCENT DI LOLLO, *Simon Fraser University*, YEHOSHUA TSAL, *Tel Aviv University* (Presented by Yehoshua Tsal) — The mutations paradigm assesses the timecourse of distractor processing within flanker tasks. While the target remained unchanged, flanking distractors' identities mutated once per trial at a random time between 8 and 75 ms after onset. The later incongruent distractors mutated to neutral during the initial 60 ms, the slower the response times (RTs). Thus, incongruent distractors were processed until (at least) 60 ms. Yet, when neutral distractors mutated to incongruent, RTs were delayed only when incongruent distractors appeared before 25 ms. When incongruent distractors appeared afterwards, RTs matched those in a neutral baseline. Thus, neutral distractors' processing ended within 25 ms. Because (a) neutral distractors could be recognized either by their task-irrelevant locations or by their task-irrelevant identities, whereas (b) incongruent distractors could only be recognized by their locations, we conclude that distractors' identities were recognized and suppressed 35 ms faster than their locations were mapped and suppressed.
Email: Ricardo Max, ricardo.max@nyu.edu

11:40-11:55 (307)

Modeling the Visual Search Literature II: Correcting for Post-Hoc Design Changes. STEPHEN R. MITROFF, JUSTIN M. ERICSON and DWIGHT J. KRAVITZ, *The George Washington University* — Scientific progress relies on accurate inference about the presence (or absence) of an experimental effect. Failures to replicate high-profile studies (Nosek et al., 2015) have elevated concerns about the integrity of inference in psychology research. One proposed solution is pre-registering experimental designs before data collection, preventing post-hoc changes that might increase false positives. However, pre-registration does not always align with the inherently complex and unpredictable nature of research. To bolster and add flexibility to the pre-registration process, the current study accessed a massive visual search dataset (>9 million participants, >2.5 billion trials: *Airport Scanner,* Kedlin Co.) to "run" 100,000+ independent experiments to which common post-hoc changes (e.g., adding participants) were applied. Analyses yielded precise estimates of the individual and combined impact of post-hoc changes on false positive rates, which in some cases were >30%. Critically, adjusted p-values that correct for post-hoc changes can be derived, providing flexibility without sacrificing integrity.
Email: Stephen Mitroff, mitroff@gwu.edu

Working Memory II
Republic, Sunday Morning, 10:00-12:00
Chaired by Evie Vergauwe, University of Geneva

10:00-10:15 (308)

Using Instructed Refreshing to Understand the Functioning of Spontaneous Refreshing in Working Memory. EVIE VERGAUWE and NAOMI LANGEROCK, *University of Geneva* — It is often assumed that, to maintain a list of items over a brief period of time, people spontaneously reactivate the to-be-remembered information by bringing the items back into the focus of attention, a process called *refreshing*. Here, we aimed at advancing our understanding of how spontaneous refreshing functions by running a series of experiments in which we instructed participants to refresh a list of items in a certain way. Three questions are addressed: *(a)* is memory performance different between spontaneous refreshing and instructed refreshing conditions?, *(b)* is memory performance different between different instructed refreshing schemes (e.g., serial forward order vs. any random order)?, and (c) does instructed refreshing result in better access to the just-refreshed memory items?
Email: Evie Vergauwe, Evie.Vergauwe@unige.ch

10:20-10:35 (309)

Improving Children's Working Memory With Cogmed and Strategy Training. TAMMY A. MARCHE, *St. Thomas More College, University of Saskatchewan*, LAUREEN MCINTYRE and TIM CLAYPOOL, *University of Saskatchewan*, JENNIFER BRIERE, *St. Thomas More College, University of Saskatchewan* — We examined whether the cognitive performance benefits of teaching children working memory strategies would be amplified by Cogmed training. Sixty children were randomly assigned to 1 of 4 groups: Strategy training, Cogmed training, Strategy + Cogmed training, or wait-list Control. They were assessed on measures of short-term memory, working memory, and long-term memory, as well as on measures of intellectual and cognitive functioning both before training and approximately 7 weeks after the last day of training. Participants in the Cogmed and Combined conditions had larger verbal short-term memory spans after training than did participants in the Control condition. Participants in the Cogmed and Strategy conditions had larger verbal working memory spans after training than Control participants. Results demonstrate that working memory strategies and training may be used as targeted interventions for children with verbal short-term and working memory difficulties. The benefits of working memory training may be most evident for individuals with poorer working memory functioning, as well as over time, once individuals are able to use and apply their newly gained skills and capacity in real life settings.
Email: Tammy Marche, tmarche@stmcollege.ca

10:40-10:55 (310)

The Impact of Age and Working Memory Maintenance Mechanisms on Recollection and Familiarity. VANESSA M. LOAIZA, *University of Essex* — Although aging is commonly assumed to entail deficient memory performance, there are instances in which older adults are less deficient than or even similar to younger adults. This series of experiments investigated the largely unexplored connection between the age-related deficits in attentional refreshing during working memory (WM) and subsequent recollection during long-term episodic memory (EM). Refreshing is the attention-based prolonging of memoranda's activation in WM, and most relevantly, may promote content-context binding. Likewise, age-related invariance in articulatory rehearsal during WM and subsequent familiarity during EM was also examined. Objective and subjective measures of recollection and familiarity were administered between experiments using source monitoring and remember-know recognition tests, respectively. Overall, refreshing more significantly predicted recollection and not familiarity in younger adults compared to older adults, whereas rehearsal did not affect familiarity in either age group. Implications for research concerning the typically distinct fields of WM and EM across the life-span are discussed.
Email: Vanessa Loaiza, v.loaiza@essex.ac.uk

11:00-11:15 (311)

Tracking the Development of Visual-Spatial Memories With Eye Movements. CANDICE C. MOREY, SILVANA MAREVA and JAROSLAW LELONKIEWICZ, *University of Edinburgh* — Though rehearsal of verbal information has been extensively studied, the processes available to support visual memory remain mysterious. Motor activities, particularly eye movements, have been suggested as a basis for rehearsing visual-spatial sequences analogously to articulatory rehearsal verbal information. Eye movements toward locations previously occupied by stimuli may reflect covert attempts to retrieve information about those items. We present evidence linking fixations during presentation and retention of spatial sequences to response accuracy in young adults, children 5-7 years old, and children 8-10 years old. Consistently with the rehearsal hypothesis, looking at longer sequences of to-be-remembered locations increased accuracy. However, children fixated on proportionally longer sequences than adults, which is inconsistent with the idea that a rehearsal module develops with age. Furthermore, while participants fixated early items most frequently, this was true for correctly and incorrectly recalled lists. Though sequential eye movements and response accuracy are related, the pattern of evidence does not imply that eye movements serve as the basis for a specialized rehearsal module of visual-spatial memories.
Email: Candice C. Morey, C.Morey@ed.ac.uk

11:20-11:35 (312)

The Impact of Irrelevant Speech and Shared Phonological Characteristics on Short-Term Recall. GEORGINA A. TOLAN, *Australian Catholic University*, GERRY TEHAN and MADELEINE ARBER, *University of Southern Queensland* — One easily replicated finding in the short-term memory (STM) domain is that background irrelevant speech has a detrimental effect upon immediate serial recall. Multiple experiments have indicated that the phonological characteristics of the ignored speech have very little impact upon the strength of this effect, a finding that is contrary to other STM tasks like free recall and short-term cued recall. The serial recall studies have relied primarily on correct recall as the dependent variable. Recently, Poirier et al. (2015) have shown that under some conditions, a target item can be recalled earlier in the list. That is, the target migrates to earlier serial positions. The current experiments explore the possibility and confirm that irrelevant speech that shares phonological characteristics with the target item, produces more frequent and remote migration errors. The data are counter to the prevailing view that between-stream similarity effects have no effect upon STM for order.
Email: Anne Tolan, anne.tolan@acu.edu.au

11:40-11:55 (313)

Effects of Item-Context Binding Training. CLAUDIA C. VON BASTIAN, *Bournemouth University*, CARLA DE SIMONI, *University of Zurich* — The effectiveness of working memory (WM) training is still under debate, with the differential malleability of the WM processes targeted across studies being a possible contributor to the inconsistencies. Here, we evaluated the effects of training item-context binding in WM. Binding is assumed to play a central role in limiting both WM capacity and reasoning ability (e.g., Oberauer et al., 2007), and, thus, is a promising candidate for improving cognitive performance. Young adults were randomly assigned to the experimental or an active control group practicing visual search. After five weeks of training, we assessed near transfer to WM processes involved in the training tasks (i.e., maintenance, updating, and removal of WM contents), and far transfer to executive functions and reasoning. However, despite a relatively large sample size and a large number of indicators, we found only few effects of training, rendering this type of intervention unlikely to induce broad transfer.
Email: Claudia von Bastian, claudia.vonbastian@colorado.edu

Bilingualism II

Back Bay C & D, Sunday Morning, 10:00-12:00

Chaired by Tamar H. Gollan, University of California, San Diego

10:20-10:35 (314)

What Is Selected in Bilingual Sentence Production? TAMAR H. GOLLAN, *University of California, San Diego*, MATTHEW GOLDRICK, *Northwestern University* — Theories of bilingual language control, shaped mostly by single word production studies, have largely ignored the possible role of grammatical encoding in language selection. To address this possibility we asked Spanish-English bilinguals to read aloud mixed-language paragraphs contrasting two switch types. In matrix switches, bilinguals switched and then stayed, completing at least a full phrase before switching back, allowing selection of language specific grammatical frames to guide production. In lexical switches, bilinguals switched languages on a single word in mid-sentence and then immediately switched back (providing no local syntactic support for switches). Additionally, we contrasted

function vs. content words (assuming grammatical encoding primarily drives selection of function words). To measure control difficulty, we examined language intrusion errors (e.g., saying *el* instead of *the*). Lexical switches elicited substantially more intrusions than matrix switches, especially with function word targets. Thus, language selection is facilitated by activation of language specific grammatical frames.
Email: Tamar H. Gollan, tgollan@ucsd.edu

10:40-10:55 (315)

The Impact of Single-Word Code Switching on Bilingual Sentence Reading — Intense at the Switch But Merciful Downstream. JASON GULLIFER and DEBRA TITONE, *McGill University* (Presented by Debra Titone) — Code-switching (CS), when bilinguals alternate languages, can lead to costs in production and comprehension. Here, we investigate whether bilingual experience modulates CS comprehension costs at the location of a CS and/or downstream within a sentence. Specifically, we monitored eye movements of 38 French-English (FE) and 42 English-French (EF) bilinguals who read English sentences, some containing French CS words. Results showed: EFs reading L1 sentences showed greater CS costs than FEs reading L2 sentences; greater CS costs for FEs with low L2 exposure, but costs for all EFs; and minimal downstream CS effects except increased interlingual homograph interference (indicative of greater cross-language activation) for EFs. Thus, CS comprehension costs depend on the predominant language of the task (L1 vs. L2), and bilingual experience (L2 exposure). Interestingly, CS had minimal downstream consequences other than increased cross-language activation during L1 reading, a situation where bilinguals may be less naturally vigilant in terms of top-down suppression of a non-target language.
Email: Debra Titone, dtitone@psych.mcgill.ca

11:00-11:15 (316)

Findings from GECO: The Ghent Eyetracking Corpus of Monolinguals and Bilinguals Reading an Entire Novel. WOUTER DUYCK, NICOLAS DIRIX and USCHI COP, *Ghent University*, DENIS DRIEGHE, *University of Southampton*, EMMANUEL KEULEERS, *Ghent University* — This paper presents GECO (Ghent Eye-tracking COrpus), the freely available monolingual (English) and bilingual (Dutch-English) eye-tracking corpus of participants reading a complete novel (56000 words). In this talk, we will present descriptive statistics of reading time measures for first-language (L1) and second-language (L2) reading. We will also present analyses of frequency, neighborhood size and cognate effects for L1 and L2 sentence reading. Results showed smaller frequency effects in L2 than in L1. Both L1 and L2 frequency effects interacted with L1, but not L2 proficiency. Both L1 and L2 reading showed intra- and cross-lingual effects of neighborhood size and cognate status. Also, bilingual L1 reading did not differ from monolingual L1 reading. Our results are consistent with an integrated mental lexicon with exposure as the main determiner for lexical entrenchment. Findings will be framed within theories of monolingual and bilingual reading, and relative to the weaker links account of bilingualism.
Email: Wouter Duyck, wouter.duyck@ugent.be

11:20-11:35 (317)

Effects of Flag-Language Congruency on Bilingual Word Recognition. JONATHAN GRAINGER, *CNRS & Aix-Marseille University*, MATHIEU DECLERCK and YOUSRI MARZOUKI, *Aix-Marseille University* — French-English bilinguals performed a generalized lexical decision task with mixed lists of French and English words and nonwords presented on a background formed of either the French or the UK national flag in a "flag-word interference" paradigm. The flag was not informative with respect to either the lexical decision response or the language of the word. Nevertheless, lexical decisions to word stimuli were faster in the congruent flag condition compared with the incongruent flag, but only in participants' L1 (French). In a second experiment using a "flag-priming" paradigm with a 150 ms SOA, flag-language congruency was found to affect lexical decision responses in both languages. We interpret these flag-language congruency effects as reflecting the operation of a mechanism that automatically processes information concerning the presence or not of a given language (e.g., language nodes in the BIA-model), and that this information can be integrated across linguistic and non-linguistic sources.
Email: Jonathan Grainger, jonathan.grainger@univ-amu.fr

11:40-11:55 (318)

Did I Just Say That Out Loud? Reality Monitoring in Bilinguals. RENEE M. PENALVER and WENDY S. FRANCIS, *University of Texas at El Paso* (Presented by Wendy Francis) — Source memory is memory for the context in which an item is learned and is encoded through source-monitoring processes (Johnson, Hashtroudi, & Lindsay, 1993). Reality monitoring is a type of source monitoring in which a person discriminates among distinct internal sources or between internal and external sources. We investigated how reality monitoring in bilinguals might be impacted by word frequency and language proficiency. At study, English-Spanish bilingual participants viewed a sequence of pictures (blocked by language and high vs. low name frequency) and were cued to name each picture either aloud or covertly. At test, participants viewed the same pictures and were asked to indicate which pictures they had named aloud and which they had named covertly. Monolingual English-speaking participants completed the same procedures in English. Implications for the source-monitoring framework, fuzzy-trace theory, models of bilingual memory, and the nature of contextual associations will be discussed.
Email: Renee M. Penalver, rmpenalver@utep.edu

Recall II
Independence, Sunday Morning, 10:20-12:00
Chaired by Ami Eidels, University of Newcastle

10:20-10:35 (319)

What Do Cows Drink? Investigating the Search Process for an Intersection of Memory Cues. ZACH HOWARD, BIANCA BELEVSKI, AMI EIDELS and SIMON DENNIS, *University of Newcastle* (Presented by Ami Eidels) — What do cows drink? Most people incorrectly answer 'milk' instead of 'water'. But what process leads to this common mistake? One explanation is

that the two 'cues' (cow, drink) have an 'associative intersection' point; both cues are independently associated with 'milk', and less so with 'water'. Thus when both cues are probed the resultant search incorrectly identifies 'milk' first. Despite the failure in the above example, in everyday life identifying such 'intersections' is extremely useful, and we seem to effortlessly solve problems of this manner every day. However, such problems are actually computationally complex, and the process through which alternatives are selected is not fully understood. The seemingly automatic response in the cow-drink example suggests we consider cues in parallel. However, previous findings have suggested that cues may be considered serially. In this talk, we investigate the nature of intersection searches using a novel application of Systems Factorial Technology.
Email: Ami Eidels, Ami.Eidels@newcastle.edu.au

10:40-10:55 (320)

Memory as a Hologram. DOUGLAS J. MEWHORT, KEVIN SHABAHANG and DONALD FRANKLIN, *Queen's University* — We treat human memory as a hologram that contains a subject's lexicon, a dynamic distributed representation (of about 40,000 words and their pair-wise associations). Studying a word reinforces the word's representation in the lexicon and alters the representation of all other words in proportion to their similarity to the studied word. When studying a list, subjects create inter-item associations, as a full or partial chain. Recall is always prompted (either a start instruction or the word just recalled). Report reflects the momentary strength of items in the lexicon, a value derived by summing the item's strength with strength contributed from associations with that item when the report is made. The model captures archival data for several list-learning experiments including immediate free recall, learning in free recall, serial recall, and learning in serial recall. An extension of the model captures semantically based phenomena such as false recall and release from PI.
Email: D. J. K. Mewhort, mewhortd@queensu.ca

11:00-11:15 (321)

Reminding, Interference, and Memory for Facts. JACOB H. NEGLEY and COLLEEN M. KELLEY, *Florida State University* (Presented by Colleen Kelley) — Interference is a major cause of forgetting. Educational contexts are rife with sources of interference, and updating information is crucial for success. Being reminded of previously learned word pairs when studying changed pairs has been shown to produce proactive facilitation rather than proactive interference (Wahlheim & Jacoby, 2013). The current experiments extend research concerning reminding and facilitation to learning educationally relevant materials, and explore the conditions that affect reminding. Interference from prior erroneous facts occurs when learners are not reminded of those facts when learning updated facts. Facilitation occurs when earners are reminded of the erroneous facts during updating. Results are discussed in terms of theory and practical implications.
Email: Jacob Negley, negleyjj@gmail.com

11:20-11:35 (322)

Massed and Spaced Repetition Effects on Face Recognition and Face Description Recall. TODD C. JONES, *Victoria University of Wellington*, PETER F. DELANEY, *University of North Carolina at Greensboro* — Giving brief descriptions of unknown faces during a study phase can lead to better recognition relative to a view-only control condition, and recalling descriptions appears to aid the recognition decision in some cases. In a series of experiments we investigated benefits of massed and spaced repetition for described faces. We found higher face recognition and description recall for massed presentations over single presentations and higher face recognition and description recall for spaced over massed presentations. The same pattern (single < massed < spaced) was observed for face recognition in a view-only condition, but there was a clear description benefit. In a final experiment we addressed the question, "Is it better for memory to generate a new description of a face or to retrieve an earlier-produced description?" On repetition trials, participants were instructed either to enter a new (different) description or to repeat their prior description. Entering a different description provided a recognition advantage for massed but not spaced repetition, whereas repeating a description provided a recall advantage for spaced but not massed repetition.
Email: Todd C. Jones, todd.jones@vuw.ac.nz

11:40-11:55 (323)

What Did I Come Here to Do? LISA STEVENSON and RICHARD CARLSON, *Pennsylvania State University* (Presented by Richard Carlson) — As you started to read this program, you may have realized that you needed your glasses and headed into the kitchen to find them. Once there, you may have forgotten your intention, but felt it was on the tip of your tongue. This very short term prospective memory failure is quite common, at least anecdotally. Little work has directly investigated this phenomenon, perhaps because it is difficult to create appropriate conditions in the lab - a familiar environment seems to be a consistent component in anecdotal descriptions. We asked our participants to carry out prospective memory tasks within a very familiar environment for many college students: their smart phones. In our paradigm, under some conditions, approximately 75% of our participants reported experiencing this sort of forgetting at least once. We examined variables that influenced the forgetting and phenomenology, and discuss similarities between this and the tip of the tongue phenomenon.
Email: Richard Carlson, racarlson@psu.edu

Human Learning and Instruction III

Back Bay B, Sunday Morning, 10:00-12:00

Chaired by Nate Kornell, Williams College

10:00-10:15 (324)

Desirable Easiness: Hints That Reduce Effort, But Not Learning, During Retrieval Practice. NATE KORNELL, *Williams College*, KALIF E. VAUGHN, *Northern Kentucky University* — Although retrieval practice is an effective way to study, students often avoid it, especially effortful retrieval

that might not be successful. Is it possible to make retrieval practice easier without decreasing learning? In Experiment 1, participants attempted retrieval with no hint (e.g., idea: _____), a 2-letter hint (e.g., idea: s____r), or a 4-letter hint (e.g., idea: se__er). Effort during practice varied, but performance on the final test did not. (Learning was worse in a restudy control condition, e.g., idea: seeker.) These results contradict the hypothesis that during retrieval, more effort causes more learning. In Experiment 2, each trial asked participants to choose one of the four conditions from Experiment 1. They chose the 4-letter hint condition almost five times as often as the two other test conditions combined. In short, hints motivated people to self-test, thus improving their self-regulated study, without any downside for learning.
Email: Nate Kornell, nkornell@gmail.com

10:20-10:35 (325)

Central Stage-Specific Mechanisms of Desirable Difficulty Effects. SCOTT WATTER and MELISSA J. PTOK, *McMaster University*, SANDRA J. THOMSON, *St. Thomas University*, KARIN R. HUMPHREYS, *McMaster University* — The "desirable difficulty" effect is described where increased difficulty during initial task performance leads to better later memory. Most studies have conceptualized "difficulty" as a task-general property. From stage processing models of single and dual-task performance, we propose that memory-enhancing difficulty manipulations should strongly depend on inducing additional selective attention/cognitive control at particular processing stages, relative to what the later memory test is testing for. Across several experiments, we demonstrate priming and interference effects using congruency prime manipulations at different stages of information processing. Inducing difficulty via semantic incongruency priming (semantic categorization stage) improves later memory for these stimuli (the "desirable difficulty" effect). In contrast, inducing difficulty via response incongruency priming (response selection stage) produces worse memory (typical dual task interference effect). We discuss a single simple model of limited-capacity cognitive control allocation that accounts for and predicts where and when desirable difficulty effects will occur.
Email: Scott Watter, watter@mcmaster.ca

10:40-10:55 (326)

Spacing and Adaptive Learning: Common Principles Across Item Learning and Perceptual Learning. PHILIP J. KELLMAN, CHRISTINE M. MASSEY and EVERETT METTLER, *University of California, Los Angeles* — Adaptive methods that tend to optimize spacing in item learning also tend to do so in perceptual category learning (Mettler & Kellman, 2014). Given that underlying mechanisms likely differ, this is puzzling. We propose that 1) despite differing mechanisms, in both domains an underlying variable of learning strength is decisive for optimal spacing. We also suggest 2) a "successful effort hypothesis" that generalizes the "retrieval difficulty hypothesis" (Bjork, 1994; Pyc & Rawson, 2009), such that successful responding with low learning strength most benefits learning. We describe experiments with adaptive methods that use accuracy and RT in ongoing assessments of learning strength. Results suggest that performance generated by adaptive spacing in the successful effort framework is unlikely to be matched by any predetermined spacing scheme. The successful effort hypothesis may be general in that 1) it pools the effects of numerous learning variables, and 2) it applies across different mechanisms of learning.
Email: Philip J. Kellman, Kellman@cognet.ucla.edu

11:00-11:15 (327)

Automatic Effects of Instructions Do Not Necessarily Reflect the Implementation of an Action Plan. BAPTIST LIEFOOGHE and JAN DE HOUWER, *Ghent University* — In recent years an increasing amount of research focused on the dynamics underlying the translation of (verbal) instructions into actions. This issue has in part been investigated by focusing on automatic effects of instructions, which supposedly offer an index of the processes underlying the implementation of novel instructions. It is a well-replicated finding that newly instructed Stimulus-Response (S–R) mappings, which have never been executed overtly before, can lead to automatic response-congruency effects. Overall, instruction-based congruency effects have been taken as evidence for the hypothesis that merely instructed S-R mappings can be implemented into an action plan and this without any form of overt practice. The present study challenges this hypothesis by demonstrating that instruction-based congruency effects can be induced even in the absence of an action plan. A series of experiments shows that maintaining instructed S-R mappings for future recall, rather than for future application also leads to instruction-based congruency effects. The implications for current accounts on the implementation of instructions is discussed.
Email: Baptist Liefooghe, baptist.liefooghe@ugent.be

11:20-11:35 (328)

Learning and Transfer of Calorie Information. ERICA L. WOHLDMANN and KATIE ALEGRIA, *California State University, Northridge* — Seeding improves learning and transfer of quantitative information (Brown & Siegler, 1996). Contrary to the generation effect, Wohldmann (2013; 2015) found no advantage of seeding over viewing calories, but both resulted in greater learning and transfer than a no-calorie control condition. The present study explored forgetting. During familiarization, participants were shown food items, one at a time, and made calorie estimates. During training, those in the seeding condition generated estimates before receiving feedback. Participants in the viewing condition were provided with calorie information. Those in the no-calorie condition were shown only the name of each item. During immediate testing, participants estimated calories for both old and new items, then returned one week later to repeat the test. The seeding and viewing conditions performed significantly better on both tests than the control condition, with no advantage for seeding, even after a 1-week delay. The applications to policy will be discussed.
Email: Erica Wohldmann, erica.wohldmann@csun.edu

11:40-11:55 (329)

The Development of Proactive Control and Intention-Based Reflexivity: A Cross-Sectional Study. FREDERICK VERBRUGGEN and ROSSY MCLAREN, *University of Exeter*, MAAYAN PEREG and NACHSHON MEIRAN, *Ben Gurion University of the Negev* — A key characteristic of human behavior is the ability to follow new instructions. When these instructions are successfully implemented, goal-directed actions may not require much control anymore; instead, actions could be activated easily by stimuli in the environment, even when they are inappropriate ('intention-based reflexivity'). The present study used the NEXT paradigm (Meiran, Pereg, Kessler, Cole, & Braver, 2015) to study the development of proactive control and intention-based reflexivity. In each miniblock, participants received S-R mapping instructions for a new task. Prior to implementing this mapping, responses were required to advance through screens during a preparatory (NEXT) phase. Children (4-11 years) and late adolescents (17-19 years) responded more slowly during the NEXT phase when the NEXT response was incompatible with the instructed S-R mapping (instruction-based interference). This instruction-based interference effect was more pronounced in young children than in older children, which is surprising because it has been argued that young children are less likely to implement task rules in advance. We will discuss the implications of our findings for theories of proactive control and development.
Email: Frederick Verbruggen, f.l.j.verbruggen@exeter.ac.uk

Emotion and Cognition
Liberty, Sunday Morning, 11:00-12:00
Chaired by Steven B. Most, University of New South Wales

10:40-10:55 (330)

Social Rewards Promote Habitual Behaviour in Low-Autism Trait Adults. JANE E. RAYMOND and LEONIE J. T[illegible], *University of Birmingham*, LILY FITZGIBBON, *University of Southern California* — Performance on most complex tasks relies on a combination of habitual and goal-directed (strategic) control over behaviour. In two studies using different methods to index habitual control over behaviour, we asked whether typical adults who are low versus high in autism-like traits (AQ) would show a greater propensity for habitual responding when social rewards were provided, reflecting the putative greater social skill of the former group. Although both high and low AQ groups benefited similarly when monetary rewards were available, only the low AQ group showed poor recovery from contingency change when social rewards were provided, and a greater propensity for model-free (versus model-based) responding in a two-state rewarded choice task. This supports the notion that people low versus high in autism-like traits more readily default to habitual control for some aspects of a social task, giving themselves greater capacity to solve the complex puzzles typical of many social interactions.
Email: Leonie Balter, LXB454@student.bham.ac.uk

11:00-11:15 (331)

Eye-Gaze and Emotional Expression Modulate Gaze Cueing Effects in Older Children. ANNA PECCHINENDA, *Sapienza University - Rome*, MANUEL PETRUCCI, *Sapienza University - Rome* — Although visual mechanisms supporting face processing are fully mature at 5 years of age, children are less proficient than adults in processing faces and some improvement occurs from 6 to 10 years of age (Germine, Duchaine, & Nakayama, 2011). Two experiments investigated children's ability to shift attention based on eye-gaze of neutral and emotional faces. In experiment 1, 6-7 year old children (N=50) completed a gaze cueing task with faces showing dynamic changes in gaze direction and facial expression (Angry, Happy, or Neutral): gaze cueing effects were observed (F (1, 49) = 71.33, p < .001, partial η^2 = .593) and they did not differ across expressions. When in experiment 2, 6-7 year old (N=48) and 9-10-year old (N=46) children completed the same gaze cueing task but with static faces, older children showed gaze cueing effects (Cue Validity by Age, F (1, 92) = 9.516, p =. 003, partial η^2 = .094) but only for emotional faces (Cue Validity by Facial Expression, F (2, 184) = 3.16, p =. 045, partial η^2 = .033). Therefore, only 9-10-year old children show the ability to use static gaze direction and shift their attention based on observed gaze but only when the face has an emotional expression.
Email: Anna Pecchinenda, anna.pecchinenda@uniroma1.it

11:20-11:35 (332)

Fractionating Attentional Bias: Distinguishing Mechanisms Linked With Negative Affect and Persistent Negative Thought. STEVEN B. MOST and SANDERSAN ONIE, *University of New South Wales* — Cognitive and clinical science offer mutually informative perspectives on emotion-driven *attentional biases*, the spontaneous tendency to attend to emotionally powerful stimuli. Whereas the clinical literature has linked emotional dysfunctions to attentional biases broadly defined, the cognitive approach has highlighted distinctions between isolatable attention mechanisms. Synthesizing these perspectives yields a powerful approach to sharpening our understanding of the relationships between attention, emotion, and individual differences. Here, we contrast the most widely used measure of attentional bias (which indexes spatial attention) with a mechanistically distinct attentional bias measure (*emotion-induced blindness*, which appears to index spatiotemporal competition) and present evidence that they account for unique variance in negative affect, with the latter uniquely predicting worry and rumination (core features of anxiety and depression). Such findings underscore the importance of distinguishing between attention mechanisms when constructing theoretical models of, and interventions that target, particular emotional disorders.
Email: Steve Most, s.most@unsw.edu.au

11:40-11:55 (333)

Taking Affectively-Rich Perspectives in Mutual Exclusion in the Mutual-Inclusion Ground of Biofunctional Understanding: The Special Case of Surprise-Ending Stories. ASGHAR IRAN-NEJAD, CATANYA G. STAGER and FAREED BORDBAR, *The University of Alabama* — Since late 1970s, decades of biofunctional-embodiment research has

suggested that complex biological systems function according to remarkably straightforward and complementary processes of (a) biofunctional mutual inclusion and (b) biofunctional mutual exclusion (BMI/E). BMI is an embodied-understanding process of simultaneous experience integration in stable continuity; and BME is an embodied-understanding process of sequential experience in moment-by-moment categorical change. To illustrate how the biofunctional embodiment process works and to what consequences, we present the results of a think-aloud study in which 14 participant individually read a surprise-ending story one idea unit at a time and spoke their thoughts into a recorder. Results confirmed the above BMI/E process of embodied story understanding. As participants actively entertained story idea units, they experienced spontaneously an affectively-rich biofunctional-understanding perspective. Then, upon actively entertaining the surprising idea units, they shifted spontaneously from their ongoing perspective into an opposite affectively-rich perspective mutually exclusive with the first.

Email: Asghar Iran-Nejad, airan-ne@ua.edu, airannej@bamaed.ua.edu

POSTER SESSION I

Thursday Evening
Hynes Convention Center, Grand Ballroom A-C
Viewing 4:00-7:30, Author Present 6:00-7:30

TASTE AND TOUCH

(1001)

Suffering Leaves a Bad Taste: Affective Beliefs Influence the Experience of Eating Meat. ERIC ANDERSON, *Tufts University*, LISA F. BARRETT, *Northeastern University* — People believe they experience the world objectively, but research continually demonstrates that beliefs influence perception. Emerging research indicates that beliefs influence the experience of eating. In three studies, we test whether beliefs about how animals are raised can influence the experience of eating meat. Samples of meat were paired with descriptions of animals raised on factory farms or raised on humane farms. Importantly, the meat samples in both conditions were identical. However, participants experienced the samples differently: meat paired with factory farm descriptions looked, smelled, and tasted less pleasant. Even basic properties of flavor were influenced: factory farmed samples tasted more salty and greasy. Finally, actual behavior was influenced: participants consumed less when samples were paired with factory farm descriptions. These findings demonstrate that the experience of eating is not determined solely by physical properties of stimuli—beliefs also shape experience.
Email: Eric Anderson, ericmranderson@gmail.com

(1002)

Haptic Perception of Stiffness From Work Cues. BING WU, *Arizona State University*, ROBERTA L. KLATZKY, *Carnegie Mellon University* — Two experiments were conducted to investigate the effectiveness of work cues (i.e., the integral of force over distance) in stiffness perception. In a magnitude-estimation task, subjects were asked to actively explore virtual springs and estimate their stiffness relative to a reference. The stimuli were linear springs, or non-linear springs that were created by modulating a linear counterpart with half-cycle (Experiment 1) or full-cycle (Experiment 2) sinewaves. Experiment 1 found that stiffness was overestimated (or underestimated) when a linear spring was positively (or negatively) modulated by a half-cycle sinewave. In Experiment 2, although the mechanical work was unchanged by the full-cycle sinewaves, an opposite pattern of over/underestimation was observed in stiffness judgments. Further modeling showed that the seeming contradiction could be reconciled by concluding that stiffness was judged by the perceived work, rather than mechanical work, along with higher weights at the later stage of interaction.
Email: Bing Wu, bing.wu@asu.edu

(1003)

The Developmental Trajectory of the Use of Spatial and Non-Spatial Features for Object Recognition. KRISTA E. OVERVLIET, *University of Hamburg, Department of Biological Psychology and Neuropsychology* — We investigated the use of spatial and non-spatial features for haptic object recognition and the influence of visual experience thereupon. In Experiment 1 we tested 5 age groups (pre-schoolers (4-5 years), first-graders (6-7 years), fifth-graders (10-11 years), young adolescents (12-13 years) and young adults (18-28 years)) on a haptic and visual shape recognition task. In Experiment 2 and 3 we asked participants to use shape, size, weight or roughness as a cue in haptic sorting and haptic search. The results show that all age groups are excellent at haptically recognising everyday objects. However, Experiment 1 showed that pre-schoolers and first-graders scored very low in shape only tasks. Experiment 2 and 3 showed that weight is not used as a cue in adults, unless they are explicitly asked to do so. The results will be discussed in terms of developmental trajectories of visual and haptic reference frames.
Email: Krista Overvliet, krista.overvliet@gmail.com

(1004)

Interactions Between Time and Space in Tactile Temporal Order Judgments Are Mediated by Motion Signals. PATRICK BRUNS and BRIGITTE RÖDER, *University of Hamburg*, STEPHANIE BADDE, *New York University* — It has been suggested that judgments about the temporal-spatial order of successive tactile stimuli might depend on the perceived direction of apparent motion between them, and thus involve integration of the single stimuli into a motion signal. To manipulate apparent motion, brief task-irrelevant sounds were presented in the interval between two touches. Tactile stimuli were applied one to each hand with varying stimulus onset asynchronies (SOAs), while participants adopted either a crossed or uncrossed hand posture. The addition of sounds facilitated tactile apparent motion perception for long SOAs of 500 ms, but impaired the discrimination of apparent motion direction for short SOAs of 80 ms. Sounds additionally affected tactile temporal order judgment (TOJ) performance: With crossed hands, TOJ performance significantly improved with the addition of a sound, possibly due to a reduction of inverted motion signals which were observed at short SOAs in the baseline condition without sounds. Conversely, TOJ performance with uncrossed hands rather declined in the sound condition at short SOAs. These findings suggest that motion signals are used when temporal-spatial information about stimuli in our environment is reconstructed.
Email: Patrick Bruns, patrick.bruns@uni-hamburg.de

(1005)

Randomness in Touch: Perception of Local and Global Disturbances. KAYLA SCHRAMSKI, JOSEPH VARNEY and IAN BUENTELLO, *Northern Michigan University*, FIONA N. NEWELL, *Trinity College Dublin*, MOUNIA ZIAT, *Northern Michigan University* — Contrary to order, randomness is the lack of predictability in events where is no intelligible pattern to follow. In two current studies, we tested tactile randomness using local and global disturbances of a grid of 49 dots printed

on PVC tiles. On the local scale, only one small portion of the grid was moved. On the global scale, every dot on the grid moved in location. In the first experiment, the dimension of the tiles were 3 x 3 cm (larger spaces between the dots); while in the second experiment, the dimension were 2 x 2 cm (smaller spaces between the dots). Our results showed that participants were better at detecting global disturbances for larger tiles and better at detecting local disturbance for smaller tiles. This finding suggests that tactile exploration works as a definite spatial focus for smaller spaces and as a whole for larger spaces.
Email: Mounia Ziat, mziat@nmu.edu

(1006)

Comparing Magnitude Estimation of Pain Intensity to the Production of Pain Ratios. JUSTIN G. HOLLANDS, *Defence Research and Development Canada*, BRIAN P. DYRE, NICHOLAS ROOME and TRISTEN BEAUDOIN, *University of Idaho* — Two methods for measuring pain intensity are numeric assignment and the visual analog scale (VAS). In two experiments, we compared these methods to the production of pain ratios. A thermal stimulator controlled the temperatures of two thermodes mounted on the volar forearms of participants, who adjusted the temperature of one thermode so that the associated pain stood in particular ratios (e.g., "twice as much") to the pain produced by a second thermode. The temperatures for the produced ratios were then re-presented and participants responded by assigning numbers (Experiment 1) or marking the VAS (Experiment 2) to represent pain intensity. We found that VAS scores were more consistently related to produced temperatures than numeric estimates; this relationship was well-described by a power function. Taken together with recent work showing that ratio productions of pain maintain a ratio scale, this result validates that VAS responses can represent a ratio scale of pain.
Email: Justin G. Hollands, justin.hollands@drdc-rddc.gc.ca

COGNITIVE AGING I

(1007)

The Effect Training on the Flanker Task: Analyses Via Delta Plots Reveal Differences for Older Adults. WILLIAM L. D. KRENZER, *DePaul University*, ESTER DEVIS, *Universitat de Valencia*, PABLO GOMEZ, *DePaul University*, MANUEL PEREA, *Universitat de Valencia* — In recent years there has been renewed interest in the transference from training games into general cognitive control skills (Strobach, Frensch, & Schubert, 2012). In the present research we explored if performance in a inhibitory control task (a Flanker task) was differentially affected by a five day training in either another control task (Simon task), or in a simple perceptual task (size estimation). In order to explore the effects of training on distinct processing components, we utilized Delta plots (Burle et al., 2002) to display the effect sizes for congruent vs incongruent trials across the quantiles of RT distributions; they are quantile-quantile residual plots. For younger adults, training shortened the RTs over all, we found that training did not differentially affect the sizes of the Q-Q residuals; for older adults, the effects of training were more generalized.
Email: Pablo Gomez, pgomez1dpu@gmail.com

(1008)

Age-Related Differences in Visual Perspective-Taking. VICTORIA E.A. BRUNSDON, ELISABETH E.F. BRADFORD and HEATHER FERGUSON, *University of Kent* — Emerging research has highlighted that despite high performance on explicit tasks, healthy adults demonstrate difficulties on implicit tasks when another person's point of view conflicts with their own. This study examined how these perspective-taking abilities change across the life-span and how executive functions and social abilities predict performance. Younger (20-40 years-old) and older (60-80 years-old) adults completed a level-1 visual perspective-taking task (with eye-tracking), a Stroop task and a task-switching task. The Autism Spectrum Quotient and Empathy Quotient provided measures of social ability. Older adults were slower overall in the visual perspective-taking task. In addition, older adults showed specific impairments when there was a conflict between their own and the avatar's perspective. This pattern was also reflected in gaze behaviour and pupillometry analysis. Statistical models examined how visual perspective-taking ability is related to individual differences in executive functions and social abilities in younger and older adults.
Email: Victoria Brunsdon, veab@kent.ac.uk

(1009)

Spill-Over Effect in Younger and Older Adults: Memory for Neutral Stimuli Is Affected by Associated Valenced Information. SANCHITA GARGYA and MOSHE NAVEH-BENJAMIN, *University of Missouri* — The finding that emotional information is remembered better than non-emotional information is ubiquitous in the literature. This effect, known as emotional enhancement of memory (EEM), has been demonstrated for single items (emotional vs. neutral) and for pairs of stimuli, consisting either of two components with similar emotional or neutral properties (e.g., soul-smile, table-advance), or those with an emotional component shown with an inherently neutral component (e.g., positive picture with a shape). No previous aging study conducted with emotional-neutral stimulus pairs has systematically studied differences in item memory performance for both the components in order to explore the relationship between memory performance for each component. To this effect, we ran two experiments testing participants' memory for faces and names. Both age-groups showed a similar pattern of performance on the face and the name tests, for each valence. Interestingly, memory for the names was affected by the valence of the face.
Email: Sanchita Gargya, sg755@mail.missouri.edu

(1010)

The Age-Related Associative Memory Deficit Can Be Modified by Manner of Presentation. AMY A. OVERMAN, *Elon University*, JOHN M. HUHN III and NANCY A. DENNIS, *The Pennsylvania State University* — The loss of the ability to

form and remember associations is one of the more severe and consequential memory impairments experienced by older adults (Naveh-Benjamin, 2000). Prior research has assumed that this age-related memory impairment is mediated by a general associative deficit (Li, Naveh-Benjamin, & Lindenberger, 2005). However, research in younger adults suggests that different neural mechanisms underlie the formation of different types of associations (Diana, Yonelinas, & Ranganath, 2012). The current set of experiments directly compared memory across item-item and item-context associations in younger and older adults by presenting the same types of stimuli (faces and scenes) as either item-item or item-context pairs. Results indicate that the associative deficit in aging is not uniform across different types of associations when controlling for stimulus characteristics. The results have implications for theories of associative memory, age-related cognitive decline, and the functional organization of the MTL in aging.
Email: Amy A. Overman, aoverman@elon.edu

(1011)

Age Differences in Semantic Representation of Past and Future Events. LISA EMERY and KATHRYN HARDIN, *Appalachian State University* — Research on autobiographical memory and episodic future thinking suggests that increased "episodic specificity" of mental representations is associated with positive outcomes. It is also well established that older adults show reduced episodic specificity in their mental representations. Less well understood is what role semantic representation plays in the mental representation of past and future events, including how increases in semantic representation with age might impact cognitive and emotional outcomes. In this study, we use correlational and experimental data to explore this question. Adults ages 20-80 remembered or imagined events under control, episodic recall, and semantic recall instructions. They also completed a battery of cognitive tests and questionnaires measuring possible mediating factors. Analyses will address (1) what cognitive or emotional factors are most strongly associated with age-related increases in semantic details under control instructions, (2) whether semantic recall instructions reduce age differences in the cognitive and emotional content of the narratives.
Email: Lisa Emery, emerylj@appstate.edu

(1012)

The Role of Schematic Support in Older Adults' Short-Term and Long-Term Associative Memory. DWIGHT J. PETERSON, *University of Missouri and Concordia College*, MOSHE NAVEH-BENJAMIN, *University of Missouri* — Older, relative to younger adults, exhibit associative memory deficits in short-term (STM) and long-term memory (LTM), with difficulty binding components to form associations despite largely intact item memory. One factor contributing to older adults' high false alarm rates during tests of associative memory relates to decreased use of recollection processes that facilitate rejection of recombined components. Younger and older adults' STM and LTM performance for faces, names, and face-name pairs that remained intact or were recombined in a standard manner (older-face, older-name) or involved a change in schematic support from study to test (older-face, younger-name) was assessed. Older adults' associative memory benefited from changes in schematic support from study to test, reducing the age-related LTM deficit. This benefit was mostly noticeable when changes in schematic support occurred and "remember", compared to "know", judgments were made, suggesting that schematic support reduces the age-related associative deficit by increasing access to recall-to-reject processes.
Email: Moshe Naveh-Benjamin, navehbenjaminm@missouri.edu

(1013)

The Influence of Aging on Self-Reference Effects Across Cultures. WANBING ZHANG, *Brandeis University*, I-TZU HUNG, *National Taiwan University*, JONATHAN JACKSON, *Brandeis University; Massachusetts General Hospital*, JOSHUA O. GOH, *National Taiwan University*, ANGELA H. GUTCHESS, *Brandeis University* — Relating information to the self facilitates general and source memory in young and older adults. However, most studies conducted on the self-reference effect test Western samples, for whom the self is considered independent and distinct from others. Little is known about how self-referencing, as a potential mnemonic strategy, operates for people with an interdependent self-construal (such as East Asians), particularly with age. In this study, we examined the effect of self-referencing on memory for younger and older adults from individualistic (Americans) and collectivistic (Taiwanese) cultures. Because the self should serve as a less salient cue in collectivistic cultures, we hypothesized that self-referencing would be a less effective strategy for younger and older East Asians. Preliminary analyses reveal no difference in self-referencing effects across the two cultures for younger adults. However, general memory of American older adults, compared to Taiwanese, benefitted more from referring to the self.
Email: Wanbing Zhang, zhan1626@brandeis.edu

(1014)

Effects of Age, Task Type, and Information Load on Discrimination Learning. MORGAN BROWN, SHARON MUTTER, MEREDITH CUNDIFF, MADISON OSBOURN and CATHERINE WOOSLEY, *Western Kentucky University* — Discrimination learning occurs more quickly when the presence (Feature positive, FP) rather than absence (Feature negative, FN) of a target stimulus indicates a response is needed. This feature positive effect (FPE) has been extensively replicated but the effect is reversed when fewer stimuli are presented; i.e., a feature negative effect (FNE) occurs (Fiedler et al., 1988). This study used a successive discrimination task to compare young and older adults' performance across FP and FN conditions under low (three of four stimuli presented) and high (three of six stimuli presented) information load (IL). Under low IL, YA demonstrated the expected FNE. Under high IL, YA and OA demonstrated equivalent performance in the FP condition but OA performed poorer when the target stimulus was present

rather than absent in the FN condition. These findings indicate FN task performance varies by age and this variation changes based on IL condition.
Email: Morgan Brown, morgan.brown910@topper.wku.edu

ACTION AND PERCEPTION I

(1015)

Doggone Affordances: Perception of Maximum Vertical Reaching Height by Canines. MATTHEW D. LANGLEY, VALERI FARMER-DOUGAN and JEFFREY B. WAGMAN, *Illinois State University* — Performing any behavior requires perceiving whether and how that behavior can be performed. Such possibilities for behavior are known as affordances. Perception of affordances exhibits action-scaling — it reflects the fit between environmental properties and action capabilities. For example, human perception of maximum reaching distance scales to reaching ability. Perceived maximum reaching distance is longer for long- than for short-armed people but occurs at the same ratio of object-height-to-arm-length for both groups. To the extent that perception is specific to invariant stimulation patterns, perception of affordances ought to exhibit action scaling regardless of species. We investigated perception of maximum vertical reaching heights by canines. We systematically presented treats at various heights and determined the height at which dogs transitioned from reaching with the head to rearing. This boundary occurred at a taller height for tall than for short dogs but at the same ratio of shoulder-height-to-treat-height for both groups.
Email: Jeffrey B. Wagman, jeffreywagman@illinoisstate.edi

(1016)

Effects of Pitch and Rhythmic Prototypicality in Music Perception and Performance. PETER Q. PFORDRESHER and PAUL KOVACS, *University at Buffalo, State University of New York*, JONATHAN B. PRINCE, *Murdoch University* — Pitch and rhythmic information are key components underlying the musical schemas of key and meter, respectively. We explored the effects of varying the tonal prototypicality of melodies (pitch), or the metrical prototypicality of rhythmic sequences (time). In one experiment, pianists produced sequences on a keyboard, and in a second experiment the same sequences were sung by trained singers. In addition to measurements of performance errors of pitch and time, we also measured perceived complexity of sequences. Results suggest that the demands of pitch control within each task (higher for singing than keyboard) influenced effects of tonal prototypicality, whereas both tasks yielded more similar effects of metrical prototypicality. In addition, similar to Prince & Pfordresher (2012), effects of prototypicality on complexity ratings were negatively related to effects on errors in production. These results suggest that dimensional salience of pitch versus time is influenced by task demands associated with each dimension.
Email: Peter Q. Pfordresher, pqp@buffalo.edu

(1017)

Inhibition of Irrelevant Spatial Sound Codes Depends on the Task-Relevant Modality: Evidence From the Accessory Simon Effect. MALTE MÖLLER and SUSANNE MAYR, *University of Passau*, AXEL BUCHNER, *Heinrich-Heine-University, Düsseldorf* — In the accessory Simon task, lateralized responses to central targets are typically facilitated when distractors are presented ipsilateral to the target response as compared with trials in which they are presented on the contralateral side. This congruency effect is explained by assuming that a spatial code is generated for distractors which conforms to or conflicts with the target response. The present study further specified the mechanisms that operate on irrelevant spatial codes. Participants either responded to a centrally presented visual (Experiment 1) or auditory (Experiment 2) stimulus. A lateralized white noise distractor either occurred prior to or simultaneously with the target. A congruency effect was found when distractors and targets were presented simultaneously or in close temporal proximity. The effect reversed with longer distractor-target intervals in Experiment 2. Together, this suggests that inhibition operates on distractor events, however, only when targets and distractors are presented in the same modality.
Email: Dr. Malte Möller, malte.moeller@uni-passau.de

(1018)

Action-Specific Perception and Team Athletic Performance. KELSEY MENZEL and EMILY K. BLOESCH, *Central Michigan University* — The action-specific perception account posits that individuals perceive the environment in terms of their ability to act within it. This has been demonstrated in a variety of studies with athletes, whose game-related perception changes with performance. For example, golfers who are putting well judge the cup as larger than golfers putting poorly. In the current study, this effect was examined within a team sport, where the outcome of the game depends not on a single individual, but rather the collective ability of the team itself. In this case, we explored whether game-related perception would correlate with team, not individual, performance. Collegiate female club soccer players estimated ball size, goalie size, and playing ability after three matches of varying difficulty. The results indicate that team performance does impact individual players' perceptions, and implications for the action-specific perception account are discussed.
Email: Emily K. Bloesch, emily.bloesch@cmich.edu

(1019)

Visuomotor Engagement Influences Object Knowledge Retrieval. HANNAH M. MORROW, *University of Connecticut*, EVANGELIA G. CHRYSIKOU, *University of Kansas* — Behavioral, neuroimaging, and neuropsychological studies have shown that certain aspects of object knowledge (e.g., the object's function or mode of manipulation) can be accessed independently of more abstract properties (e.g., the object's name) and faster when participants are presented with three-dimensional relative to two-dimensional objects. Here we examined whether visual and manual exposure to three-dimensional objects, relative to two-dimensional pictures of

these objects, would allow for differential access to semantic memory under conditions of impromptu relative to canonical goal achievement (i.e., when a participant has to come up with an unusual, relative to a typical, use for a common object). Our results showed that the combination of visual and manual exposure to three-dimensional objects interfered with the generation of uncommon uses, liked due to the facilitated access to sensorimotor object properties associated with the objects' canonical use. We discuss the implications of these results for theories of object knowledge retrieval.
Email: Evangelia G. Chrysikou, lilachrysikou@ku.edu

(1020)

The Independence of Perceived Animal-Neutral and Animal-Referential Environmental Properties. BRANDON J. THOMAS, *University of Utah*, JEFFREY B. WAGMAN, *Illinois State University*, MATTHEW HAWKINS and MICHAEL RILEY, *University of Cincinnati* — Three experiments were conducted to test the relationship between perception of environmental properties taken with reference to action capabilities (e.g., affordances) and perception of environmental properties that are independent of an animal (e.g., metric properties). In all three experiments, participants provided reports of the maximum height they could reach above their head with a stick(s) (reach-with-stick height) and the stick length, a property that is constituent of reach-with-stick height. In Experiment 1 reach-with-stick height reports improved over trials whereas stick length reports remained constant. In Experiments 2a and 2b, feedback about maximum reach-with-stick height improved perception of this affordance, but such improvements did not transfer to perception of stick length in a pretest/practice task/posttest design. The results suggest that perceiving animal-referential and animal-neutral properties may require the detection of different information.
Email: Brandon J. Thomas, thomab9@mail.uc.edu

(1021)

Auditory and Visual Learning Transfer to Motor Reproduction. BRANDON BATZLOFF and RAMESH BALASUBRAMANIAM, *University of California Merced* (Sponsored by Michael Spivey) — It is thought that auditory perception has a privileged temporal relationship with movement, and subjective auditory intervals are more accurately reported than subjective visual intervals. Prior research shows that training in sub-second intervals through auditory discrimination tasks results in a transfer of learning to motor reproduction of these intervals. We tested whether this transfer effect also occurs with visual interval training and predicted a less pronounced learning transfer effect in the visual modality. Twenty-four participants were trained in five sessions using auditory or visual discrimination tasks on 300 or 500 ms intervals. Motor reproduction of visual and auditory intervals were tested pre and post training. On shorter intervals, preliminary results show that training in one modality interferes with reproduction in the other modality. Further testing is underway. A robust interference effect would impact our understanding of temporal processing in the auditory cortex and the role of attention in interval timing.
Email: Brandon Batzloff, bbatzloff@ucmerced.edu

(1022)

Pre-Crastination: Completing Subgoals Earlier or Starting Tasks Sooner? LISA R. FOURNIER and ALEXANDRA STUBBLEFIELD, *Washington State University*, DAVID A. ROSENBAUM, *University of California at Riverside*, EZANA TADDESE, *Washington State University*, BRIAN P. DYRE, *University of Idaho*, BRYAN HAFLICH, *Washington State University* — Pre-crastination is defined as the "hastening of subgoal completion, even at the expense of extra physical effort." We asked whether pre-crastination is a bias to complete subgoals earlier or to start tasks sooner. Participants filled a bowl at the end of a runway with ping pong balls from either of two buckets containing different numbers of balls and positioned at different distances from the participants' start location. Participants either poured all the balls into the bowl at once (Experiment 1) or placed the balls into the bowl one at a time (Experiment 2). Participants preferred to pick up the nearer bucket, consistent with the desire to start tasks sooner, but they also preferred to pick up the bucket that had more balls, especially when the balls were placed into the bowl one at a time, consistent with the desire to complete the subgoal earlier. Thus, both factors contribute to pre-crastination.
Email: Lisa Fournier, lfournier@wsu.edu

(1023)

This Is for You: Influences of Social Intentionality on Reach-to-Grasp Actions. KAITLIN LAIDLAW, JODY C. CULHAM and MELVYN A. GOODALE, *Western University* — Much of human communication occurs nonverbally. It is clear that action goals (e.g. picking up a bottle to pour versus to drink) influence initial reach-to-grasp kinematics. However, relatively little is known about whether and how actions can be affected by social intentions, even when the movement itself remains the same (e.g., moving a salt shaker to be within reach of a dinner companion versus to get it out of the way). In the present study, participants picked up and repositioned a small block that was then either collected by another actor (Give condition), or not (Place condition). Though the action goal was identical – to move the object a set distance – reach-to-grasp parameters nevertheless revealed faster action execution when participants were aware that their action would yield an interaction with the actor, compared to when the task was performed independently. Several kinematic variables also exhibited changes over the course of each condition. We discuss these findings in relation to how nonverbal communication via subtle kinematic changes may facilitate action in shared spaces.
Email: Kaitlin Laidlaw, klaidl3@uwo.ca

(1024)

Insights from Awareness, Attentio[illegible]otor Adjustment on Sensorimotor Cross Tall[illegible] OLIVER SIMON SACK, *Technische Universität Darmstad[illegible]* In modern technical environments tool use is often specified by spatial separation and distortion

between sensory and motor action effects. Theories of common coding propose that perception and action are represented within the same cognitive domain. Consequently, they are likely to interact (cross talk), and generate short-term aftereffects. We experimentally investigated the role of awareness, attention and motor adjustment on aftereffects. Participants performed a horizontal stroke on a covered digitizer tablet, while the cursor amplitude was shorter, equal to, or longer than the constant hand amplitude (phase 1). In phase 2, participants replicated the hand or cursor amplitude without visual feedback (intra- vs. intermodal application). The findings demonstrate a rapid adjustment of the motor system that benefits intra-modal replications, but interferes intermodal replications. The cross talk between sensory and motor information appears to be very stable. Its magnitude is strongly affected by implicit and explicit strategies.
Email: Christine Sutter, c.sutter@iad.tu-darmstadt.de

(1025)

Heads Up! Dynamic Similitude for Perception With Object Held With Hand or Head. ALEX DAYER and JEFFREY B. WAGMAN, *Illinois State University*, ALEN HAJNAL, *University of Southern Mississippi* — Affordances are opportunities for behavior determined by the fit between action capabilities and environmental properties. In large part, perception of affordances is anatomically independent. For example, perception of affordances of a given surface can be perceived by exploring that surface with an object held in the hand or attached to the head. Blindfolded participants explored an inclined surface with a wooden rod held in the hand or attached to the head and reported whether they could stand on that surface. In both conditions, the angle of the surface was systematically increased or decreased until the response changed from yes to no, or vice versa. There was no difference in the perceptual boundary for the two appendage conditions. However, in both appendage conditions, perceptual boundary occurred at lower angle of inclination for ascending than for descending trials. The results highlight a dynamic similitude between perception of affordances by these appendages.
Email: Alex Dayer, adayer@ilstu.edu

(1026)

Investigating the Link Between Response Selection Difficulty and Response-Effect Compatibility. GREG HUFFMAN, *University of Toronto*, DAVOOD G. GOZLI and BERNHARD HOMMEL, *University of Leiden*, JAY PRATT, *University of Toronto* — Responses tend to be faster when the anticipated sensory effects are spatially compatible with the response (e.g., left key causing luminance onset in the left periphery). Here, we tested if the magnitude of this response-effect (R-E) compatibility effect depends on response selection difficulty. Across three experiments, we manipulated response selection difficulty by varying response precues within experiments and stimulus-response (S-R) mapping between experiments. In all experiments, we found response precueing reliably increased response selection difficulty and responses were slower in the R-E incompatible than incompatible block. Between experiments, S-R mapping modulated the R-E compatibility effect, with larger compatibility effects with harder S-R mappings, but the trial-by-trial variations in response precue difficulty did not influence R-E compatible effects. These results suggest that the processing weight given to novel R-E contingencies is sensitive to the overall response selection difficulty, but the given weight might be relatively unchanged within a task session.
Email: Greg Huffman, greg.huffman@mail.utoronto.ca

ASSOCIATIVE LEARNING I

(1027)

Visual Scenes Preactivate Newly Associated Novel Object Concepts in Graded Fashion. CYBELLE M. SMITH and KARA D. FEDERMEIER, *University of Illinois, Urbana-Champaign* — When and how is the brain able to make use of newly-learned information about objects and their associated contexts? To address this, we recorded EEG from 24 participants as they studied line drawings of novel objects paired with visual scenes. Objects belonged to categories and object categories were paired with particular types of scenes (e.g., forests, beaches). At test, scenes were previewed (2.5s), after which an object appeared that was either identical to study, a different object of the same category, or a different object of a different category (never associated with that scene type). Between category violations elicited an early, frontal negativity (200-300ms; "N300"), while a later effect (300-400ms) differentiated object matches from both within- and between-category violations. Our findings replicate prior relational memory effects, and suggest that scenes prepared subjects for upcoming newly associated novel objects in a temporally and categorically graded fashion.
Email: Cybelle Smith, cmsmit13@illinois.edu

(1028)

Reminding and Interference: The Role of Task Context. NICHOLAS D. GRAY and COLLEEN M. KELLEY, *Florida State University* — Interference between similar memories is a major cause of forgetting, but being reminded of prior experiences when encountering a similar experience can prevent interference, and even create facilitation in memory. Therefore it is important to understand conditions that affect the likelihood of reminding and the consequences for interference in memory. In a retroactive interference paradigm using word pairs, we varied whether encoding tasks changed between lists or not for interference pairs and as predicted, found more reminding when the encoding task was the same between lists. Encoding tasks also differed in the degree to which they fostered reminding, possibly due to working memory demands. We explored the effects of working memory demands in a second experiment by varying the time pressure for performing the encoding task on the second list and traced the relation between probability of reminding and interference.
Email: Nicholas Gray, ndgray00@gmail.com

(1029)

Awareness of Explicit and Implicit Category Rule Learning. POOJA PATEL, AUDREY HILL, MARK NEIDER and COREY BOHIL, *University of Central Florida* — The theory of category learning called COVIS (competition between verbal

and implicit systems) posits that separate brain systems mediate category rule acquisition. Verbalizable rules are learned explicitly, nonverbalizable rules are learned implicitly. Although supported by behavioral and neuroimaging data, few studies have assessed subjective awareness of what strategy learners think they are using within the COVIS framework. Participants completed either rule-based or information-integration category learning. After every 40-trial block, participants were asked whether they knew the category rule and to describe it in their own words. By the final block, individuals who indicated that they knew the rule over the final 3 blocks of training achieved high accuracy (84% in both conditions). Participants in the RB condition who reported not knowing the rule had accuracy slightly above chance (60%). Many participants in the II condition indicated they did not know the rule yet they still achieved high accuracy (68%).
Email: Corey Bohil, corey.bohil@ucf.edu

(1030)

Does Testing Episodic "Lion-Tiger" and/or "Tiger-Stripes" Associations Facilitate Later "Lion-Stripes" Learning? DEANA VITRANO and JAMES H. NEELY, *University at Albany, State University of New York* — When subjects learn semantically related/associatively unrelated cue-target (C-T) pairs (mother-child), relative to restudying, C-T testing enhances later T recall to C (Carpenter, 2011). The Mediator Effectiveness Hypothesis (MEH) states that C-T testing strengthens cue-mediator (C-M, mother-father) and mediator-target (M-T, father-child) associations rather than the direct C-T association. At last year's meeting, our lab argued against the MEH based on the testing effect for T recall to C being the same whether or not M could be recalled to C prior to T recall. The current experiment had subjects learn semantically/associatively unrelated C-T pairs (lion-stripes) that are mediationally associated (via tiger) two days after separately studying and then being tested on or restudying C-M (lion-tiger) and M-T (tiger-stripes) pairs. According to the MEH, testing on both the C-M and M-T pairs should facilitate C-T learning more than testing on only the C-M or M-T pairs or the restudying of both pairs. Although M-T testing facilitated C-T learning, C-M testing had no effect.
Email: Deana Vitrano, dvitrano@albany.edu

(1031)

A Reference Point Explanation for XOR Extrapolation in Categorization With Kernel Methods. LEE-XIENG YANG, *National Chengchi University* — Past research showed that the reference point view has difficulty accounting for the extrapolation phenomenon in a partial XOR problem (Conaway & Kurtz, 2015), in that the items in the transfer quadrant in a space were classified as the category in the opposite quadrant, not the closer category. In this study, I show that a reference point explanation is still viable so long as the similarity is computed with the components of the psychological space representing the exemplars instead of the input dimensions composed of the stimuli. In my simulations, the nonlinear components are first extracted with kernel-based PCA (Principal Component Analysis) from the similarity matrix between exemplars. Subsequently, the product of these components and the similarity matrix between the transfer items and the exemplars are mapped as inputs to a hyper-dimensional psychological space. In this psychological space, the reference point model can perform extrapolation obtained in the partial-XOR problem.
Email: Lee-Xieng Yang, lxyang@gmail.com

(1032)

Developing Sensitive Measures of Statistical Learning for School-Age Children. YOEL SANCHEZ ARAUJO, WENDY C. GEORGAN, ZHENGHAN QI, JOANNE ARCIULI, and JOHN D. GABRIELI, *Massachusetts Institute of Technology* — This study seeks to develop sensitive tasks for measuring statistical learning in school-age children. Modeled after Arciuli & Simpson (2011) and Saffran et al. (1999), the familiarization phase was revised to enable real-time measurement of learning. During the familiarization phase, alien pictures or tones were presented, which either contained structured or random sequences of triplets. Concurrently, participants conducted a target-detection task by pressing a button to the third stimulus of the target triplet. Immediately after training, participants' knowledge of the trained triplets was assessed via a two-forced choice task. Results showed greater accuracy in the structured block for both tasks (paired t-test p's < 0.005). Participants' response time during the familiarization phase showed greater reductions in the structured block over the course of visual statistical learning (significant interaction between blocks and training trials, $p = 0.02$). Future work will apply these tasks in school-age children examining variations of performance across modalities.
Email: zhenghan.qi@gmail.com, zhenghan.qi@gmail.com

EMOTION AND COGNITION I

(1033)

Losing Track of Time: Effect of Pain on Time Perception in a Psychophysical Study. AMANDINE E. REY, *University Lyon2,* CORINA DONDAS, *Petre Andrei University*, MARVIN THAR, *University Lyon2,* LUIS GARCIA-LARREA, *Lyon Neuroscience Research Center,* STÉPHANIE MAZZA, *University Lyon2* — A growing body of evidence suggests that emotion influences the estimation of time: subjects in an unpleasant condition experienced time as long-lasting. Here, we investigated the influence of pain on time estimation using a prospective psychophysical paradigm to measure the on-line distortion of a time estimation. Participants performed a temporal bisection task during a painful condition (cold pressor test, 12° Celcius) and a nonpainful condition (ambient temperature). Subjects were shown several temporal stimuli and asked to indicate whether these stimuli were presented for a duration closer to the short or the long standard (presented in a previous phase). They also evaluated their pain several times during both conditions. Results showed that they experienced a same duration as long-lasting in a painful condition compared to a nonpainful condition. This distortion of time was increased by a higher subjective evaluation of pain. As negative emotion, pain induced an overestimation of time.
Email: Amandine Rey, amandine.e.rey@gmail.com

(1034)

Executive Control Training Enhances Emotion Regulation. NOGA COHEN, *Columbia University*, HADAS OKON-SINGER, *Haifa University*, NILLY MOR, *Hebrew University*, AVISHAI HENIK, *Ben-Gurion University of the Negev* — Adaptive behavior depends on the ability to effectively regulate emotional responses. Failure in the regulation of emotional arousal can result in heightened physiological reactions and disruptive behavioral performance. In turn, these behavioral and physiological alternations can lead to various psychopathologies. In several studies we demonstrated that training executive control, an attentional mechanism that enables goal-directed behavior, lead to reduced emotional interference by aversive pictures and to a lower amygdala activation to these pictures. Moreover, we showed that training individuals to recruit executive control prior to the presentation of unpleasant pictures enhances their ability to regulate an upsetting personal event using reappraisal. These findings suggest that the interplay between emotion and executive control is essential for maintaining adaptive behavior and may be impaired in individuals with emotion regulation difficulties.
Email: Noga Cohen, nc2688@columbia.edu

(1035)

Mapping the Relationship Between Theory of Mind and Executive Functioning in Adulthood. ELISABETH E.F. BRADFORD, VICTORIA E.A. BRUNSDON and HEATHER FERGUSON, *University of Kent* — A vital part of successful everyday social interaction is the ability to infer information about others. Much prior research has demonstrated a strong link between Theory of Mind (ToM) and Executive Functioning (EF) abilities, particularly in young children. Less is known about the relationship between ToM and EF in adulthood, or the precise breakdown of which components of EF modulate specific aspects of ToM. The current research employed a battery of tasks that tapped different aspects of ToM (including emotion recognition, intention reasoning, and perspective-taking) and EF skills (inhibition, working memory, cognitive flexibility, and planning) to tease apart potentially different relationships between separable EF components in predicting success on different ToM tasks. Results from adult participants (20-50 years old) demonstrated a key role of working memory and inhibition, suggesting the importance of these two abilities in successful engagement in higher-level ToM, even in adulthood.
Email: Elisabeth Bradford, E.E.Bradford@kent.ac.uk

(1036)

Theta and Alpha EEG Oscillations Mediate Neural Mechanisms of Experiencing Boredom. ERI MIYAUCHI and MASAHIRO KAWASAKI, *University of Tsukuba* — Previous research suggests that boredom is related to attentional failure. However, this viewpoint is not currently supported by neuroscientific evidence. Therefore, the present study aimed to investigate the neural correlates of boredom, and to examine whether boredom can be explained in terms of attention. Here, we used electroencephalograph recordings to measure changes in brain activity during subjective experiences of boredom in healthy subjects. In addition, we assessed attentional deficits using the Adult ADHD Self-Report Scale. We found simultaneous increase in the upper alpha and upper theta activity, and subsequent decrease in the lower theta activity prior to the key press response for experiencing boredom. Our results demonstrate that not only attentional lapses, but also sustained attention, are associated with boredom, and that this mechanism is mediated by alpha and theta activity. Our results suggest that modulating neural activity may lead to alleviate problems associated with boredom.
Email: Masahiro Kawasaki, kawasaki@iit.tsukuba.ac.jp

(1037)

Exploring the Deception Paradigm: Should Social Factors Play a Role? SCOTT W. MEEK and BRITTANY A. WORTMAN, *University of South Carolina - Upstate*, MICHELLE C. PHILLIPS-MEEK, *Limestone College* — Deception research has often focused on the cognitive aspects of the deceptive process. The social component is frequently ignored. Consequently, many deception paradigms do not include any social component. A previous study demonstrated that reaction times differed when participants responded deceptively to a human voice versus a computer voice. The current paradigm further explores the social component using a similar methodology. In the current study, participants were again asked questions by a computer voice, but are led to believe that the questions are selected either by a friend, another random student, or randomly by the computer. Participants answered questions regarding criminal, social taboo, or neutral actions, and were cued to answer either truthfully or deceptively. Preliminary results indicate strong effects for both deception and question type, as well as a potential effect of the social component on reaction times. These results are consistent with the findings of the first experiment.
Email: Scott Meek, smeek@uscupstate.edu

(1038)

Attentional Blink Towards Food Stimuli. EVELYN SMITH, *Western Sydney University*, JAYANTHI RAMAN, *University Technology Sydney*, KATE TCHANTURIA, *Kings College London*, PHILLIPA HAY, *Western Sydney University* — The obese appear to differ from healthy weight people in their attentional biases toward food. We explored this with the attentional blink (AB) paradigm, a deficit in detecting the second of two targets (e.g., words) that appear in close succession. The design was a 2 (T1 (food vs non-food words)) x 2 (T2 (food vs non-food)) x 2 (intervening distractor type (food vs non-food)) x 4 lags (1, 3, 5, 9), x 2 (obese versus normal weight). As expected, for both obese and normal weight, T2 accuracy was significantly lower when distractors were food, compared to non-food (household items). Surprisingly, however, the healthy weight differed from the obese in that they were more accurate when T2 was a food word, but only at lag 1. These findings are a challenge for theories of the AB. We also report the results of mixture modelling of errors to separate accuracy differences into differences in the efficacy, precision, and latency of attentional selection.
Email: Dr Evelyn Smith, evelyn.smith@westernsydney.edu.au

(1039)

Don't Touch That! Constraints on Environmental Engagement Increase Reports of Boredom. ANDRIY A. STRUK, *University of Waterloo*, PAUL SELI, *Harvard University* (Sponsored by Jonathan Fugelsang) — In the present study, we were interested in examining the possible influence that people's external environment has on their self-reported levels of boredom. We found that when participants are placed in an environment characterized by many affordances (e.g., a laptop, puzzle, etc.), and are instructed to refrain from engaging with the items in the environment, they report significantly higher levels of boredom than do participants who are placed in an environment that is devoid of affordances (i.e., an empty room). Furthermore, we found that participants often disobey the instruction to refrain from engaging with the external environment, presumably because they are motivated to minimize the extent to which they experience boredom. These findings suggest that boredom may arise due to a discrepancy between possible actions and the ability to engage in them, and that this discrepancy may promote engagement.
Email: Andriy Struk, astruk@uwaterloo.ca

(1040)

Medical Embarrassment: A Cross-Cultural Perspective. MINGI CHUNG, *University of California, San Diego*, SUNGJOON PARK, *Korea Advanced Institute of Science and Technology*, MINHEE KIM, *Korea Counseling Graduate University*, HAL PASHLER and CHRISTINE HARRIS, *University of California, San Diego* — Medical embarrassment was previously found in US samples to comprise two distinct factors, bodily embarrassment and judgment concern, differentially related to different types of medical visits. The present study examined the construct of medical embarrassment in a very different culture, namely Korea. Factor analysis similarly showed two factors of bodily embarrassment and judgment concerns with Koreans. However, there were more judgment concern items for Koreans compared to Americans whereas bodily embarrassment was more similar between the two. Medical embarrassment was significantly higher for women and lower for those who had higher education. Structural equational modeling further revealed medical embarrassment significantly mediated the number of psychological visits but not sex-related visits or general health visits for Koreans. This suggests some universality in the construct of embarrassment.
Email: Christine Harris, charris@ucsd.edu

(1041)

Gender Difference for the Detection of Gaze Direction Changes in Social Anxiety. KENTA ISHIKAWA, HIKARU SUZUKI and MATIA OKUBO, *Senshu University* — Socially anxious men have more intense fear of being evaluated by other such as a direct gaze from observers when compared with socially anxious women (Jun, Mareschal, Clifford, & Dadds, 2013). We investigated the effect of the gender difference for the detection of gaze direction changes in social anxiety. Eighty-nine participants were divided into high and low social anxiety groups. Participants performed a gaze change detection task. There were three conditions in the gaze directions; looking towards the observer, looking away from the observer and no direct gaze.Men with high social anxiety were more accurate in the detection of gaze direction changes in the "looking towards the observer condition" when compared with those with low social anxiety. On the other hand, this pattern was reversed for women. These results suggest that men with social anxiety are more vigilant to the direct gaze than women with social anxiety
Email: Kenta Ishikawa, cognition.psy.k@gmail.com

(1042)

Big Five Personality Traits and Emotional Components of Goosebumps. KENJI KATAHIRA and AI KAWAKAMI, *Kwansei Gakuin University* — This study examined the relation of the big five personality traits to the types of emotion that induce goosebumps. Forty-four university students were presented a list of ten discrete emotions and were asked to rate how frequently they experienced goosebumps with each of these emotions. Cluster analysis based on the frequency of goosebumps revealed that two groups differed in the emotional components of goosebumps. Both groups experienced goosebumps in response to negative emotions at a similar frequency, while, regarding positive emotions, one group experienced goose bumps more frequently than the other group did. In line with previous findings regarding pleasurable chills, the group with the higher frequency of goosebumps associated with positive emotions showed a higher openness-to-experience score. The results suggested that the types of emotion that induce goosebumps may be associated with individuals' cognitive styles.
Email: Kenji Katahira, k.katahira@kwansei.ac.jp

(1043)

Executive Functioning Performance and Neural Correlates of Empathic Concern and Happiness. MATTHEW A. BEZDEK, *Georgia Institute of Technology*, ZINAT O. TAIWO and SHAREE N. LIGHT, *Georgia State University* — Past research has found links between executive functioning and empathy in lesion patients and clinical populations. In the present study, we presented non-clinical participants with a reality television program shown to elicit both empathic concern and empathic happiness at different moments in the program. While participants viewed the program, we measured brain activation with functional magnetic resonance imaging. Following the scan session, participants completed a battery of cognitive tasks that measured aspects of executive functioning. Program segments that elicited empathic concern and empathic happiness evoked a pattern of brain activation in brain networks recruited for these processes. Performance on the executive functioning tasks correlated with activity in empathy-related brain areas, such that increased performance on the cognitive tasks was associated with increased response during empathic moments in the television program. These results contribute to our understanding of the relationship between subtypes of empathy and executive functioning in healthy adults.
Email: Matthew Bezdek, mbezdek@gatech.edu

(1044)

Selective Consolidation of Emotionally Salient Information During a Nap is Preserved Across Age. SARA E. ALGER and JESSICA D. PAYNE, *University of Notre Dame* — Emotionally salient information is better remembered at the expense of less relevant details. Sleep increases the magnitude of this memory trade-off, preferentially preserving emotional components in young adults. Although both memory and sleep decline with age, little is known about whether their functional relationship changes. The current study compared changes in memory for negative and neutral components of scenes across a retention period containing an immediate or delayed nap versus wake in subjects 18-64yrs. Interestingly, covarying for age, immediately napping led to the greatest increase in negative memory trade-off compared to both wake and delayed napping, indicating that sleep facilitated preferential consolidation of emotional components. There was a positive correlation between features of slow-wave sleep and negative object memory across all nap subjects. These results provide strong evidence that even as we age, sleep actively preserves salient information over less important details, despite general declines in memory and sleep.
Email: Sara E. Alger, Ph.D., salger@nd.edu

(1045)

The Processing of Positive and Negative Emotion-Laden Words During Reading: An Eye-Tracking Study. H. FAYE KNICKERBOCKER, *Skidmore College and State University of New York, Albany*, REBECCA L. JOHNSON, EMMA L. STARR, ANNA M. HALL, DAPHNE M. PRETI and SARAH ROSE SLATE, *Skidmore College*, JEANETTE ALTARRIBA, *State University of New York, Albany* — While recent research (Knickerbocker et al., 2014; Scott et al., 2013) has explored the effect that positive and negative emotion words have on the eye-movement record during reading, the current study looked at the effect of positive and negative emotion-laden words (e.g. birthday, funeral) which are words that do not express a state of mind but have emotional connotations. Results indicated that both positive and negative emotion-laden words have a processing advantage over neutral words. Positive emotion-laden words showed advantages in early, late, and post-target measures, while negative emotion-laden words showed effects only in late and post-target measures. Theoretical models for the distinction between emotion and emotion-laden words are discussed.
Email: H. Faye Knickerbocker, hknicker@skidmore.edu

(1046)

The Effect of Explicit Access to Emotion Words During Categorical Perception of Emotional Faces. JENNIFER M.B. FUGATE, SARAH CORDEIRO and NICOLE ZIINO, *University of Massachusetts - Dartmouth* — In two studies, we assessed how the presence of emotion words within a categorical perception (CP) paradigm changes performance. In Experiment 1, participants (n = 38) completed a standard 2-part CP task using emotional faces, in which they identified stimuli into categories without explicit reference to emotion words (e.g. pictures of the faces used to create the emotional stimuli). In Experiment 2, participants (n = 49) completed the same 2-part task, but identified stimuli into categories anchored with emotion words (e.g. "anger" or "fear"). Participants in both experiments showed CP (i.e. better discrimination of "between-category pairs" compared to "within-category pairs"), but those who matched to emotion words often showed less rigid category boundaries compared to those who matched to pictures. The results suggest that, in the presence of emotion words, participants' categories might become more permissive likely because words activate a wider representation of what constitutes a category member.
Email: Jennifer M.B. Fugate, jfugate@umassd.edu

(1047)

Can Depressed and Non-Depressed People Put Themselves in Each Other's Shoes? CONSTANCE IMBAULT and VICTOR KUPERMAN, *McMaster University* — Depression is one of the most prevalent mental health disorders in the United States (NIMH, 2014). People suffering from depression display self-focused attention (Beck, 1967) and predict negative outcomes in their future (Pyszczynski et al., 1987). Using an online tool that measures approach and avoidance, participants responded to words with varying levels of valence as a neutral or a depressed person (within-participant). When participants without depression (QIDS <5) responded as a neutral person, they approached positive stimuli, and avoided negative stimuli. When responding as a depressed person, they correctly replicated the behavior shown by our depressed participants (QIDS > 15): e.g. a flat affect with minimal approach to positive and avoidance of negative words. Interestingly, our depressed participants showed the same affective responses when performing as a depressed or a neutral person. This inability to differentiate oneself from a non-depressed person suggests self-focused attention and impaired theory of mind.
Email: Constance Imbault, imbaulcl@mcmaster.ca

(1048)

Strategic Practice as a Means to Regulate Affect-Induced Facial Muscle Contractions. JULIA KOZLIK, *Ernst-Moritz-Arndt-University, Greifswald*, ROLAND NEUMANN, *University of Trier* — Recently, it has been shown that unintentionally activated emotional responses (i.e., manual approach/avoidance movements) can be modulated by strategical practice. In a series of experiments we tested whether this modulation would also apply to affect-induced facial muscle contractions which have been discussed to be relatively inflexibly linked to the processing of affect. Participants were asked to voluntarily contract the *zygomaticus major* muscle (which is associated with positive affect) or the *corrugator supercilii* muscle (which is associated with negative affect) in response to a non-valence feature of positive and negative stimuli (i.e., affective Simon task). We observed significant reductions of the affective Simon effect occurring after practice of incompatible (as compared to compatible) S–R assignments. Importantly, the formation of an implementation intention without action execution seems to be sufficient for the observed modulation to occur. These results stress the importance of practice and will-power as effective means to regulate facial muscle contractions.
Email: Julia Kozlik, julia.kozlik@uni-greifswald.de

(1049)

Examining the Processing of Emotional Facial Expressions in Trait Anxious Individuals. MELANIE PERRON, RYAN FERGUSON, ANNIE ROY-CHARLAND, CHRISTIAN LAFORGE and KELSIE MACLEAN, *Laurentian University* — Contradictions were observed in previous studies with regards to emotional facial expression recognition in trait anxiety. One study reported greater accuracy for expressions of fear in high trait anxiety, and another observed no differences as a function of trait anxiety. The current study sought to clarify the inconsistencies by examining processing differences (featural vs. holistic) within a emotion recognition task. Eighty-five participants viewed 24 facial expressions of the six basic emotions for each of the five conditions (mouth only, eyes/brows only, mouth hidden, eyes/brows hidden, full face) and were asked to identify the emotion. Happiness was recognized more accurately than all other emotions, with the exception of surprise and fear was recognized least accurately. The featural account could explain for the processing of happiness, disgust and sadness, and the holistic account for fear. However, more importantly, results did not reveal difference in processing or recognition as a function of anxiety.
Email: Melanie Perron, mperron@laurentienne.ca

(1050)

What Does a Smile Weigh?: The Relative Visual Weights of Common Facial Emotions. PHILIP MARSHALL and FRANCESCO DONATO, *Texas Tech University* — This research applies "orientational metaphors" as discussed by Lakoff and Johnson (1980) to studies of the "visual weight" of expressions of facial emotions in the context of composition balance in visual art and aesthetics. By extension, the metaphors that "happy is up, and sad is down" were reconsidered as "happy is light, and sad is heavy" (Hurtienne, Stobel, & Weber, 2009). In Experiment 1, using a computer-generated balance beam graphic, participants placed individual images of seven facial emotions on the right side of the beam to balance them against a standard rectangular weight on the left side. Faces depicting negative emotions (e.g., sad, disgust, anger) were placed closer to the fulcrum (judged heavier) than were faces of positive emotions (e.g., happy, surprise). In Experiment 2, participants assigned numerical weights to actual artistic portraits having neutral expressions, as well as to manipulations of the portraits that depicted sad and happy faces. Results indicated that sad faces were given significantly greater weight values than happy faces. Future research should determine if facial expressions of emotion may ultimately be a factor in determining composition balance, and aesthetic "goodness" and preference.
Email: Philip H. Marshall, philip.marshall@ttu.edu

SPATIAL COGNITION I

(1051)

Asymmetries in Scene Depiction: An Embodiment Effect in Spatial Composition? JYOTSNA VAID, OMAR GARCIA and PAIGE DUSTHIMER, *Texas A&M University* — Past research has established that the direction in which drawn objects typically face is influenced by hand dominance and reading/writing habits: right handed left-to-right readers tend to draw static objects facing leftward, and moving objects facing rightward. The present research examined variability in the choices made in depicting objects described in the context of a scene. Right- or left-handed readers of English were to draw a series of common scenes described in one or another version. The results showed a uniformity in scene depiction for certain versions, e.g., a hiker going up a hill, runners starting a race, but variability in depicting another version of the same scene: a hiker going down a hill, or runners finishing a race. These findings suggest that, besides biomechanical factors affecting stroke direction preferences, other factors are at play that may result in certain versions of a scene becoming the canonical depiction.
Email: Jyotsna Vaid, jvaid@tamu.edu

(1052)

Lost and Confused: Measuring Uncertainty in Navigation. CHRISTOPHER THOMAS, AARON L. GARDONY and ALEKSANDRA KASZOWSKA, *Tufts University*, GEORGE L. WOLFORD, *Dartmouth College*, HOLLY A. TAYLOR, *Tufts University* — The sight of someone standing on a street corner, looking in all directions, often triggers the question "can I help you find something?" How can this disorientation behavior be captured reliably in real time? Such a measure could help optimize navigational aid technologies for environment learning and reveal strategies navigators employ when uncertain. Brunyé, Haga, Houck, and Taylor (in press) explored whether entropy or variance related to heading orientation would better predict navigational efficiency through a virtual environment. Entropy predicted navigation efficiency better than circular variance. The present study replicates this finding, extending it to when people have foreknowledge of the environment and to a smaller environment. Further, we relate disorientation and navigation performance to strategies used when studying an overhead environment view prior to navigation. Using these measurements to provide people with navigational information at optimal times may help build flexible spatial representations.
Email: Christopher Thomas, christopher.thomas@tufts.edu

(1053)

The Effect of Signage and YAH Maps on Indoor Wayfinding in Regular and Emergency Condition. QI WANG and YIN XIAO, *Sun Yat-Sen University* — With complex indoor environments, people wayfind using available signage or symbolic maps, e.g., the You-Are-Here (YAH) map. The present study investigated indoor wayfinding using signage and a YAH map under either regular or emergency conditions. Participants attempted to reach the exit of an indoor virtual environment as quickly as possible, by following route signs and/or determining a route using the YAH map. Signs at intersections were either valid or invalid. The results showed shorter decision times in the emergency condition. While participants trusted the signage in both regular and emergency conditions, the validity of the first sign encountered strongly influenced trust of subsequent signs, the reaction time of route selection and times they checked the map. Further, if a sign guided to a more complex route than the one shown on the map, participants defaulted to using the map.

While people usually follow signage for indoor wayfinding, signage validity and route complexity can affect wayfinding behavior.
Email: Qi Wang, wangq227@mail.sysu.edu.cn

(1054)

Convex Hull as a Heuristic. NAAMA KATZIN, *Ben Gurion University of the Negev*, DAVID KATZIN, *Tel Aviv University*, MOTI SALTI and AVISHAI HENIK, *Ben Gurion University of the Negev* — A common task in the field of numerical cognition is the enumeration task, in which participants are asked to quickly and accurately estimate the number of objects presented on the screen. The results yield two psychophysical curves. Enumeration up to four, subitizing, is accurate and fast. Enumeration above four, counting, is less accurate and more time consuming. Theories that attempted to account for the switch between four and five assumed that this is a behavioral phenomenon. We show that the shape of the convex hull, the polygon created by the smallest set (of dots) that contains all stimuli, changes at five. We ran a computer simulation that showed that the probability that all dots will compose the convex hull drops drastically at five. In addition, up to four, the convex hull highly predicts numerosity. We suggest that the perceptual system utilizes convex hull as a heuristic to estimate numerosity.
Email: Naama Katzin, naamaka@post.bgu.ac.il

(1055)

Investigating Sex Differences in a Large Scale, Real World Way-Finding Task. A. K. MUNION, JEANINE STEFANUCCI and JON E. BUTNER, *University of Utah*, ERICKA ROVIRA and MICHAEL D. HENDRICKS, *United States Military Academy*, PETER N. SQUIRE, *Naval Surface Warfare Center Dahlgren* — Navigation and way-finding are a daily part of human experience. In both spatial cognition and spatial navigation, sex differences are consistently found; however, there is little research on whether and how these differences manifest in large scale, real world navigation tasks. Spatial cognition measures and GPS tracks were collected from male and female cadets completing a way-finding task, using a map and compass in a 6km sq. wooded area. We tested which of the cadets produced levy flight patterns, and created variables representing revisiting behavior and directional persistence in navigation, from the GPS tracks, as behavioral characterizations of the cadets movements. Preliminary results suggest that women perform worse than men on both time to completion and accuracy on the task. Further investigations between navigation success, GPS decomposition variables and cognitive measures are being tested with more complex models, determining if the different spatial patterns produced by men and women predict success.
Email: Ascher Munion, a.munion.psych@gmail.com

(1056)

The Use of Distance and Direction Information in a Virtual Reality Environment. DARIN L. HOYER and STEPHEN DOPKINS, *George Washington University* — The layout of a spatial environment can be coded using direction and/or distance information. We hypothesize that reliance on these separate pieces of information can be influenced by environmental factors. Using a virtual reality environment, participants were tasked to remember the location of target objects using two reference objects of identical shape but differing orientation. One reference object was vertical, creating a tall pillar, and the second reference was horizontal, creating a long extended boundary. We hypothesized that distance information and direction information would not be encoded equally from the two different reference objects and that evidence of that would show in the distribution of the placement of the target objects. Results suggested that distance information was better encoded from the extended boundary while direction information was better encoded from the vertical pillar.
Email: Darin Hoyer, darinhoyer@gwmail.gwu.edu

(1057)

"Moral is Up, and Immoral is Down": Does Vertical Spatial Metaphor of Morality Influence Our Spatial Relation Judgments? NING JIA and ZHONGYI LU, *Hebei Normal University* — The study systematically investigated the impact of vertical spatial metaphor of moral concepts on spatial relation judgments in three experiments using the spatial relation judgment paradigm. We found that: (1) In the verticality (above/below) judgment, moral words were responded to faster than immoral words when the words were presented above the bar; in contrast, when the words were presented below the bar, immoral words were responded to faster; (2) in the proximity (near/far) judgment, more moral than immoral words were judged to be "far" (an upward bias) when words were presented above the bar; but when the words were presented below the bar, no significant bias was found for moral or immoral words; (3) in precise distance estimation, an overestimation was observed when participants were primed with moral words and an underestimation was observed when participants were primed with immoral words. The current results demonstrated that vertical spatial metaphor of moral concepts influences various dimensions of our spatial relation judgments. They extend research on moral metaphor and embodied cognition by using Chinese traditional moral concepts and the classical spatial relation judgment task.
Email: Ning Jia, jnajh@126.com

(1058)

Negative Patterning in a Virtual Environment With a Distinctive Shape. MURRAY R. HORNE, *California State University, East Bay* — In Experiment 1, participants were required to learn about the presence or absence of a hidden goal in different environments. The presence of a goal could be determined by the geometric cues of a kite environment (A+), or a spherical cue presented in a square (B+). When the sphere was presented in the kite-shaped environment the goal was not present (AB-). In Experiment 2 a more complex negative patterning paradigm was used to determine if configural or unique cue theory could explain the results observed. To do this, participants received A+ trials as described above, but in the square, the sphere and white wall panels predicted the presence of the goal (BC+). In addition, when the wall panels and the sphere was present in the kite, there was no goal present

(ABC-). For both experiments, participants successfully solved the discriminations. Further results suggest that these results are more in line with a configural theory of learning rather than alternative elemental theories. Implications of these results to associative theories of spatial learning in environments with distinctive shapes will be discussed.
Email: Murray R. Horne, murray.horne@csueastbay.edu

(1059)

Relating Video Gaming and Spatial Cognition in Women. LANIE DIXON, LACE M. PADILLA, JEANINE K. STEFANUCCI, SARAH H. CREEM-REGEHR and ALEXANDER H. JOHNSTONE, *University of Utah* — While research has identified sex differences in some spatial abilities, less is known about how experience or training may play a role in the potential development of these differences. The current study examines whether regularly playing video games outside of a laboratory environment is related to performance on spatial cognition tasks that typically demonstrate sex differences: mental rotation and a virtual Morris Water Maze task. We were especially interested in whether women gamers who had a preference for playing action games, and play at least 7-9 hours per week, show better performance than women non-gamers. Preliminary results confirm this hypothesis. Women gamers were significantly more accurate than women non-gamers on the virtual Morris Water Maze task. Ongoing testing with male gamers and non-gamers is currently in progress as comparison groups. Our results will be discussed in the context of the potential for spatial training to facilitate spatial cognition.
Email: Jeanine Stefanucci, jeanine.stefanucci@psych.utah.edu

(1060)

Switching Between Global and Local Orientations. XUEHUI LEI, LEI ZHANG and WEIMIN MOU, *University of Alberta* — This study investigated whether people could develop a global representation of local environments by locomoting among them. Participants learned objects' locations in two virtual rooms in an immersive virtual environment. One group of participants, as a control, only were teleported between the rooms. The other group of participants learned locations of five buildings' before they locomoted between the rooms to learn the objects inside. During testing, both groups adopted a local view, which alternated between the rooms, and pointed to objects within the same room. The second group also pointed to the buildings while adopting local views. The results showed that participants responded faster if the headings in two consecutive trials were locally consistent. Although no global priming effect was observed, the second group overall estimated their global headings and positions accurately relative to buildings; their global heading estimation positively correlated with the global priming effect, but not with the local priming effect. These results suggest that people can develop a global representation of two local environments by path integration without impairing local ones and adopt the perspective on the more efficient level.
Email: Xuehui Lei, xuehui1@ualberta.ca

(1061)

Gender Differences in Memory for Landmarks at Choice Points. ZACHARY HIMMELBERGERER, KYLE KRAEMER and EDWARD C. MERRILL, *The University of Alabama* — In daily life, people are often tasked with learning specific routes through novel environments. A common strategy, disproportionately employed by females, is remembering which direction to turn at specific landmarks (Lawton, 1994). Using this strategy, landmarks occurring at choice points are generally more important for remembering the route. The current study evaluated possible gender differences in landmark recognition for landmarks occurring at choice points versus those not at choice points. Participants were shown a novel virtual environment and asked to learn a specific path. After participants navigated the route on their own, they were shown pictures of landmarks and asked to decide if they were seen in the environment. Further, participants were asked to decide which direction they turned after seeing the landmark. The results suggest gender differences in the way people process different landmarks during wayfinding. This has important implications for basic and applied research on spatial navigation.
Email: Zach Himmelberger, zhimmelbergerer@crimson.ua.edu

(1062)

Acquisition of Spatial Knowledge From Wayfinding. QILIANG HE, TIMOTHY P. MCNAMARA and BOBBY BODENHEIMER, *Vanderbilt University*, ALEXANDER KLIPPEL, *Pennsylvania State University* — Participants learned locations of buildings in a mall by repeatedly searching for storefronts from a fixed starting position. Desktop VR was used; participants used a joystick for translation and rotation. Three levels of environmental complexity were created by varying the mutual alignment of buildings. Path type was manipulated by varying object penetrability: Buildings could be impenetrable, which required participants to navigate on the roads, or penetrable, which allowed participants to take the shortest straight-line path to a goal. After completing learning, participants pointed to storefronts from the starting position. Results showed that object penetrable and impenetrable conditions measured survey-like and route knowledge respectively; survey knowledge as measured by the pointing task was better in the least complex environment; and environmental complexity modulated knowledge transfer, such that in the least-complex environment, both route and survey knowledge developed regardless of path type, but in the most-complex environment, only path-specific spatial knowledge developed.
Email: Timothy P McNamara, t.mcnamara@vanderbilt.edu

(1063)

Folding the Dice: Strategy and Individual Differences in the Make-A-Dice Test. HEATHER BURTE and AARON L. GARDONY, *Tufts University*, ALLYSON HUTTON, *Think3d!*, HOLLY A. TAYLOR, *Tufts University* — The Make-A-Dice test was designed to assess spatial visualization abilities, or the ability to mentally manipulate 2- and 3-dimensional figures. The test involves viewing a cube net (flattened cube) with numbers on two cube sides. Participants number the empty cube sides

using two rules: numbers 1-6 used only once, and numbers on opposite sides add to 7. Elementary students (8 items) and adult (11 items) completed Make-A-Dice pre- and post-tests, along with measures of mathematical reasoning and spatial visualization. Elementary student Make-A-Dice performance related to math, Paper Folding, and Purdue spatial visualization performance. Adult Make-A-Dice performance related to math anxiety and performance on math, Paper Folding, and Purdue spatial visualization measures. Despite the simple math involved in the Make-A-Dice test, performance was related to real-world math problems in which spatial strategies could be used. Overall, the Make-A-Dice test assesses individual differences in spatial visualization in both adults and children.
Email: Heather Burte, heather.burte@tufts.edu

(1064)

Age-Related Differences in Cognitive Mapping During Spatial Navigation. ALINA NAZARETH, *Temple University*, STEVEN M. WEISBERG, *University of Pennsylvania*, KATE MARGULIS, ANH DO, REFA HAJ and NORA S. NEWCOMBE, *Temple University* — Cognitive mapping during navigation has primarily been studied with adult populations. We investigated cognitive mapping during pre-driving adolescent years. One hundred and six participants, between 8 and 16 years of age explored a virtual environment (VE; Weisberg, et al., 2014), comprising two main routes and two connecting routes. Main routes comprised 4 target buildings. This was followed by a pointing task and a map arrangement task. Hierarchical regressions suggested that age accounted for approximately 27% and 29% of unique variance on the pointing and map arrangement tasks respectively. The 8-10 age group did significantly worse than the 11-13 and 14-16 age groups on the pointing, F (2, 103) = 17.158, p< .001 and map arrangement tasks F (2,103) = 13.32, p < .001. The latter two groups were significantly different only on the map arrangement task. Results suggest developmental trends in cognitive mapping that may develop from independent driving/navigation experience.
Email: Alina Nazareth, alina.nazareth@temple.edu

(1065)

Visual Comparisons That Enhance Spatial Category Learning in Science. BENJAMIN D. JEE, *Worcester State University* — This study investigated whether and how the similarity of visual examples affects spatial category learning in science. Participants learned about the distinction between two types of geological structures—*normal* and *reverse* faults—that differ in spatial layout. Research on analogical comparison suggests that highly similar contrasting examples highlight spatial distinctions between categories. Thus, we predicted that comparison of visually similar examples would enhance learning. We conducted an experiment in which participants were presented with two images of geological faults—one normal, and one reverse—embedded in a structural geology text. The images were either high or low in similarity. Participants then classified 22 new images of faults, 11 normal and 11 reverse. Consistent with our prediction, participants who saw similar examples in the instructional text classified faults more accurately. Thus, visually similar contrasts may provide effective supports for concept learning. This finding can be broadly applied in the sciences.
Email: Benjamin D. Jee, bjee@worcester.edu

(1066)

Understanding the Interplay Between Self-Reflection and Navigation Performance. BENJAMIN D. NELLIGAN, *University of Notre Dame*, JUSTIN G. LEE and AMY L. SHELTON, *Johns Hopkins University* — Although people can readily describe their navigational abilities and preferences, questions remain about the malleability of these self-perceptions and whether they influence subsequent behavior. In Experiment 1, participants completed inventories about navigational ability and preferences before and after a virtual navigation task. Results indicated that participants' ratings changed from pre- to post-navigation to more closely match their performance. Moreover, we observed an unexpected pattern of performance in the navigation task. For Experiment 2 we reanalyzed data from a previous study in which participants either completed the questionnaires before or after the navigation task. There were no differences in navigation performance or average self-report ratings between groups. The key difference between Exp. 1 and 2 was whether we cued the participant to the relationship between measures or not, suggesting that although self-reports and navigation can influence each other, the key may be in the way you frame the overall experience.
Email: Benjamin Nelligan, bnelliga@nd.edu

(1067)

Distribution Analysis for Category-Based Distortions in Spatial Memory. CRISTINA SAMPAIO, *Western Washington University*, RANXIAO FRANCES WANG, *University of Illinois at Urbana-Champaign* — Remembered locations consistently reflect a compromise between a target's coordinate position and its region's prototypical position. The effect is robust, and blending of codings is the standard interpretation of these data. However, no available data reveal *how* the bias actually occurred. People may take a weighted average of the metric and categorical representations, or the two codings may compete for response, each winning with a certain probability. Both mechanisms can produce a biased mean response. The present study investigated the underlying basis for the category-based distortions using a new distribution analysis. Participants viewed a target within a blank circle and reproduced its location after a delay. The error data for individual participants were fit with a Kernel curve, which provides the distribution without the assumption of normality. All individual distributions displayed a clear biased main peak, indicating a weighted average between the representations, not an alteration between two representations.
Email: Cristina Sampaio, cristina.sampaio@wwu.edu

(1068)

Integrating Partial Viewpoints of Space: Array Stability Supports Flexibility. CORINNE A. HOLMES (Graduate Travel Award Recipient) and NORA S. NEWCOMBE, *Temple University* — The ability to recall a spatial layout from multiple orientations – spatial flexibility – is a challenging cognitive

process, especially when the global layout is viewed piecemeal and must first be integrated before it can be flexibly recalled. The current study examined if experiencing the transition between partial viewpoints improves global spatial memory (segmented views versus continuous visual flow), if action provides an additional advantage above passive visual flow (participant- versus experimenter-generated transitions), and if the type of action matters (rotating the array versus moving around it). Compared to segmented views, continuous visual flow provided a significant spatial advantage when paired with movement around a stable array (active or passive). This advantage was evident at both preferred and non-preferred orientations, suggesting that array stability may be key to flexible spatial learning. The advantageous effect of keeping the to-be-learned space stable may inform science pedagogy, when models are used to teach spatial structure.
Email: Corinne A. Holmes, corinne.holmes@temple.edu

WORKING MEMORY I

(1069)

Unconscious Information Processing in Working Memory. AMY L. UNDERWOOD, *University of Missouri-Columbia*, FERNANDO VALLE-INCLAN, *University of La Coruna-Spain*, NELSON COWAN and STEVEN A. HACKLEY, *University of Missouri-Columbia* — Traditionally, the contents of WM have been equated with conscious awareness. This view is contradicted by experimental findings regarding unconscious visual perception (Pan, Bingyuan, Zhao, & Soto, 2013), which indicate that unconscious items can also be maintained in WM. Therefore, it seems plausible that unconscious items held in WM should also place a cost on WM capacity. In this study, memory items (randomly oriented bars) on one half of a stereoscopic display were made invisible using continuous flash suppression (CFS). After an 800 ms delay, participants decided whether the probed memory item on either the visible or invisible hemifield was of a changed orientation. Results indicate that change detection for visible memory items was impaired by increasing the load of suppressed items, while change detection for suppressed items was at chance levels. These findings suggest that unconsciously processed items require space in working memory, much like items of conscious awareness.
Email: Nelson Cowan, cowann@missouri.edu

(1070)

Moving the Limits of Performance in a Visual Working Memory Task. NICOLE HAKIM and EDWARD VOGEL, *University of Chicago* — The time course of visual working memory has previously been studied using single-probe measures. Here, we used a Whole Report task, which allowed us to test memory about all items in the set. Subjects were shown arrays of 6 colored squares and were asked to report the color of every square. Across experiments, we manipulated the interval between the memory array and the test array (from 0 to 7.5 seconds) so that we could chart the time course of memory acquisition. We found that performance on the task was impaired at very short ISIs, reflecting a data limit, and increased thereafter until reaching a limit of roughly 3 items. However, at very long intervals (>5.5 seconds), performance increased slightly, possibly due to the use of verbal rehearsal strategies. These results suggest that working memory performance limits may change depending upon the available amount of time for encoding and rehearsal.
Email: Nicole Hakim, nhakim@uchicago.edu

(1071)

Looking Sharp: Becoming a Search Template Boosts Precision and Stability in Visual Working Memory. JASON RAJSIC and NATASHA OUSLIS, *University of Toronto*, DARYL WILSON, *Queen's University*, JAY PRATT, *University of Toronto* — Visual working memory (VWM) plays a central role in visual cognition, and current work suggests that there is a special state in VWM for items that are the goal of visual searches. However, whether the quality of memory for target templates differs from memory for other items in VWM is currently unknown. In this study, we measured the precision and stability of memory of search templates and accessory items in order to determine whether search templates receive representational priority in VWM. Memory for search templates exhibited increased precision and probability of recall, while accessory items were remembered less often. Unlike search templates and baseline VWM representations, accessory items did not exhibit memory benefits when these items appeared in search. Taken together, our results show that becoming a search template can substantially affect the quality of a representation in VWM.
Email: Jason Rajsic, j.rajsic@gmail.com

(1072)

Can We Learn to Forget? EDYTA SASIN (Graduate Travel Award Recipient), FLORIAN SENSE and MARK NIEUWENSTEIN, *University of Groningen* (Sponsored by Candice Morey) — While a lot is known about why people forget information that has to be remembered, only little is known about whether people can intentionally forget information held in working memory (WM). Here, we used memory-driven attentional capture to examine such intentional forgetting. In Experiment 1, we found that a distractor matching a to-be-forgotten item still captured attention in a visual search task, but this capture effect was weaker than that observed for distractors that matched a to-be-remembered item. In Experiment 2, we asked whether forgetting can be learned by practicing the task across four days. Results showed that while attentional capture by to-be-remembered distractors decreased with training, there was no reduction of attentional capture by to-be-forgotten items. These results suggest that while practice may allow participants to resist attentional capture by items retained in WM, it does not allow participants to become better at forgetting no longer relevant items.
Email: Edyta Sasin, e.sasin@rug.nl

(1073)

Exploring the Focus of Attention Using a Double-Retro-Cue Paradigm. JAMIELYN R. SAMPER, JASON CHEIN and PAULINE GEPILANO, *Temple University* — Cueing visual information after its initial presentation, known as retro-cueing, imparts a heightened status in working memory (WM)

to the cued item. Some research suggests that this special status is afforded by a single item focus of attention (FOA), such that when maintaining multiple items in WM there is a necessary tradeoff in the quality and accessibility of all but a single item representation. However, evidence to date does not clarify whether prioritization of a specific item occurs under volitional control, or through an involuntary process. The current study manipulated the validity of two sequentially-presented retro-cues, as well as the specific instructions regarding the treatment of each cue. When both cues could be considered equally valid, no differences in relative priority were observed. However, when the second cued item could be treated as more valid than the first, the latter item attained a more privileged status in WM.
Email: Jamielyn Samper, jamielyn.samper@temple.edu

(1074)

Memory Is in the Eye of the Beholder: Pupil Dilation as a Psychophysiological Index of Working Memory Capacity. ALEXANDRE MAROIS, JOHNATHAN CRÉPEAU, MICHAËL LÉVESQUE-DION and FRANÇOIS VACHON, *Université Laval* — Measures of working memory capacity (WMC) are consistently used as predictors of a wide range of human abilities. According to Unsworth and Robison (2015), the pupil diameter measured during the retention of visual material can index individual differences in the number of items held in memory and WMC limits. In that study, WMC and pupil size were estimated based on the same memory task. Yet, Kahneman (1973) stated that a valid physiological proxy of cognitive processing must reflect not only within- but also between-tasks variability. Accordingly, our study aimed to verify whether this relationship between pupil dilation and WMC extend to contexts where both measures are assessed using distinct memory tasks. To do so, the pupil dilation response (PDR) was measured during the encoding phase of a visual serial recall task while WMC was estimated using complex span tasks (e.g., OSPAN). Results showed that the mean PDR elicited by the to-be-remembered items was 1) positively correlated with both serial recall and complex span performance and 2) larger for high-capacity than for low-capacity individuals. Those findings suggest that PDR constitutes a valid within- and between-tasks psychophysiological index of WMC.
Email: Alexandre Marois, alexandre.marois.1@ulaval.ca

(1075)

Alpha-Band Activity Reveals Robust Representations of Spatial Position During a Non-Spatial Working Memory Task. JOSHUA J. FOSTER, EMMA BSALES and EDWARD AWH, *The University of Chicago* — Past work suggests that stimulus location has a privileged status in visual working memory (WM). Indeed, items in WM are typically probed on the basis of their original location. Nevertheless, it remains unclear whether stimulus location is actively maintained in WM during non-spatial WM tasks. To test this possibility, we examined spatially selective alpha-band activity, which tracks location held in WM (Foster et al., 2016). In Experiment 1, observers remembered the color of a sample stimulus. Although location was irrelevant to the task and was unpredictive of probe position, alpha activity tracked the original location of the stimulus throughout the delay period. Experiment 2 showed that this spatially-selective alpha activity was amplified for voluntarily selected items, indicating that these spatial representations are under volitional control rather than being an automatic consequence of sensory activity. Thus, active representations of spatial position are sustained during the maintenance of non-spatial features in WM.
Email: Joshua Foster, joshuafoster@uchicago.edu

(1076)

Working Memory Complex Span Task: The Study of Distractors' Status Through Repetition Priming Paradigm. ISABELLE DAGRY and PIERRE BARROUILLET, *University of Geneva* (Sponsored by Anik De Ribaupierre) — In working memory complex span tasks involving the maintenance of memory items while processing distractors, it has been suggested that the free time in-between these distractors is used for their inhibition by removal. This hypothesis was tested by asking participants to maintain letters while performing a lexical decision task on letter strings successively displayed on screen after each letter at two different paces (fast and slow). Some of these strings were repeated in order to produce repetition priming. The hypothesis was that if free time in-between distractors is used for their removal, this removal will make repeated distractors new again and reduce repetition priming. Consequently, repetition priming should decline as free time increases and makes distractor removal more efficient. Contrary to the removal hypothesis, variations in free time had no effect at all on repetition priming. This suggests that distractors are not actively removed from working memory.
Email: Isabelle Dagry, isabelle.dagry@unige.ch

(1077)

Examining Expectancy Effects in Working Memory Training. NANCY TSAI and SNIGDHA KAMARSU, *University of California, Irvine*, MARTIN BUSCHKUEHL, *MIND Institute*, JOHN JONIDES and PRITI SHAH, *University of Michigan*, SUSANNE JAEGGI, *University of California, Irvine* — Working memory (WM), the ability to store and manipulate information for brief periods of time, is critical for higher-order cognition and highly predictive for scholastic achievement. Recent interventions targeting WM have demonstrated promising results suggesting the malleability of the WM system. It has been argued, however, that gains resulting from WM training are due to placebo effects, and that in order to evaluate the efficacy of WM training, expectations must be matched in an active control group. We examined the effect of expectations on WM training upon inducing specific beliefs about expected outcomes. Results indicated that participants in the WM training condition showed gains regardless of expectations, however, for the active control group, expectations for positive outcomes did not result in WM gains. Together, these results indicate a genuine change in WM that is not driven by expectations, supporting the notion that WM training is indeed effective.
Email: Nancy Tsai, NTsai1@uci.edu

(1078)

Working Memory Performance and Neural Activity Associated With Strategy Use. ARIANA TART-ZELVIN, ALYSSA M. KORELL, REINALYN ECHON, XIAOMENG XU and KANDI JO TURLEY-AMES, *Idaho State University* — Strategy training positively influences working memory (WM) processing and enhances the relationship between WM and higher cognitive functioning (Turley-Ames & Whitfield, 2003). We examined neural activity during a WM task with and without the use of rehearsal strategy (RS). Forty healthy participants, who did not significantly differ on age, gender, or years of education, completed a modified operation span task in an MRI scanner (M-OSPAN; Turner & Engle, 1989). The experimental group (EG; $n = 20$) completed the M-OSPAN after RS training. Controls (CG; $n = 20$) displayed diffuse activation spanning most of the frontal lobes, while the EG demonstrated a significantly more parsimonious activation pattern ($p < .001$). The EG outperformed the CG on free recall (t (38) = -2.94, $p = .006$), displaying better performance on the WM task. Impressively, the EG completed the task more efficiently by utilizing significantly fewer brain regions than the CG.
Email: Ariana Tart-Zelvin, tartaria@isu.edu

(1079)

When Output Order Modulates the Hebb Learning Effect. JEAN SAINT-AUBIN, MYLENE RICHARD, MARIE-CLAUDE GUERRETTE and KATHERINE GUERARD, *Universite de Moncton* — In immediate serial recall, when a list is repeated, recall performance improves. This phenomenon, known as the Hebb repetition effect (Hebb, 1961), is considered a laboratory analogue to language learning. We investigated the role of language production by varying recall direction. One list was repeated every third trials and recall direction changed halfway in the experiment. In Experiment 1, participants began with a forward recall requirement, while in Experiment 2, they began with backward recall. Recall performance of the non-repeated lists was unaffected by the change in recall direction. However, recall performance of the repeated list dropped after switching from forward to backward recall, while it was unaffected by the change from backward to forward recall. It is concluded that learning of a repeated list in forward recall relies on production processes while in backward recall, production processes seem to play a negligible role.
Email: Jean Saint-Aubin, jean.saint-aubin@umoncton.ca

(1080)

What Item Response Theory Can Tell Us About the Complex Span Tasks. CHRISTOPHER DRAHEIM, TYLER L. HARRISON, SUSAN E. EMBRETSON and RANDALL W. ENGLE, *Georgia Institute of Technology* (Sponsored by Dan Spieler) — Working memory capacity is often measured via complex span tasks, which have demonstrably high reliability and validity (Redick et al., 2012). Recent work has introduced shortened versions of the complex span tasks, resulting in different versions being administered (Foster et al., 2015; Oswald et al., 2015). These differences can lead to varying power to discriminate individuals at different ability levels. Thus, research findings may be inconsistent across populations due to differing appropriateness for the ability levels. The present study uses a combination of item response theory and correlational analyses to better understand the psychometric properties of the complex span tasks. Our findings show that the typical administration of the complex span tasks is not suitable for above average ability samples, and the operation span is particularly problematic. We discuss the implications of these findings.
Email: Christopher Draheim, cdraheim3@gatech.edu

(1081)

The Reliability and Stability of Change Detection Capacity Estimates. KIRSTEN C. S. ADAM, *University of Chicago* (Graduate Travel Award Recipient), XINYI FANG, *Southwest University*, EDWARD K. VOGEL, *University of Chicago*, ZHAN XU, *Southwest University* — Because of the central role of working memory capacity (WMC) in cognition, many studies have used short measures of WMC in order to examine its relationship to other domains. Here, we measured the reliability and stability of single-probe change detection capacity estimates. In Experiment 1, subjects (N = 135) completed a large number of trials of a single-probe change-detection task (540 in total, 180 each of set –sizes 4, 6, & 8). With large numbers of trials and subjects, reliability estimates were high (split-half reliability $r = .9$). We then used an iterative down-sampling procedure to create a "look-up table" for expected reliability in experiments with small sample sizes. In Experiment 2, subjects (N = 79) completed 31 sessions of single-probe change-detection. The first 30 sessions took place over 30 consecutive days, and the last session took place 30 days later. This unprecedented number of sessions allowed us to examine the effects of practice on stability and internal reliability. Even after much practice, individual differences remained stable over time (average between-session $r = .76$).
Email: Kirsten Adam, kadam1@uchicago.edu

(1082)

Instructed Refreshing: Beneficial for All Kinds of Memoranda? NAOMI LANGEROCK, *University of Geneva,* VALÉRIE CAMOS, *University of Fribourg,* EVIE VERGAUWE, *University of Geneva* — The present study aimed at better understanding the process of refreshing in a working memory context. A recent study by Souza, Rerko and Oberauer (2015) had shown that instructed refreshing (i.e., actively rethinking about a cued memory item) has a beneficial effect on the short term maintenance of colors. Colors cued twice were better recalled than colors cued once, which were in turn better recalled than colors not cued at all. The present study aimed to replicate these results, making use of verbal memoranda (see also Souza, Vergauwe, & Oberauer, in prep), either words or non-words. The beneficial effect of instructed refreshing was not replicated, neither for words nor non-words. This effect seems thus to depend on the nature of memoranda involved. This raises questions on the type of mechanism this paradigm is tackling and on the nature of memory items that can be refreshed.
Email: Naomi Langerock, naomi.langerock@unige.ch

FALSE MEMORY I

(1083)

Passive Acquisition of Misinformation From Social Media. ANDREW P. HUNT and ALAN D. MUSICANT, *Middle Tennessee State University* — We were interested in whether or not participants would use misinformation learned from social media to answer questions on a general knowledge test. Participants read through fake Facebook statuses, some of which contained incorrect information about general world knowledge. Participants were told that they were participating in a study examining the effect of social media layout on visuospatial attention. This deception was utilized so that the participants would not actively monitor the posts for misinformation. Following a visuospatial delay task, they were then given a test of general knowledge. Participants used information from the posts to answer the questions. Many indicated that the information was something that they had known prior to the experiment. The results suggest that people may learn misinformation from social media when they are simply "scrolling" through posts in their social networks. People may also integrate that information into memory as something that they just know.
Email: Andrew P. Hunt, ahuntpsy@gmail.com

(1084)

Reactivation of Event Memory Does Not Increase Memory Impairment Due to Misinformation. DIANNA S. LONG, *University of Nebraska-Lincoln*, ROBERT F. BELLI, *University of Nebraska- Lincoln*, AYANNA K. THOMAS and LEAMARIE T. GORDON, *Tufts University* — Retrieval enhanced suggestibility occurs when initial testing prior to postevent misinformation increases the misinformation effect. One explanation suggests introduction of postevent misinformation disrupts the reconsolidation process initiated by reactivation. To test this explanation, half of the participants' memories were tested (reactivated) prior to exposure to consistent, neutral, and misleading postevent information. Participants then took a modified cued recall test which asked them to report both original and postevent details. Results indicate a misinformation effect in which consistent postevent information increases performance and misleading information decreases performance, and a testing effect, in which reactivation increases performance. Analyses restricted to misleading and neutral postevent information reveals an overall postevent information main effect indicative of memory impairment but no significant reactivation x postevent information interaction. These findings indicate that event memory is impaired by misinformation but not more strongly impaired by reactivation. Hence, we find no evidence for impairment via disrupting reconsolidation.
Email: Dianna Long, dlong4789@gmail.com

(1085)

Critical Lure Valence and Memory Distortion for Orthographic Associates: An EEG Study. NICHOLAS GRIFFIN and DAVID M. SCHNYER, *University of Texas, Austin* — Emotional stimuli lead to memory bias in individuals with depressive symptoms – people with depression have stronger memory for mood-congruent information, creating a bias for negative stimuli. To further investigate this phenomenon, we collected EEG data as participants were tested on their memory for orthographic associates. Participants encoded 40 lists of 8 orthographic associates of either neutral or negative critical lures, then were tested on studied list words and novel lures. Our non-depressed sample showed a significant main effect of accurate responses to lure by valence, with significantly more correct rejections of negative lures than neutral lures. Examining the ERPs associated with the response to lures revealed a late positive deflection (450ms-600ms) that was greater for correct rejections relative to false alarms. Further, we found greater peak N400 negativity for correct rejections of neutral lures relative to negative lures. Our findings support the use of ERPs to elucidate memory components involved in valence-related recognition memory and memory bias.
Email: Nicholas Griffi, ngriffin@utexas.edu

(1086)

Systematic Distortions in Clinicians' Memories for Client Cases: Increasing Causal Coherence. ERIENNE R. WEINE and NANCY S. KIM, *Northeastern University* — Clinicians represent mental disorders as causal networks of features (Kim & Ahn, 2002), and people generally treat the proportionality between two features as a cue to causality (Einhorn & Hogarth, 1986). In the current work, we asked whether clinicians remember client cases as more causally coherent than they actually were. Specifically, we tested whether clinicians misremember features of client cases that were disproportionate to one another in severity as having been more proportionate. Seventy-one clinicians completed a recognition task for client cases that described life events, client reactions to those events, and behaviors following those reactions. In cases where the severity of the client's reaction did not match the severity of the event or behaviors, clinicians incorrectly recognized false reaction lures that were more proportionate to the event or behaviors than the actual reaction. Causally incoherent client cases were thereby systematically distorted in clinicians' memories to become more causally coherent.
Email: Erienne Weine, e.weine@neu.edu

(1087)

The Effect of Suggested Misinformation and Multifaceted Questions on Memory for Witnessed Events. BLAIR E. BROWN, PAIGE E. SCHREIFELS and QUIN M. CHROBAK, *University of Wisconsin Oshkosh* — Previous research has demonstrated that multifaceted questions (which contain both true and false propositions in the same question) significantly reduce eyewitness accuracy (e.g., Perry et al., 1995). Chrobak, Rindal, and Zaragoza (2015) added to these findings by showing that the negative impact of multifaceted questions is magnified for participants that have been previously exposed to misleading information about the initial witnessed event. The current investigation extended these findings by showing that the effect is not eliminated or even reduced when participants were instructed to only assent when all parts of the question were true. This was found regardless of whether participants were tested immediately or after a 1 week delay. The inclusion

of these instructions did however make participants less likely to indicate that they remembered seeing the false details as opposed to believing that they occurred. Both theoretical and practical implications for these findings are discussed.
Email: Quin M. Chrobak chrobakq@uwosh.edu, chrobakq@uwosh.edu

(1088)

A Representational Hierarchical Account of Recognition Memory: Paradoxical Shielding From Semantic Interference in Natural Aging. D. MERIKA WILSON, KEVIN POTTER and ROSEMARY A. COWELL, *University of Massachusetts Amherst* — In the Deese–Roediger–McDermott (DRM) paradigm, false memory for unpresented lures depends upon semantic associations between lures and studied items. We hypothesized that the medial temporal lobe (MTL) houses conjunctive representations of items in their spatial, temporal and semantic context, and that natural aging causes MTL deterioration. We predicted that older participants should paradoxically be shielded from semantically-mediated false memories if semantic associations are rendered less obvious at study, such that young adults extract the associations, but older adults do not. In a modified DRM paradigm, we presented multiple lists of semantically-related words interleaved, partially obscuring the semantic relations within each list. As a control, we included lists of phonetically-related words. Compared to young controls, older adults showed less study-related interference for recognition of semantic items, but more interference for phonetic items. These findings support a Representational Hierarchical account of memory in which aging compromises conjunctive MTL representations.
Email: D. Merika Wilson, dmerikawilso@umass.edu

(1089)

The Role of Fluency in the Truthiness Effect. ABIGAIL JACKSON and ROBERT L. GREENE, *Case Western Reserve University* — Claims are more likely to be judged true when accompanied by related information, even when that information does not actually provide any evidence for evaluating the veracity of the claims. This finding, coined the truthiness effect, is thought to occur because claims accompanied by nonprobative information are processed more fluently— and therefore seem more accurate— than unembellished claims. The role of fluency in the truthiness effect is explored in a series of experiments, in which participants are asked to verify statements in the presence or absence of related but nonprobative images.
Email: Abigail Jackson, abigail.jackson@case.edu

(1090)

False Memories for Associatively and Categorically Related Items: The Role of Critical Lure Identifiability and Warnings. RACHEL A. WORKMAN, *Illinois State University*, MONIQUE LEGAULT and JEN COANE, *Colby College*, DAWN MCBRIDE, *Illinois State University* — Empirically induced false memories are reliably elicited by giving participants lists of words related to a single non-presented word (i.e., the critical lure, CL). False memories are higher for lists that are associatively and categorically related (A+C; e.g., *boxer*, *coyote*) than lists that are non-categorically but associatively related (NC-A; e.g., *bark*, *beware*), reflecting a *feature boost*. An alternative is that lower false memory in NC-A lists is due to more effective monitoring - in other words, participants are better able to identify and reject the CL at test. We examined whether the effectiveness of warnings and CL identifiability varied across list type. Participants were more likely to correctly identify the CL in A lists; however, warnings were equally effective for both list types. Consistent with previous findings, C+A lists resulted in higher errors, suggesting that the feature boost is not solely due to differences in monitoring across list types
Email: Jen Coane, jhcoane@colby.edu

(1091)

Memory For the Model Statement as a Cue to Deception. DOMINICK J. ATKINSON and CHRISTIAN A. MEISSNER, *Iowa State University* — Recent research in deception has focused on the development of cognitive techniques to aid in discrimination between liars and truth tellers (Vrij, 2015). One such technique involves the use of a model statement, which is presented to individuals prior to eliciting a statement from them. The model statement offers an example of a detailed/complete memory and has been shown to improve reporting and distinguish liars (Leal et al, 2015). Additionally, lying strategy has been shown to influence discrimination, with lies based upon actual memories being more difficult to identify (Michael, 2014). Participants created an alibi statement that was true, a lie based upon a real memory (displaced lie), or a lie that was based upon what they typically do, but not based upon a real event (novel lie). Additionally, half were presented with the model statement. We found that liars and truth tellers differentially attended to and recalled different parts of the model statement, with all conditions recalling equally at the beginning and end of the statement, but novel liars (cognitive load) recalling less of the middle. We discuss the theoretical and practical implications of this finding.
Email: Dominick Atkinson, datkinso@iastate.edu

(1092)

Boundary Extension in Picture Memory: The Forest or the Trees? LESLIE A. VALDES, *Saint Cloud State University*, W. TRAMMELL NEILL, *University at Albany, State University of New York* — When tested on memory for scenes, people often mistakenly believe that they studied a wider angle picture than they actually did. This "boundary extension" is commonly assumed to reflect inferential processing at the time of study. In the present experiment, participants (N = 60) studied 40 pictures of nonsense shapes (primarily from Hale, Brown, McDunn & Siddiqui, 2015) on different backgrounds of plant leaves for a later memory test. The size of the shapes (small or large) and the background viewpoint (closer or farther) were varied orthogonally. After a 20-minute delay task, participants judged whether the same pictures and eight new pictures were closer or farther in viewpoint when originally studied. Shape size and viewpoint had significant and additive effects on the

distance judgments, for both studied and unstudied pictures. The present results imply a role of decision bias at the time of test.
Email: Leslie A. Valdes, lavaldes@stcloudstate.edu

(1093)

Tunnel Memory for Traumatic Events: Is It Real? BUSRA TANRIVERDI OZKAN, *Koc University*, SALIHA BUSRA SELMAN and SINEM PALA, *Istanbul Sehir University*, ADIL DENIZ DURU, *Marmara University*, REYYAN BILGE, *Istanbul Sehir University* — Tunnel memory accounts suggest that traumatic events are remembered in a narrower perspective, with more focus on central details, compared to neutral events (Safer et al., 1998). Some argue that underlying mechanism for a tunnel memory is arousal. Fifty-four university students who does not meet the diagnostic criteria for PTSD (Brewin et. al.,2002) were tested for their memories for neutral versus emotional pictures from wide and narrow perspectives wherein arousal was induced via physical activity before encoding and retrieval phases of the experiment. Chi-square tests revealed that accuracy was higher for neutral pictures. Negative pictures were remembered from a wider perspective, while neutral pictures were remembered from a closer perspective. Physical arousal did not have an effect on recognition performance of negative or neutral pictures. The results are contradictory to the previous findings and will be discussed further.
Email: Büşra Tanrıverdi Özkan, bbusra.tanriverdi@gmail.com

(1094)

Completion of Observed Actions Through Kinematic Mental Simulation as a Source of False Memories. FRANCESCO IANÌ and MONICA BUCCIARELLI, *University of Turin*, GIULIANA MAZZONI, *University of Hull* — The results of recent investigations suggest that when people observe an action of other individuals they immediately predict what action they are going to perform (Bach et al., 2014). We assume that the underlying mechanism is a kinematic mental simulation, namely a representation of a sequence of events as they unfold in time (Khemlani et al, 2013). It does follow a main prediction: the completion of the observed action through mental simulation may give rise to a false memory. The results of an experiment confirmed the prediction. The participants watched videos in which an actor is going to perform an everyday action whose completion is not comprised in the video; in a subsequent recognition task they were more likely to accept as part of the original video a frame depicting the natural completion of the action rather than a frame depicting the completion of a different action.
Email: Francesco Ianì, francesco.iani@unito.it

(1095)

Flexible Retrieval: When True Inferences Produce False Memories. ALEXIS C. CARPENTER and DANIEL L. SCHACTER, *Harvard University* — Episodic memory involves flexible retrieval processes that allow us to link together distinct episodes, make novel inferences across overlapping events, and recombine elements of past experiences when imagining future events. However, the same flexible retrieval and recombination processes that underpin these adaptive functions may also leave memory prone to error or distortion, such as source misattributions in which details of one event are mistakenly attributed to another related event. To determine whether the same recombination-related retrieval mechanisms support both successful inference and source memory errors, we developed a modified version of an associative inference paradigm in which participants encoded overlapping experiences (AB, BC) that could later be linked to support novel inferential retrieval (AC). Participants were more susceptible to false memories for contextual details after successful inferential retrieval compared with before successful inference or after unsuccessful inference. These results suggest that retrieval-mediated recombination mechanisms underlie associative inference and memory distortion.
Email: Alexis C. Carpenter, alexiscarpenter@g.harvard.edu

METAMEMORY/METACOGNITION I

(1096)

Selectively Distracted: Divided Attention and Memory for Important Information. CATHERINE D. MIDDLEBROOKS, TYSON K. KERR and ALAN D. CASTEL, *University of California, Los Angeles* (Sponsored by Kou Murayama) — Memory can suffer as a consequence of being distracted or when multi-tasking. People often study while listening to music, in noisy coffee shops, and while checking their email. The current study examines how distraction and divided attention during encoding influences one's ability to selectively remember important information. Participants studied lists of words, with words ranging in value from 1-10 points, under one of four learning conditions: full attention; while completing a digit detection task; while listening to popular music; or while listening to unfamiliar music. Though participants recalled fewer words overall when completing the digit detection task than the other conditions, there were no significant differences between conditions in terms of selectively remembering the more valuable items. These results suggest that the ability to recall important information may be maintained in spite of other demands and that, under certain conditions, people can attend to important information while distracted.
Email: Catherine D. Middlebrooks, cmiddlebrooks@ucla.edu

(1097)

Metacognition of Time Perception. MATHILDE LAMOTTE, SYLVIE DROIT-VOLET and MARIE IZAUTE, *Clermont Auvergne University* — Metacognition concerns both individuals' knowledge about their cognitive functioning and the processes that regulate them. The study of the perception of time showed that many factors cause temporal distorsions, including, for example, attention and feedback. The purpose of the study is to propose data on metacognitive processes on temporal judgments. Participants were given a temporal discrimination task and had to rate their confidence level. Our results showed a 'hard-easy' effect in confidence judgment. The overconfidence bias observed in different cognitive tasks was

thus replicated in the case of time perception. These results were discussed in an integrative model of metacognition of time perception.
Email: marie.izaute@univ-bpclermont.fr, marie.izaute@univ-bpclermont.fr

(1098)

Expressions of Strong Verbal Confidence and Context Influence Inferences About the Person's Event Encoding. DANIELLA K. CASH and SEAN M. LANE, *Louisiana State University* — Recent research (Cash & Lane, under review) found that people readily integrate contextual information into their interpretations of verbal expressions of confidence. Eyewitness identifications justified by memory for a facial feature that appeared not to discriminate between lineup members reduced perceived confidence ratings, but seemingly discriminative justifications were rated similarly to a confidence-only statement. This suggests that participants assume optimal witnessing conditions when a highly confident statement is provided without justification. Participants in this study made a number of judgments about the presumed witnessing conditions (e.g., amount of attention) for statements that varied with respect to justification and feature discriminability of the identified suspect. Results revealed that participants interpreted a high confidence-only statement as indicating that aspects of event encoding was relatively optimal (similar to a halo effect); demonstrating willingness to make a number of broad inferences based on minimal information. Statements adding non-discriminative feature justifications decreased such ratings uniformly.
Email: Daniella Cash, daniellakcash@gmail.com

(1099)

The Susceptibility of Metacognitive Processes to Contextual Cues: The Case of Problem Solving on Screen Versus on Paper. YAEL SIDI and RAKEFET ACKERMAN, *Technion–Israel Institute of Technology* — Research comparing text-learning on screen and on paper has yielded conflicting results regarding screen inferiority in performance and monitoring accuracy. We expended this investigation to meta-reasoning, to reveal factors affecting monitoring and effort-regulation in this context, while aiming to expose specific conditions prompting screen inferiority. Our guiding hypothesis was that the screen provides contextual cues eliciting shallower processing only when task characteristics legitimate it. To examine this, we manipulated time frame (Experiment 1) and perceived task importance (Experiment 2) while solving challenging problems. We found screen inferiority in performance, efficiency, and monitoring accuracy under time pressure and when framing the task as secondary, both cues legitimating reduced effort. Practical implications are drawn from the high sensitivity of screen work to these cues. On a theoretical level, work environment is suggested to act as a contextual cue affecting metacognitive processes. The study also demonstrates commonalities between the meta-comprehension and meta-reasoning domains.
Email: Yael Sidi, yaelsidi@gmail.com

(1100)

Making Retrospective Confidence Judgments Improves Learners' Ability to Decide What 'Not' to Study. ALISON ROBEY and MICHAEL DOUGHERTY, *University of Maryland* — Judgments of learnings, predictions about future retrieval success have been assumed to help learners effectively guide study behavior. Support for this notion comes from findings showing that JOLs are correlated with memory retrieval. Retrospective confidence judgments, evaluations of past retrieval success, however, are better correlated with memory recall than JOLs. In this study we explored, given that RCJs are better correlated with memory retrieval than JOL, if RCJs would also lead to better study decisions. Participants completed a paired recall task where after recall they made a metacognitive judgment followed by a restudy decision. Metacognitive judgments were either JOLs, RCJs, or a no judgment condition. No differences were found regarding decisions for incorrectly retrieved items, however for item that were correctly retrieved, participants who made JOLs selected to restudy significantly more items than either participants who made RCJs or those who made no judgment.
Email: Alison robey, arobey@umd.edu

(1101)

The Role of Prior Knowledge and Confidence in Error Correction. DANIELLE M. SITZMAN, *Eastern Washington University*, UMA S. K. TAUBER, *Texas Christian University* — When provided with corrective feedback, high-confidence errors are more likely to be corrected than low-confidence errors, a finding termed the hypercorrection effect. However, recent research demonstrates that error correction, for both older and younger adults, is largely related to prior knowledge, while confidence may primarily serve as a proxy for prior knowledge. The current experiment explored how confidence and prior knowledge contributed to error correction across a one-week retention interval. Older and younger adults answered 120 general knowledge questions, rated their response confidence, received feedback, and rated their prior knowledge of the correct response. For the final test, participants answered the same general knowledge questions after either a 6-minute or one week retention interval. Overall, for older and younger adults, prior knowledge was strongly related to error correction regardless of retention interval and older adults demonstrated high levels of error correction even after one week.
Email: Danielle M. Sitzman, dsitzman@ewu.edu

(1102)

Retrieval Monitoring Benefits Older Adults' Self-Regulated Learning. RENEE DECARO and AYANNA K. THOMAS, *Tufts University* — We evaluated whether young and older adults used retrieval monitoring to regulate subsequent study. Young and older adults studied unrelated cue-target pairs, where the target had either a positive or negative valence. Participants made item-by-item feeling-of-knowing judgments (FOK-Js), and were questioned about target valence during the FOK-J phase. Restudy and a final test followed. FOK accuracy was lower for older adults; however, providing valence information before making FOK-Js increased older adult prediction accuracy. Both

age groups chose to restudy cue words with lower FOK ratings, though the difference in FOK-Js between items selected and not selected for restudy was more pronounced for younger adults. Importantly, restudy helped both older and younger adults; however for items not restudied, older adults demonstrated poorer final test performance than younger adults. Results highlight the effect of retrieval monitoring on the efficacy of restudy.
Email: Renee DeCaro, renee.decaro@tufts.edu

(1103)

Does Priming Productive Interpretations of Difficulty Support Engagement in Desirably Difficult Learning? VERONICA X. YAN, *University of Southern California*, ROBERT A. BJORK and ELIZABETH LIGON BJORK, *University of California, Los Angeles*, DAPHNA OYSERMAN, *University of Southern California* — One challenge to self-regulating one's learning in an effective way is that strategies that enhance learning often introduce a sense of difficulty, which leads those strategies to be under-appreciated and under-utilized. This failure to appreciate the benefits of "desirable difficulties" may be based on an assumption that difficulty experienced during learning signals impossibility. Telling people what strategies are effective or even showing them their better performance following their use of an apparently more difficult strategy is not enough to increase learners' self-directed use of such strategies (Yan, Bjork, & Bjork, in press). We investigated the effects of priming a belief that difficulty signals importance (versus impossibility or a control condition) on both learning and appreciation of two "desirably difficult" strategies: interleaving (studying related concepts intermixed vs. one at a time) and testing (vs. rereading). Activating productive interpretations of difficulty not only improved learning, but affected metacognitive judgments. Potential underlying mechanisms and moderators are explored.
Email: Veronica Yan, veronicy@usc.edu

(1104)

Neural Evidence That Learners Activate Both Cues and Targets When Making Delayed JOLs. TIMOTHY D. KELLEY, DEBBIE A. MAGREEHAN, MICHAEL J. SERRA and TYLER H. DAVIS, *Texas Tech University* — Learners' judgments of learning (JOLs) are more accurate when they make them at a delay from study than when they make them immediately after study (the delayed JOL effect). Behavioral data suggests that this effect occurs because learners attempt to retrieve target information while making delayed JOLs, whereas both cue and target information is readily available while making immediate JOLs. In the present study, we used neuroimaging to further examine the delayed JOL effect. While in the MRI scanner, learners studied pairs of faces, scenes, and objects and then made JOLs either immediately or at a random delay after studying each item. They then completed a recognition memory test. Multi-voxel pattern analysis revealed that learners activated information associated with both cues and targets when making delayed JOLs, which suggests that they attempted to retrieve associations between cues and targets. In contrast, learners mainly activated targets when making immediate JOLs.
Email: Timothy D. Kelley, timothy.kelley@ttu.edu

(1105)

The Impact of "Good" and "Bad" Lecturing on Judgments of Learning and Actual Learning. MIKO M. WILFORD, YANA WEINSTEIN, SYDNEY J. VENUTI, CARTER J. COTRUPI, CAMILA BORRERO and ANNMARIE KHAIRALLA, *University of Massachusetts Lowell* — The current research examined the effect of lecturer fluency on judgments of learning (JOLs) and actual learning. Participants (*N*=96) were randomly assigned to watch a fluent or disfluent lecturer give two different ~1-minute talks—the order of the talks was counterbalanced. The identity of the lecturer was the same in both conditions, but she spoke confidently with good posture in the fluent version and spoke haltingly referring to notes in the disfluent version. All participants watched the first of the two talks, submitted a JOL, and (after 12-minutes) completed a free recall test. They then watched the other talk, submitted another JOL, and completed a second free recall test (again after 12-minutes). The fluent speaker was rated significantly higher than the disfluent speaker on several course evaluation-type measures. Preliminary data indicate that fluency did not have a clear impact on JOLs, but did seem to affect actual learning.
Email: Miko M. Wilford, Miko_Wilford@uml.edu

(1106)

The Effects of Picture Size on Natural Category Learning and Metacognition. CARLEE M. DEYOUNG, *Texas Tech University*, TOSHIYA MIYATSU and MARK A. MCDANIEL, *Washington University in St. Louis* (Sponsored by Kenneth DeMarree) — Learners judge large-font words as more likely to be remembered than small-font words, although font size typically has no effect on later memory performance. The present research investigated whether this metacognitive illusion would generalize to natural category learning. Participants learned categories of tropical fish at the family level where the body shape was the diagnostic feature with small (100px) or large (1000px) pictures. Participants made category learning judgements (CLJs) after studying the last picture of a given category; that is, they predicted their likelihood of classifying instances (pictures of fish) into the correct category at a later test. Participants' learning performance was assessed by requiring them to classify new instances from the studied categories. In two experiments, we showed that participants thought they would be able to better classify categories learned through large pictures. Their actual performance by contrast was better for categories learned through small pictures.
Email: Carlee DeYoung, carleedeyoung@gmail.com

(1107)

Parallel Effects of Task Difficulty on Remembering and Forecasting. JULIE GREGG, SRI SIDDHI N. UPADHYAY, KARL KUNTZELMAN, ELIZABETH SACCHI and DEANNE L. WESTERMAN, *Binghamton University, State University of New York* — Recent research has identified striking parallels

between recalling the past and simulating the future. The present study explored the role of task difficulty in judgments about the past and the future. Participants recalled events from childhood and imagined events that may happen to them in the future. The difficulty of the task was manipulated by asking participants to generate either 4 or 12 events. Participants then rated how well they could remember events from their childhood or how well planned their futures were. Consistent with past research (e.g., Winkielman, Schwarz & Belli, 1998), participants in the difficult recall group rated their childhood memories as less complete than participants in the easy recall group. A parallel effect was found in participants' judgments of their future. Participants who were asked to imagine 12 future events rated their future plans as less complete than those who imagined 4. Moreover, there was a negative correlation between the rated difficulty of the task and the degree to which participants found their memory and plans to be complete. The results suggest that similar attributional processes mediate beliefs about the past and the future.
Email: Deanne L. Westerman, wester@binghamton.edu

(1108)

Memory Self-Efficacy Creates Illusion of Control: The Effects of Distraction and Metamemory on Learning. IAN M. MCDONOUGH, JESSICA S. MENDOZA, BENJAMIN C. PODY and CATHERINE REYNOLDS, *The University of Alabama*, SEUNGYEON LEE and MYEONG W. KIM, *University of Arkansas at Monticello* — Highly confident people often perform better in the classroom than their less confident peers. However, overconfidence might lead to false beliefs that they will effectively learn new material especially when they are distracted. We tested how differences in memory self-efficacy influenced learning during distraction. Participants (N=210) watched a 20-minute video lecture and received four text messages to distract them. Distraction was assessed by the number of times they looked or picked up their cell phone. Then, participants received a 20-item comprehension test and a questionnaire assessing their memory self-efficacy. We found that more distracted participants performed worse on the test, but memory self-efficacy moderated this distractibility effect. High memory self-efficacy was related to greater distraction-related decrements in performance, whereas low memory self-efficacy was not. People high in memory self-efficacy might have an illusion of control over their learning, which might prevent effective allocation of attention.
Email: Ian M. McDonough, immcdonough@ua.edu

(1109)

The Influence of Judgments of Learning on Memory. AMBER E. WITHERBY and UMA S. K. TAUBER, *Texas Christian University* — Judgments of learning (JOLs) can directly influence one's memory. In some cases, participants' memory is enhanced after making JOLs (e.g., Soderstrom, Clark, Halamish, & Bjork, 2015), whereas in others it is impaired (e.g., Mitchum, Kelley, & Fox, 2016). The present experiments were designed to further explore such reactive effects and additionally evaluate the influence of a lengthy retention interval (RI) on them. Participants were presented with a series of items to study. Half of the participants made a JOL for each item and the other half did not. Participants had a short (3 min) or long (2 day) RI and a memory test. Participants' memory tended to be influenced by whether they made JOLs, often demonstrating positive reactivity even after a long RI. This suggests that making JOLs can alter learning and subsequent memory, which has implications for metamemory research and for student learning.
Email: Amber Witherby, amber.witherby@tcu.edu

HUMAN LEARNING AND INSTRUCTION I

(1110)

Knowing When It No Longer Works: One Benefit of Inducing a Solution. NICOLE R. HALLINEN, *Temple University*, DANIEL L. SCHWARTZ, *Stanford University* — Negative transfer occurs when people overgeneralize a solution beyond appropriate contexts. We hypothesize that induction, the process of generating an abstraction from specific instances, may help learners realize the limits of the solution. The current work tests this hypothesis with an algebra task. Some participants were given a perimeter formula to apply to a series of geometric figures; others were prompted to induce it using the same examples. All participants eventually efficiently compute correct answers, though the initial induction process was slower than using a provided formula. On a generalization task that required adaptation, many students who induced the formula correctly adapted it. Most participants who were told the formula overgeneralized and inappropriately continued using it. We conclude that induction helped students tie the formula to the referent, buffering against negative transfer. A replication study, connections to previous work on transfer and human induction, and educational implications will be discussed.
Email: Nicole R. Hallinen, nicole.hallinen@temple.edu

(1111)

Scarcity in an Educational Setting: Influences of Test Length on Performance. HANNAH MOSHONTZ and ELIZABETH J. MARSH, *Duke University* — While scarcity can be associated with maladaptive behaviors (e.g., in the context of economic scarcity), scarcity can also force people to use opportunities wisely. For example, a shot is more likely to hit a target when a player only has a few shots rather than a larger arsenal (Shah, Mullainathan, & Shafir, 2012, Science). We evaluate these ideas in the domain of education, where time and opportunities to show knowledge can be limited. Paralleling the shooting example, we examined a situation where students had many opportunities to demonstrate their knowledge (a longer test) in comparison to one where such opportunities were scarce (a shorter test). Participants studied 30 English-Swahili word pairs and then were required to translate 5 or 20 Swahili words. Consistent with the idea that scarcity focuses attention, participants in the scarce condition spent more time on each item, earned more points per item, and skipped fewer items.
Email: Hannah Moshontz, ham24@duke.edu

(1112)

The Effects of Retrieval Practice on Spatial Learning. LUKE G. EGLINGTON and SEAN H.K. KANG, *Dartmouth College* — Prior research has shown that retrieval practice benefits visuospatial memory (Carpenter & Pashler, 2007; Kang, 2010). Less is known about how retrieval practice affects the integration of spatial information and, more generally, of complex information that contains interrelations (some made explicit and others not). Participants learned the relative locations of landmarks by viewing pairs of landmarks and their relative locations (e.g., *church* directly north of *school*; *forest* directly east of *church*), followed by either restudy or cued recall. Participants only viewed/practiced the landmark locations one pair at a time, although the entire set of pairs together formed a coherent spatial map. In Experiment 1, retrieval practice enhanced retention of the relative spatial direction of landmark pairs that were presented during study/practice. In Experiment 2, we extended our paradigm to examine transitive inference of spatial locations by assessing spatial relationships among landmarks that were not specifically presented together during study/practice.

Email: Luke G. Eglington, Luke.Eglington.GR@Dartmouth.edu

(1113)

The Effect of Type of Feedback on Long-Term Retention. YOONHEE JANG and ELAINE MARSHALL, *University of Montana* — To understand what feedback is best for cumulative final exams, we investigated the effectiveness of different types of feedback on long-term retention. After completing an intervening multiple-choice test, participants were randomly placed into one of four feedback conditions: feedback displaying the original question and four options, with the correct answer; feedback displaying the original question and only the correct answer; feedback displaying only the correct answer; and no feedback as the control condition. On the final test two days later, participants who received feedback displaying the original question and four options, with the correct answer provided the best performance, and interestingly, even participants who received only the correct answer outperformed the control group. This study can serve as evidence for both students and professors to use for the enhancement of final test scores.

Email: Yoonhee Jang, yoonhee.jang@umontana.edu

(1114)

Drawing on What Matters: Sketching Reduces Memory for Seductive Details. ALLISON J. JAEGER, ANASTASIA DAWDANOW and THOMAS F. SHIPLEY, *Temple University* — Seductive details are interesting pieces of information in expository text that are non-essential to the target concepts and can result in reduced comprehension (Garner, Gillingham, & White, 1989). Previous work has unsuccessfully attempted to reduce the impact of seductive details through various manipulations. Research suggests sketching is beneficial for science learning and can improve learning from science text (Ainsworth et al., 2011). The current experiment tested whether a post-reading sketching task could reduce the negative impact of seductive details and facilitate learning from a geology text. Results indicated that the presence of seductive details reduced recall of target concepts compared to a plain text. While sketching did not lead to higher recall of target concepts compared to summarizing, those who sketched recalled fewer seductive details. This suggests that sketching may help to focus attention on more relevant information in expository text. Interactions with spatial skills will also be discussed.

Email: Allison J. Jaeger, allison.jaeger@temple.edu

(1115)

Spelling Native and Foreign Language Words: Investigating the Efficacy of Three Learning Strategies. ANGELA C. JONES, *John Carroll University*, STEVEN C. PAN and TIMOTHY C. RICKARD, *University of California, San Diego* — In two experiments we investigated the efficacy of three different learning strategies for learning to spell difficult-to-spell native language words (English) and foreign language words (Lithuanian): retrieval practice, copying, and reading. A secondary aim of the current study was to test the focused study hypothesis (Pan et al., 2015), which indicates that copying may be as effective a learning strategy as retrieval practice for skilled spellers because they are able to focus on specific, difficult-to-learn phoneme-grapheme mappings. Results across both experiments indicate that, for both native and foreign language words, retrieval practice was the most effective learning strategy, followed by copying then reading. Although a strong version of the focused learning hypothesis was ruled out, results from Experiment 2 (wherein the number of times a word could be copied was equated during learning) showed that copying significantly outperformed restudy only for native language words. Thus, the familiarity that learners have with phoneme-grapheme mappings may influence the extent to which copying is an effective learning strategy.

Email: Angela C. Jones, acjones@jcu.edu

(1116)

Understanding the Cognitive Processes Involved in Writing-to-Learn. KATHLEEN M. ARNOLD, *Duke University*, SHARDA UMANATH, *Claremont McKenna College*, KARA THIO, *Duke University*, WALTER REILLY and MARK A. MCDANIEL, *Washington University in St. Louis*, ELIZABETH J. MARSH, *Duke University* — Empirical support for the benefits of writing-to-learn is mixed, likely because the literature conflates many diverse activities. Instead of focusing on tasks, we focus on the underlying cognitive processes. Our experiment examines learning from three writing tasks and (one non-writing control) that engage different cognitive processes, with an emphasis on whether or not the tasks engaged retrieval. Tasks that engaged retrieval (essay writing, free recall) led to better final test performance than those that did not (note-taking, highlighting). Individual differences in structure building (the ability to construct mental representations of narratives; Gernsbacher, 1990) modified this effect; skilled structure-builders benefited more from essay writing and free recall than did less skilled structure-builders. Further, more essay-like responses led to better performance, implicating the importance of additional cognitive processes (e.g.,

reorganization, elaboration). Together, these results underline the importance of focusing on cognitive processes involved when writing, as opposed to focusing on tasks.
Email: Kathleen Arnold, kathleen.arnold@duke.edu

(1117)

The Effect of Accent on Second-Language Vocabulary Learning. NICHOLE RUNGE, MITCHELL S. SOMMERS and JOE BARCROFT, *Washington University in St. Louis* — In two experiments, we examined how the type of accent at study affects second-language (L2) vocabulary learning. In Experiment 1, participants learned novel Spanish words spoken either by a native speaker of Spanish or a native speaker of English. Following six exposures to each word, picture-to-L2 and L2-to-L1 recall was marginally better for words spoken in the English accent condition. In Experiment 2, participants learned 8 words from a mix of Spanish accented speakers, 8 from a mix of English accented speakers, and 8 from a mix of speakers in both accents. The addition of the mixed-accent condition was to determine if accent variability would have a beneficial effect above and beyond talker variability (Barcroft & Sommers, 2005). Although the mixed accent condition did produce the best performance on the picture-to-L2 recall test, the English accented condition produced the best L2-to-L1 accuracy. Results are discussed using a perceptual assimilation model.
Email: Nichole Runge, nrunge@gmail.com

(1118)

Promoting Learning From Online Video Lectures. ANDREW T. STULL, LOGAN FIORELLA, MORGAN GAINER and RICHARD E. MAYER, *University of California, Santa Barbara* — With growing interest in online lectures, research is needed to understand how best to design online instructional videos that foster learning. Students viewed a chemistry video lecture in which the instructor drew on a conventional whiteboard while talking (conventional group) or on a transparent whiteboard in which the instructor faced learners while talking and drawing (transparent group). Both conditions incorporated identical verbal descriptions, drawn diagrams, and models. Although students showed no difference in drawing molecular diagrams (d = 0.03), those viewing transparent lectures were better than those viewing conventional lectures at answering questions about spatial diagrams (d = 0.70) and at explaining key concepts (d = 0.84). We hypothesize that the lectures differed in the extent to which they followed multimedia design principles and to which they provided social cues important for student engagement and learning. These results are interpreted in terms of theories of multimedia learning and social agency.
Email: Andrew T. Stull, stull@psych.ucsb.edu

(1119)

Effects of Writing Explanations on Subsequent Restudying and Learning. LOGAN FIORELLA, *University of Georgia*, CELESTE PILEGARD, *University of California, Santa Barbara* — Two experiments investigated how prompting students to write an explanation after studying a multimedia lesson on a car's brakes system influences subsequent restudy behavior (eye movements) and learning outcomes (retention and transfer). In Experiment 1, writing a retention-based explanation ("Explain how the car's brake system works") resulted in better performance on the retention test but not the transfer test, and it did not appear to influence integrative saccades during restudying compared to a control group. In Experiment 2, writing a transfer-based explanation ("Suppose you press on the brake pedal in your car but the brakes don't work. What could have gone wrong?") resulted in better performance on the retention and transfer tests for students who produced quality explanations, yet the prompting again did not appear to influence integrative saccades during restudying. This study provides implications for learning by explaining and for developing valid measures of self-regulated learning.
Email: Logan Fiorella, lfiorella@uga.edu

(1120)

Generation and Corrective Feedback in Memory for Context. MARY F. BERNHARDT and AMY A. OVERMAN, *Elon University*, JOSEPH D.W. STEPHENS, *North Carolina A&T State University* — Self-generation improves subsequent memory for information relative to passive reading. When combined with feedback, incorrect generation can improve memory just as well as correct generation (Metcalfe & Kornell, 2007). In contrast, generation can diminish memory for context features associated with items (Mulligan, 2004; Mulligan, Lozito, & Rosner, 2006). However, prior studies have focused only on memory for contextual details of correctly generated items, without feedback. In the present study, participants read and generated exemplars from semantic categories, with half of their generated responses treated as correct (confirmatory feedback), and the other half treated as incorrect (corrective feedback). After each trial, the "correct" exemplar (i.e., either the participant's own response, or an alternate exemplar) was presented in blue or yellow font. Preliminary results suggest that font color was remembered more accurately when associated with corrective versus confirmatory feedback. The findings are discussed relative to potential advantages and disadvantages of errorful learning.
Email: Amy A. Overman, aoverman@elon.edu

(1121)

Underestimation in Function Learning: Anchoring or X-Y Similarity? GUY LACROIX, MARK BROWN, LINDSAY MORGAN, DEMI PLAGIANAKOS and TESS WALSH, *Carleton University* — Function learning (FL) tasks require people to estimate the level of a criterion variable (e.g., arousal level) from the level of a presented predictor variable (e.g., drug dosage). It has been found that people underestimate Y in the lower extrapolation range for positive linear relationships. Kwantes and Neal (2006) proposed that this underestimation occurs because people anchor at zero (i.e., they mistakenly assume that Y=0 when X=0). Alternatively, however, people could simply be biased to produce a Y response similar to the presented X-value. To differentiate these explanations, 135 participants learned functions with an intercept either greater than or lesser than zero. In line with the anchoring at zero hypothesis, participants underestimated in the lower

extrapolation range when the intercept was greater than zero, but they overestimated when the intercept was less than zero. These results are congruent with exemplar-based accounts that include an exemplar representing 0 in the model.
Email: Mark Brown, markbrown2@cmail.carleton.ca

(1122)

Do Interleaving Benefits Persist Amid Indiscriminative Contrasts? MICHAEL A. GARCIA, ELIZABETH BJORK and ROBERT A. BJORK, *University of California, Los Angeles* — The optimization of category induction—discovering what ties together exemplars in a category—is of both theoretical and pedagogical importance. Recent work has shown category induction is facilitated by interleaving the exemplars of to-be-learned categories (Kornell & Bjork, 2008), but the processes underlying this benefit remain in dispute (e.g., Wahlheim, Dunlosky, & Jacoby, 2011; Birnbaum, Kornell, Bjork, & Bjork, 2013). The benefits of interleaved practice appear due, at least in part, to the opportunities interleaving provides for discriminative contrast between exemplars of different categories (Kang & Pashler, 2012). In our study we manipulate the relatedness of across-category comparisons to see whether indiscriminative contrasts (e.g., comparing an animal to a painting) also produce interleaving benefits.
Email: Mikey Garcia, gikeymarcia@gmail.com

(1123)

Evaluating the Contributions of Test Expectancy and Test Type in Testing and Guessing Memory Benefits. MARK J. HUFF, *University of Southern Mississippi*, DAVID BALOTA, *Washington University in St. Louis* — Recently we have shown that two types of initial testing (recall of a list or guessing of critical items repeated over 12 study/test cycles) improved final recognition of related and unrelated word lists relative to restudy. These benefits were eliminated however when test instructions were manipulated within-subjects and presented after study of each list, procedures designed to mitigate expectancy of the initial test (Huff, Hutchison, & Balota, in press, *JEP: LMC*). We follow-up these experiments by further examining test expectancy in contributing to guessing and testing benefits. Testing and guessing benefits were not found when test instructions were presented before either a single study/test cycle (Experiment 1) or three study/test cycles (Experiment 2), but guessing benefits did occur after 6 study/test cycles (Experiment 3). Experiment 4 employed a final recall test which produced a testing benefit (i.e., transfer-appropriate processing) suggesting that guessing and recall benefits found previously on recognition may be due to an increase in familiarity-based processes provided participants receive sufficient practice with the targeted test.
Email: Mark J. Huff, mark.huff@usm.edu

(1124)

Testing the Interleaving Effect by Varying Category Relatedness. FARIA SANA, *Athabasca University*, VERONICA X. YAN, ELIZABETH LIGON BJORK and ROBERT A. BJORK, *University of California, Los Angeles*, JOSEPH A. KIM, *McMaster University* — Interleaving exemplars of to-be-learned categories (e.g., $A_1B_1C_1A_2B_2C_2A_3B_3C_3$…), rather than blocking exemplars by category (e.g., $A_1\ A_2\ A_3B_1\ B_2\ B_3C_1C_2C_3$…), often enhances category learning, arguably because the former promotes discriminative contrast, leading to the discovery of critical differences between exemplars from different, but similar categories. We examined whether varying the relatedness of juxtaposed items would affect the interleaving benefit. In Exp. 1, we juxtaposed exemplars of unrelated topics (3 concepts from each of 2 unrelated topics, statistics and physics), which should limit the benefits of interleaving. We found benefits of interleaving over blocking when exemplars were interleaved either at the concept level or the topic level, but not when both levels were interleaved. In Exp. 2, we varied sequential juxtaposition of 3 related pairs of statistical concepts (e.g., Kruskal-Wallis Test & Mann–Whitney U test). Pairing related concepts improved learning relative to pairing unrelated concepts, regardless of schedule. The results are partly consistent with the discriminative-contrast hypothesis, but they suggest that other factors as well moderate the benefits of interleaving.
Email: Faria Sana, fsana@ualberta.ca

COGNITIVE CONTROL I

(1125)

The Impact of Inverted Cross-Modal Priming in Free Recall: Implications for the Cognitive Control of Distraction. JOHN E. MARSH, *University of Central Lancashire,* KATHERINE LABONTÉ, *Université Laval*, ROBERT W. HUGHES, *Royal Holloway, University of London*, FRANÇOIS VACHON, *Université Laval* — A novel inverted priming effect is reported in which free recall of a visually-presented categorized list of words on trial *n* (probe trial) was poorer if presented in the presence of distractor words that had just been presented as the to-be-recalled list on trial *n* - 1 (Experiment 1). The effect was item-specific since distractor items at probe that were merely categorically related to the previously to-be-recalled list failed to produce the effect (Experiment 2). These results indicate that the distractive power of auditory information is more potent when that specific information has recently been activated through deliberate processing. Yet, the effect appears to be independent of cognitive control since individuals with high and low working memory capacity (as measured by complex span tasks) were equally susceptible to the effect (Experiment 3). This later finding suggests that the mechanisms underlying this new form of auditory distraction do not involve the top-down inhibition of the internal representations of competing items, unlike the negative priming phenomenon.
Email: John E. Marsh, jemarsh@uclan.ac.uk

(1126)

Context-Specific Adjustment of Cognitive Control: The Perseverative Retrieval of Adaptive Control Sets. RICO FISCHER, *Ernst-Moritz-Arndt University of Greifswald*, CAROLINE GOTTSCHALK, *Technische Universität Dresden*, GESINE DREISBACH, *University of Regensburg* — Variations in processing demands (e.g., frequency of conflict) at certain contexts determine the flexible engagement of cognitive control, leading to specific context-control associations.

Here, we investigated the robustness and transferability of the acquired context-control demands to new situations. In a context-specific proportion congruence (CSPC) paradigm, each context (e.g., location) was associated with specific conflict frequencies, determining high and low control demands. In a learning phase, associations between context and control demands were established. In a subsequent transfer block, either stimulus-response mappings, whole task sets, or context-control demands changed. Results showed an impressive robustness of context-control associations, as context-specific adjustments of control from the learning phase were virtually unaffected by new stimuli and tasks in the transfer block. Only a change of the context-control demand eliminated the context-specific adjustment of control. This suggests that context-control associations that have proven to be adaptive in the past are continuously applied despite major changes in the task structure as long as the context-control associations remain the same.
Email: Rico Fischer, rico.fischer@uni-greifswald.de

(1127)

Cognitive Control in Dual Tasks: Evidence From Task-Pair Switching. PATRICIA HIRSCH, SOPHIE NOLDEN and IRING KOCH, *Institute of Psychology, RWTH Aachen University* — To isolate performance costs occurring at the level of task-pairs from those at the level of Task 1 (T1) and Task 2 (T2), we implemented a novel task-pair switching logic into the psychological refractory period (PRP) paradigm. In two experiments, we generated three task-pairs by combining one of three visual T1 with an auditory T2. Performance was worse after a short than a long SOA (i.e., PRP effect). Moreover, there were performance deteriorations in n-1 task-pair switches as compared to n-1 task-pair repetitions (i.e., n-1 task-pair switch costs), indicating that task-pairs were activated during dual-task processing. Since we found performance to be better in n-2 task-pair repetitions than in n-2 task-pair switches, the data suggest priming rather than persisting inhibition as a crucial selection mechanism at the global level of dual-task processing. These effects were found with conceptually overlapping responses (Experiment 1) and with physically overlapping responses (Experiment 2).
Email: Patricia Hirsch; patricia.hirsch@psych.rwth-aachen.de, koch@psych.rwth-aachen.de

(1128)

An Alternative Multidimensional Vector Framework for Modeling Stimulus-Response Compatibility. AIPING XIONG, *Purdue University*, MOTONORI YAMAGUCHI, *Edge Hill University*, ROBERT W. PROCTOR, *Purdue University* — Yamaguchi and Proctor developed a multidimensional vector model (MDV) to explain stimulus-response compatibility (SRC) effects based on subjective expected utility to reveal the influence of response properties on stimulus discrimination. In MDV, the subjective utility of a stimulus is computed by an orthogonal projection of the stimulus' utility in the multidimensional space onto a random decision vector. Recently, quantum models (alternative probabilistic frameworks drawn from quantum theory to describe human decision making under uncertainty and conflict) have shown promise in addressing cognitive phenomena. We propose a framework based on a combination of MDV and quantum cognition to model SRC. The framework defines events on subspaces of a vector space rather than using the vector space to represent stimulus attributes, and uses the projective geometric structure of vector spaces to assign probabilities. Example applications of the framework to various Simon tasks revealed its capability to explain SRC.
Email: Aiping Xiong, xionga@purdue.edu

(1129)

Applying Response Time Distribution Analysis to Item-Level Manipulations: Evidence for Stimulus-Driven Control. THOMAS G. HUTCHEON, AILEEN LIAN and ANNA RICHARD, *Bard College* — In item level manipulations, the size of the congruency effect is reduced for words that are frequently presented as incongruent trials compared to words that are frequently presented as congruent trials. This item specific proportion congruent (ISPC) effect has been taken as evidence for a fast and flexible form of cognitive control that emerges as a function of experience within a task. This so-called stimulus-driven control represents an important modification to existing models of cognitive control, but manipulations in which the ISPC effect is observed are often confounded with stimulus-response contingencies. Thus, it is unclear whether the ISPC effect reflects stimulus-driven control or contingency learning. Here, we apply a quantile analysis to determine how the ISPC effect unfolds over the course of an experimental trial. Consistent with stimulus-driven control accounts, we find that the modulation of performance is larger on incongruent compared to congruent trials. Moreover, the impact on incongruent trials does not increase as reaction time increases. Together, we take these results as support for the operation of stimulus-driven control in item-level manipulations.
Email: Thomas Hutcheon, thutcheo@bard.edu

(1130)

Cognitive Control and Associative Processes in a Process Dissociation Model of the Stroop Task. KERSTIN DITTRICH, NADINE SCHIMPF and CHRISTOPH KLAUER, *Albert-Ludwigs-Universität Freiburg* — In a process dissociation model of the Stroop task, Lindsay and Jacoby (1994) dissociated word-reading and color-naming processes. To validate the estimated color-naming parameter (C parameter) and word-reading parameter (W parameter), they manipulated color prototypicality (affecting only the C parameter) and the proportion of congruent and incongruent stimuli (affecting only the W parameter). For the proportion manipulation, smaller interference effects are typically obtained when stimuli are mostly incongruent; a result pattern that was initially attributed to experiment-wide cognitive control strategies of reduced word-reading processes. However, a new account ascribes proportion congruent effects to an associative-learning mechanism (Schmidt & Besner, 2008). Given this new interpretation of proportion congruent effects, it is apparent that Lindsay and Jacoby's interpretation of the W parameter is ambiguous. In three experiments, we investigated the processes underlying the W parameter with the help of an adapted

process dissociation model. Results revealed that the parameter captures not only word reading processes but also cognitive control and associative processes.
Email: Kerstin Dittrich, dittrich@psychologie.uni-freiburg.de

(1131)

Interference Between Time Estimation and Simple RT Tasks. MICHAEL D. KLEIN and JENNIFER A. STOLZ, *University of Waterloo* — According to one influential theory, mental timing relies mainly on the same attentional resources used by executive-level tasks, and should therefore generally only interfere with those tasks. We show that concurrent time estimation slows performance on a simple response time task – that is, participants are slower to press a key after a stimulus appears if they are concurrently timing an interval. Such a task requires little complex processing and is therefore unlikely to compete with mental timing for executive resources. Importantly, the amount of slowing does not increase when a longer time period precedes the stimulus, which would be expected if mental timing interferes with potentially executive-resource-demanding processes such as task preparation. The result therefore raises two questions that challenge the executive-resource theory of mental timing: why does mental timing interfere with response to the stimulus, and why doesn't mental timing seem to interfere with preparation? We further investigate these questions and whether they can be reconciled with the executive-resource theory.
Email: Michael Klein, mdklein@uwaterloo.ca

(1132)

What's Mine Isn't Yours: Self-Prioritization in Shared and Non-Shared Task Environments. KATIE L. JONES, MELINA A. KUNAR and DERRICK G. WATSON, *University of Warwick* (Sponsored by Gordon Brown) — There is substantial evidence showing that people prioritise information based on self-relevance. In addition, recent research suggests co-actors might automatically represent each other's task instructions, resulting in task interference. We investigated self-prioritization in perceptual matching tasks performed alone and alongside another participant. Similar to the work of Sui, He and Humphreys (2012) we find that people also prioritize associations that confer ownership (e.g. mine versus yours) and that these associations remain when participants are given longer to respond. Importantly, when participants performed in pairs there was greater response conflict when discriminating between self- and co-actor- relevant information than between self- and stranger- relevant information. There was no change in performance when co-actors were given compatible versus incompatible task instructions, suggesting that participants were able to successfully prioritize their own task instructions and ignore their co-actor's. These results indicate that while self-prioritisation prevails, self-other discrimination is more difficult in shared environments.
Email: Katie Jones, k.jones.2@warwick.ac.uk

(1133)

Long(er)-Term Item-Specific Gratton Effects. NICHOLAUS P. BROSOWSKY, *The Graduate Center of the City University of New York*, MATTHEW J.C. CRUMP, *Brooklyn College of the City University of New York* — Gratton effects refer to the finding in selective attention tasks (e.g., Stroop, Flanker) that interference effects (incongruent minus congruent RTs) are smaller on trials immediately following an incongruent than congruent trial. Gratton effects are commonly explained by transient or reactive conflict-induced shifts in attentional weights on trial n-1 that carry forward to influence trial n. Separately from this short-term influence, episodic memory traces may also bind together attentional control settings associated with features of particular items that could allow for longer-term cue-driven reinstatement of prior attentional settings. In three related experiments, participants completed a color-identification flanker task. Colors were presented on different images, and specific images were paired with congruent or incongruent trial types. We found that re-presenting an image 4-8 trials later modulated congruency effects on an item-specific, and longer-term basis than the traditional Gratton effect.
Email: Nicholaus P. Brosowsky, nbrosowsky@gradcenter.cuny.edu

(1134)

Dissociating Proactive and Reactive Control: A Replication and Extension Using Color-Word Stroop. ERIN M. GOURLEY, TODD S. BRAVER and JULIE M. BUGG, *Washington University in St. Louis* — The dual-mechanisms of control account proposes that conflict is resolved in a preparatory (proactive) or just-in-time (reactive) fashion. Using within-subject manipulations of list-wide and item-specific proportion congruency in a picture-word Stroop task, it was recently demonstrated that proactive and reactive control are dissociable as indicated by unique behavioral signatures. Proactive control produced a congruency cost whereas reactive control produced a transfer cost. The current study (N = 96) aimed to replicate and extend these patterns in a traditional color-word Stroop task that remedied design limitations of the prior study. There were three primary findings: First, there was again evidence that proactive and reactive control are dissociable—they were associated with a similar benefit (reduced interference) but unique costs. Second, an alternative theoretically guided approach to indexing the transfer cost of reactive control proved fruitful. Third, individual differences in theoretically relevant constructs were related to costs and benefits of proactive control.
Email: Julie Bugg, jbugg@wustl.edu

(1135)

Desirable Difficulty and Attentional Boost Effects Operate on Common Central Mechanisms. MELISSA J. PTOK, LINDSEY LEES, KARIN R. HUMPHREYS and SCOTT WATTER, *McMaster University* — The attentional boost effect (ABE) has been interpreted as enhanced perceptual processing; recent evidence suggests a more central locus of effect. A separate literature has recently shown that increased selective attention and cognitive control via task difficulty/interference modulates

incidental encoding in long-term memory. Combining these ideas, participants performed a typical ABE task consisting of blocks of word and picture stimuli. A later memory test with words/picture labels revealed the ABE was consistent across study modalities, suggesting a central attentional influence for the ABE. Furthermore, the addition of a semantic animacy categorization task produced a strong memory benefit for word stimuli, and abolished the ABE for words. Increased work/semantic activation to access animacy features from words versus pictures, and the selective absence of ABE in this situation for words, suggests a common central locus of effect.
Email: Melissa Ptok, ptokmj@mcmaster.ca

(1136)

Role of Prime Awareness in Single-Prime Negative Priming. HSUAN-FU CHAO, *Chung Yuan Christian University* — Single-prime negative priming refers to the phenomenon that repeating a single prime as the probe target slows the response to that target. It has been demonstrated that single-prime negative priming is modulated by cognitive control. That is, the negative priming effect is reduced when the probability of repeating the prime as the probe target is high and when the stimulus-onset asynchrony (SOA) between the prime and the probe is long. The present study investigated the influence of awareness of the prime on controlling single-prime negative priming. The results showed that when the probability of repetition was at the chance level and when the SOA was short (147 ms), single-prime negative priming surfaced regardless of whether the participants were aware of the primes or not. When the probability of repetition was higher than the chance level and when the SOA was short, single-prime negative priming was larger when the participants were not aware of the primes. These findings support the importance of prime awareness on controlling single-prime negative priming.
Email: Hsuan-Fu Chao, hfchao@cycu.edu.tw

(1137)

On the Unconscious Context-Specific Proportion Congruency Effect: The Role of Facilitation and Interference. CHRIS BLAIS, MOLLY E. BENKAIM and GENE A. BREWER, *Arizona State University* — Cognitive control is widely examined in psychology and cognitive neuroscience and modulating Stroop interference is considered one of its hallmarks. Although recent work has focused on many of the low-level processes that contribute to these effects, such as feature integration and implicit learning, cognitive control is still highly associated with the conscious regulation of thoughts and actions. A recent paper by Panadero, Castellanos, and Tudela (*Consciousness & Cognition, 2015*) questions this assumption by reporting the presence of an interaction between the proportion of congruent trials and the magnitude of the Stroop effect—an effect long cited as evidence for strategic control—*in the absence of awareness*. We replicate and extend this work by measuring the extent to which this interaction is driven by the modulation of interference or facilitation. Across several behavioral and EEG studies, we find that the interaction primarily results from the modulation of facilitation. We conclude that cognitive control in the form of actively suppressing word processing mechanisms cannot operate in the absence of awareness.
Email: Chris Blais, chris.blais@gmail.com

(1138)

Cognitive Aging and the Distinction Between Intentional and Unintentional Mind-Wandering. PAUL SELI and DAVID MAILLET, *Harvard University*, DANIEL SMILEK, *University of Waterloo*, DANIEL L. SCHACTER, *Harvard University* — Recent studies have reported age-related reductions in the frequency of mind-wandering. Here, we re-examined this association while distinguishing between intentional and unintentional mind-wandering. Young and older adults completed a sustained-attention task during which they responded to thought-probes that required them to indicate whether any mind-wandering they experienced was engaged with or without intention. Based on research demonstrating age-accompanied declines in mind-wandering, we expected to observe decreases in both unintentional and intentional mind-wandering with increasing age. However, because aging is associated with increased task engagement, we reasoned that older adults might be more engaged in the sustained-attention task, and hence, show a more prominent decline in intentional than unintentional mind-wandering relative to young adults. Preliminary results indicate, as hypothesized, that older adults show an decrease in rates of unintentional and intentional mind-wandering, and moreover, that the age-related decline in mind-wandering appears to be largely attributable to a decline in intentional mind-wandering.
Email: Paul Seli, paulseli@fas.harvard.edu

(1139)

Cognitive Control Demands Affect Task-Relevance But Not Frequency of Mind Wandering. NATHANIEL T. DIEDE and JULIE M. BUGG, *Washington University in St. Louis* — A prominent account posits that mind wandering (MW) represents a failure to engage control in response to task demands. To test this account, demands on control were manipulated in a list-wide proportion congruence Stroop paradigm. Half of the participants performed a high control demand mostly incongruent (MI) list first, while the other half performed the less demanding mostly congruent (MC) list first. MW probes appeared intermittently to assess task-related (TRT) and task-unrelated (TUT) thoughts. The Stroop effect was smaller on MI compared to MC lists regardless of order, suggesting increased control during MI lists. The key finding was that control affected type, but not frequency, of MW. TRTs were proportionally greater than TUTs in MI lists performed first but were equivalent in MC lists performed first. TUTs increased in proportion regardless of list type for the list performed second, suggesting potential limits on the effects of control on MW.
Email: Nathaniel T. Diede, ndiede@wustl.edu

(1140)

Mind Wandering in Different Learning Environments: A Direct Comparison. TRISH L. VARAO-SOUSA and ALAN KINGSTONE, *University of British Columbia* — Everyday learning environments, such as reading and lectures, are highly susceptible to mind wandering (MW) episodes. How do these episodes compare? In the present experiment MW report method (self-caught or probe-caught) was manipulated between-subject, and learning method (reading nonfiction and lecture watching) was manipulated within-subject. Additionally, participants were required to indicate whether reported MW instances were intentional or unintentional. Two main results emerged: 1) Participants reported significantly more MW when watching a lecture than when reading, however this was only true for the probe-caught sessions; 2) Participants reported significantly more unintentional compared to intentional MW for both reading and lecture watching, regardless of whether MW was probe-caught or self-caught. Variation in MW and task type (reading vs. lectures) are discussed with regard to memory test performance, interest and motivation ratings. This study reveals that MW reports vary with task type and supports past work on MW and intentionality.

Email: Trish L. Varao-Sousa, tvaraosousa@psych.ubc.ca

(1141)

A Subjective Measure of Explicit and Implicit Category Rule Learning. AUDREY P. HILL, ANDREW WISMER, MARK NEIDER and COREY BOHIL, *University of Central Florida* — The neuropsychological theory COVIS (COmpetition between Verbal and Implicit Systems) postulates that distinct brain systems compete during category learning. The explicit system involves conscious hypothesis testing about verbalizable rules, while the implicit system relies on procedural learning of rules that are difficult to verbalize. Despite behavioral data supporting COVIS, it is unclear what participants understand about the rule when learned implicitly. The current study was designed to gain deeper understanding of implicit category learning. Participants were trained on either explicit rule-based (RB) or implicit information-integration (II) category structures. Using an adaptation of Dienes & Scott's (2005) measure of unconscious knowledge, participants made trial-by-trial assessments attributing each categorization response to guessing, intuition (a marker of implicit learning), or rule use. Implicit and explicit strategies seem to manifest differently in learner awareness. RB participants overwhelmingly made the "rule" attribution. II participants attributed "intuition" significantly more than RB participants, despite high accuracy.

Email: Audrey Hill, audrey@knights.ucf.edu

(1142)

Eye Movement Patterns Associated With Mind Wandering During Real-World Scene Viewing. ROBERT MCMANUS, KRISTINA KRASICH, JAMES R. BROCKMOLE and SIDNEY K. D'MELLO, *University of Notre Dame* — Attention can shift to task-irrelevant thoughts at alarming rates throughout our day – a phenomenon commonly referred to as mind wandering. Research on mind wandering during reading has indicated that people tend to shift their gaze less often, fixate longer, and blink more compared to moments when they are paying attention to the text. The current study assessed whether similar changes in eye movement patterns occur when people mind wander during scene viewing. Participants studied pictures of urban scenes while their eye movements were recorded. Probe-caught mind wandering was associated with fewer fixations and longer fixation durations compared to periods of sustained attention. Furthermore, these differences were observable as early as 15-20 seconds before mind wandering was reported. These findings provide further insight into how eye movements change across varying attentional states and inform initiatives that use behavioral signals to detect and combat mind wandering in real-time.

Email: Kristina Krasich, kkrasich@nd.edu

ATTENTION: CAPTURE I

(1143)

The Impact of Emotional Deviant Sounds on the Processing of Emoji Faces in a Sustained Attention Task. JESSICA KORNING LJUNGBERG, HANNA HJARTSTROM and DANIEL ERIKSSON SORMAN, *Umea University - Sweden* — The involuntary shift of attention to emotional sounds were investigated in a cross-modal oddball task in which participants categorized angry and disappointed emoji faces. Prior to each face, a standard tone was presented (80% of trials) or a deviant "disappointed" or a buzzing "angry" sound (20% of trials). The deviant trials were either congruent (e.g., disappointed sound/disappointed emoji) or incongruent trials (e.g., a disappointed sound/angry emoji). Results showed that the emotional content of the deviant sounds interacted with the processing of the faces, but that the effect was only present in the congruent trials. Participants showed deviance distraction (prolonged response times compared to standard) in the disappointed trials and facilitation (no deviance distraction) in the angry deviant trials. The facilitation (or lack of distraction) caused by the angry deviant sound in the congruent trial may have been a result of an arousal effect due to the processing of threat

Email: Jessica K. Ljungberg, jessica.korningljungberg@psy.umu.se

(1144)

Attention Capture, Top-Down Control, and the Size of the Cross-Modal Stroop Effect. DANIELLE A. LUTFI-PROCTOR and EMILY M. ELLIOTT, *Louisiana State University* — Evidence suggests distraction due to attention capture can be mitigated through top-down control, such as providing warnings that distracting stimuli will appear. With this information, people are frequently able to lessen or eliminate distraction due to attention capture. In the cross-modal Stroop paradigm, participants name the color of visual items while ignoring auditory color words. Generally, incongruent color words lead to slower response times and more errors than color naming in the presence of tones and silence. We examined whether this detriment in performance could be due, at least in part, to attention capture and whether the effect could be mitigated through the presentation of warning cues. Two experiments provided participants with explicit warning cues as to what

type of trial they would experience (incongruent, congruent, or tone). Overall, the results suggested that top-down control, and potentially attention capture, had little impact on the size of the interference effect.
Email: Danielle Lutfi-Proctor, dlutfi1@lsu.edu

(1145)

Distraction by Acoustical vs. Semantic Deviant Sounds: Two Sides of the Same Coin? FRANÇOIS VACHON, KATHERINE LABONTÉ, MICHAËL LÉVESQUE-DION and JOHNATHAN CRÉPEAU, *Université Laval* — The rare and unexpected occurrence of a sound that acoustically deviates from the auditory background typically captures attention and interferes with ongoing mental activity. It has recently been reported that an infrequent change in the semantic content of an irrelevant auditory stream is also endowed with distracting power. Aiming toward the characterization of this semantic deviation effect, the present study sought to determine whether this form of auditory distraction is subtended by the same mechanisms as its acoustical counterpart. To contrast the impact of acoustical and semantic deviance, an unpredictable change of voice or of semantic category was randomly inserted in a to-be-ignored auditory sequence while participants performed visual serial recall. Whereas both types of deviant disrupted performance, no correlation was found between the size of the two deviation effects. Moreover, we showed that individual differences in working memory capacity predict the magnitude of the acoustical deviation effect, but not the semantic version of the phenomenon. Although both effects originate from a deviation, the present findings point toward two independent forms of auditory distraction driven by distinct mechanisms.
Email: François Vachon, francois.vachon@psy.ulaval.ca

(1146)

Ownership Is Sticky: The Persistence of Self-Relevance on Responding. GRACE TRUONG and TODD C. HANDY, *University of British Columbia* (Sponsored by Peter Graf) — Self-owned objects receive greater attentional resources but does this biased processing hold when ownership is given up? For all experiments, participants first learned the arbitrarily assigned ownership statuses of a set of everyday objects. Next, participants were tested for recall on these categories until ceiling performance or a maximum of six attempts. Lastly, participants were told that the object ownership statuses had "switched" from self to other and vice versa. Participants had to report the "new owner" of each object in a third and final task. In Experiment 1, participants were faster to correctly respond in the last task for their (relative to others') original objects. Experiment 2 examined the effect of purposefully directing attention towards self/other during the first task. Experiment 3 examined the decay of the self-bias over time. Results suggest ownership imbues objects with enduring prioritization that is not easily removed.
Email: Grace Truong, gracet@psych.ubc.ca

(1147)

Auditory Distraction by a Semantic Deviation: What Role for Cognitive Control? KATHERINE LABONTÉ and ANNIE DESMARAIS, *Université Laval*, JOHN E. MARSH, *University of Central Lancashire*, FRANÇOIS VACHON, *Université Laval* — An acoustical deviation—i.e. an unexpected change in the physical properties of the auditory background—is known to capture attention and decrease task performance. While it was recently established that a semantic deviation (e.g., a change in semantic category) also interfered with cognitive functioning, whether or not acoustical and semantic deviation effects share the same functional characteristics is still unknown. Given that top-down factors can shield against the distractive power of an acoustical deviation, we sought to determine whether the semantic deviation effect is also tempered by cognitive control. Participants performed a visual serial recall task while ignoring irrelevant sound. On some rare trials, an unexpected change in semantic category occurred within the auditory channel. This semantic deviation disrupted performance, even when increasing the level of concentration (by reducing the to-be-remembered items perceptual discriminability; Exp. 1) or providing foreknowledge of an imminent deviation (Exp. 2). These results suggest that, in contrast to its acoustical counterpart, the semantic deviation effect is immune to cognitive control, pointing toward two distinct forms of attentional capture.
Email: François Vachon, francois.vachon@psy.ulaval.ca

(1148)

Reward Uncertainty Modulates Value-Driven Attentional Capture. SANG A. CHO and YANG SEOK CHO, *Korea University* (Sponsored by Jacqueline Shin) — Value-driven attentional capture (VDAC) refers to an involuntary deployment of attention to a value-associated stimulus. In previous studies, a high value stimulus is associated with high reward more frequently, resulting in a high expected value. Thus, it is unclear whether VDAC is elicited by reward probability or expected value. The present study examined whether reward probability modulates VDAC with a constant expected value. We used a visual search task with one color associated with 100 points 25% probability (uncertainty) and the other associated with 25 points with 100% (certainty) in training. In test sessions, only the stimulus with reward uncertainty showed a significant distractor effect, but the stimulus with reward certainty didn't. To test the possibility that this distractor effect was due to the saliency of reward (e.g., 100 points), Experiment 2 was conducted with the one color associated with 75 points with 25% probability and the other with 25 points with 75%. Even with different reward magnitudes (e.g., 75points and 25 points), both stimuli showed a same amount of the distractor effects. These results imply that the reward uncertainty gains priority to induce attentional bias.
Email: Cho, Sang A, csaquinas21@gmail.com

(1149)

Value-Driven Contingent Attentional Capture Is Not Solely Due to Target Repetition Effects. BRAD T. STILWELL, *University of Iowa*, ZACHARY ROPER, *Vanderbilt University*,

SHAUN P. VECERA, *University of Iowa* — Attentional orienting is influenced by previously rewarded stimuli (e.g. Anderson, Laurent, & Yantis, 2011). Reward associations can be instantiated using secondary reinforcers such as images of US bills within a visual search paradigm (Roper & Vecera, in press). In the current research, we demonstrate that secondary reinforcers can shape attentional control settings in a reward contingent capture paradigm (Roper, 2015). This new task allows for more robust value-driven attentional effects when reinforced features (e.g., color) are not task relevant. We then address Sha and Jiang's (2016) suggestion that the demonstrated value-driven attentional effects are not due to reward associations but instead, arise solely from repetition of the target feature throughout training and testing. We demonstrated that previous results on rewarded attention effects are not due to target repetition exclusively and that target repetition effects can be demonstrated using the contingent capture paradigm without reward, but only for visual features that occur frequently.
Email: Brad Stilwell, brad-stilwell@uiowa.edu

(1150)

Influences of Category Membership and Encoding History on Attention Capture. ALLISON E. NICKEL and DEBORAH E. HANNULA, *University of Wisconsin - Milwaukee* — Questions about how memory and attention interact, and whether encoded content might capture attention have been relatively underexplored. The current investigation examines effects of encoding history and category membership on allocation of attention to task-irrelevant distractors in simple visual search arrays. During encoding, participants attempted to commit pre-experimentally unfamiliar faces and houses to memory. Subsequently, in a search task, participants were presented with several objects surrounding central fixation. Flanking each object was a small colored circle. One circle, defined by its color, served as the search target. Participants were instructed to fixate the target, ignoring any remaining display elements. A subset of arrays contained a face or a house, remainders did not. As reported previously, faces captured attention more often than objects from any other category. Now, however, effects of encoding were also evident (e.g. in viewing directed to houses). Additional evidence for encoding- and category-based prioritization will be discussed.
Email: Allison Nickel, aenickel@uwm.edu

(1151)

Encoded Materials Draw Attention, Even When Memories Are Successfully Concealed in Explicit Recognition Responses. ELAINE J. MAHONEY and DEBORAH E. HANNULA, *University of Wisconsin - Milwaukee* — Past work suggests that encoded content draws attention rapidly during test, and that this prioritization is evident under a variety of testing conditions. The objective of the current investigation was to examine whether or not this effect persists even when participants attempt to conceal memories. Participants encoded several scene-face pairs and were tested with 3-face displays superimposed on studied scenes. A cue preceded each test display and indicated whether the face that had been paired with the scene during encoding would be present and, if so, whether memory for this associate should be revealed or concealed. Participants complied with instructions, selecting associates on reveal, but not conceal trials, though evaluation of eye movement data revealed prioritization of associates in both conditions. A notable feature of viewing patterns on conceal trials was short-lived preferential viewing of associates, which suggests that voluntary control of eye movement behavior increases with test trial progression.
Email: Elaine Mahoney, mahoneye@uwm.edu

LETTER AND WORD PROCESSING I

(1152)

How Response Time Variability During a Rapid Automatized Naming Task Relates to Pre-Reading Skills and Future Reading Ability. ELIZABETH S. NORTON, EMILY M. HARRIOTT, SARA BROWN, SHELBY H. ISAACS, CELIA S. KAUFER and LINDA SELPH, *Northwestern University*, NADINE GAAB, *Boston Children's Hospital, Division of Developmental Medicine and Harvard Medical School*, JOHN D.E. GABRIELI, *Massachusetts Institute of Technology* — Rapid automatized naming (RAN) task performance is a robust predictor of future reading ability. Response time (inter-item pauses) is associated with overall RAN time and better reading outcomes. One previous study found that traditional RAN completion time as well as response time variability (RTV; defined as RT mean/SD) for some RAN tasks related to reading comprehension in school-age children. We examined RAN color naming in kindergarten children (n=31, ages 4;10-6;8). RTV was not significantly correlated with RAN completion time, nor with other measures of processing speed or inhibition in kindergarten, but was significantly greater in children with family history of dyslexia. Mean RT and completion time were strongly predictive of future reading accuracy, rate, and comprehension (all r>.42**), but RTV was not related to any measures of reading ability. These findings suggest that variability in item response time does not account for the strong relationship between RAN and reading ability.
Email: Elizabeth Norton, enorton@northwestern.edu

(1153)

Neuroelectric Markers of Hemispheric Differences in Ambiguity Resolution of Words in Context: A Split Visual Field ERP Study. MARK E. FAUST, ELAINE HILL and JORDAN PIERCE, *University of North Carolina at Charlotte* — Control of lexical activations that vary in their appropriateness in relation to a preceding sentence context is an important aspect of sentence comprehension. Homographs, words with the same written form but multiple distinct meanings (e.g., bank) provide a challenging control problem requiring lexical disambiguation in light of preceding context. To assess behavioral interference from contextually inappropriate homograph meanings, participants read sentences that ended in a homograph and judged the relationship between probe words and the preceding sentence. We used event-related potential (ERP) methodology to identify neuroelectric markers of the control of contextually inappropriate homograph meanings, e.g., the N400, a negative

scalp potential sensitive to the semantic incongruity between a word and prior sentence context. The present study adds to our previous work by using split visual hemifield presentation of the target probe words to better understand hemispheric differences in cognitive control during sentence comprehension.
Email: Mark Faust, mefaust@uncc.edu

(1154)

The Role of Reading Comprehension Ability on the Missing-Letter Effect. ANNIE ROY-CHARLAND, VICTORIA FOGLIA, CHRISTIAN LAFORGE, JUSTIN A. CHAMBERLAND and CHANTAL CHARETTE, *Laurentian University* — While reading for comprehension and performing a letter detection task, individuals omit more letters in frequent function than less frequent content words. This is called *the missing-letter effect.* The current study examined the effect of reading comprehension skills on omission rates. In Experiment 1, the relationship between reading comprehension and omission rates for frequent and rare function and content words was examined. Results revealed a negative correlation between the comprehension and omission rates for the word *it.* As *it* was the most frequent word used, it was hypothesized that there may be a threshold in frequency for the observed correlation. In Experiment 2, we explored the possibility of a threshold in frequency. Results revealed a negative correlation for *the, and, in* and *of* which are some of the highest is frequency. Results are discussed in relation to the Attentional-disengagement model of the missing-letter effect.
Email: Annie Roy-Charland, aroycharland@laurentian.ca

(1155)

Evaluating Text Difficulty Using a Computerized Letter Detection Task. ANDRIANA L. CHRISTOFALOS and GARY E. RANEY, *University of Illinois at Chicago* (Sponsored by Kara Morgan-Short) — We explored the influence of passage difficulty on word processing using the letter detection task. Participants performed letter detection while reading easy and difficult passages using a paper-based (Experiment 1) or computer-based (Experiment 2) version of the task. In the paper version, readers circled target letters. In the computer version, readers mouse clicked on target letters. Overall error rates were higher for the computer task, but the pattern of results was the same across tasks. For both the paper and computer versions, there was a larger Missing Letter Effect (MLE), defined as more target letter detection errors in function words than content words, for difficult passages than for easy passages. The larger MLE resulted from participants having larger error rates for target letters in content words within easy passages compared to difficult passages. These results support the conclusion that content word processing changes as a function of passage difficulty.
Email: Andriana Christofalos, achris29@uic.edu

(1156)

The Race Toward the Lexicon: How Does Cursive Shape Up? JASON GELLER, *Iowa State University*, MARY L. STILL, *Old Dominion University* — Featural (word shape) information plays a nominal role in type-printed word recognition. Cursive recognition, however, appears to be more dependent on word shape information due to the relative ambiguity and contiguity of cursive letters. The present experiment further explores recognition of handwritten cursive words. Using an unprimed lexical decision task, the transposed-letter (TL) effect was examined for type-print and cursive TL nonwords. In this design, the TL effect is demonstrated when more errors are made for TL nonwords (e.g., *JUGDE*) than double-substitution control nonwords (e.g., *JULHE*). We obtained TL effects for both type-printed and handwritten cursive stimuli. These results suggest that both stimulus types rely on the same mental representations.
Email: Jason Geller, jgeller1@iastate.edu

(1157)

Gaining Insight Into Dyslexia by Measuring Eye-Movements During Reading: Foveal and Parafoveal Processing. RHIANNON S. BARRINGTON, *Bournemouth University*, SIMON P. LIVERSEDGE, *University of Southampton*, JULIE A. KIRKBY, *Bournemouth University* — A single phonological deficit does not seem to be sufficient to cause dyslexia (Peterson & Pennington, 2012). One potential risk factor is weak visual attention (Bosse, Tainturier, & Valdois, 2007). The present study used the boundary paradigm (Rayner, 1975) to examine whether dyslexic children extract information from the parafovea during reading. Eye-movements were recorded from children with dyslexia, typically developing children matched for chronological age and typically developing children matched for reading age. Parafoveal previews were either identical to the target (e.g., before), transposed-letter (e.g., ebfore) or substituted-letter (e.g., tcfore) non-words. The results showed disruption in reading for previews with transposed-letters and substituted-letters compared to identical previews, which occurred for all reading groups. However, in comparison to children matched for reading age, dyslexic readers required more fixations, longer gaze-durations and total-readings times, indicating that while parafoveal processing is occurring in dyslexic reading, foveal processing requires increased visual sampling.
Email: Julie Kirkby, jkirkby@bournemouth.ac.uk

(1158)

Using the Letter Detection Task to Investigate Focus of Attention During Reading of Metaphor Phrases. FELIX S. PAMBUCCIAN and GARY E. RANEY, *University of Illinois at Chicago* (Sponsored by Eric Leshikar) — We examined processing of familiar and unfamiliar metaphors using the letter detection task (LDT). In metaphors such as a sailboat is a cat, readers fixate longer on the vehicle (cat) than the target (sailboat), with this difference being largest in unfamiliar metaphors (Campbell & Raney, 2013). Extra processing time should lead to extra attention given to vehicle words, which should lead to fewer LDT errors on vehicle words. Participants read and performed the LDT on passages containing familiar or unfamiliar metaphors. We unexpectedly found higher error rates for vehicle words than target words in unfamiliar metaphors. We explain this result by considering the focus of attention when reading unfamiliar metaphors. Upon reaching

the vehicle word, readers direct attention to prior words such as the target word and preceding context to resolve comprehension difficulties. This results in rapid disengagement of attention from the vehicle word, causing higher vehicle word error rates.
Email: Felix Pambuccian, fpambu2@uic.edu

(1159)

Polysemy and Semantic Precision: Semantic Measures Extracted From WordNet. GRACE C. LIN, *University of California, Irvine*, JOSHUA LAWRENCE, *University of California, Irvine and University of Oslo*, SUSANNE M. JAEGGI, NATHAN KRUEGER and JIN K. HWANG, *University of California, Irvine*, ASTE HAGEN, *University of Oslo* — Features of vocabulary words contribute significantly to learners' understanding, acquisition, and access of words. We introduce and highlight two word features: polysemy—the number of meaning senses of a word—and semantic precision—how precise a word is, i.e., the number of hypernyms a word has. We demonstrate that the most common meaning senses of polysemous words tend to be less precise. We also show that these two word features are well correlated with existing lexical features such as frequency and dispersion; polysemy is significantly and positively correlated with frequency and dispersion, while semantic precision is negatively correlated with frequency and dispersion. Semipartial correlations and hierarchical regression analyses illustrate that, controlling for existing lexical features, polysemy and semantic precision explain more unique variance than such existing lexical feature as dispersion. Overall, polysemy and semantic precision may prove to be useful constructs in future vocabulary and reading research.
Email: Grace Lin, gracecl@uci.edu

(1160)

The Differential Effects of Reading and Spelling Skill on Lexical Ambiguity Resolution. ASHLEY N. ABRAHAM, JOCELYN R. FOLK and MICHAEL A. ESKENAZI, *Kent State University*, ANGELA C. JONES, *John Carroll University* — Previous research has found that individual differences in reading and spelling ability affect how readers use context (Andrews & Bond, 2009) and how context interacts with skill to impact word recognition (Ashby, Rayner, & Clifton, 2005). Together, this research suggests that both reading and spelling ability interact with context to affect lexical processing. The current study investigated this relationship by embedding biased lexically ambiguous words in sentences with prior context supporting the subordinate meaning of the ambiguous word. Participants read sentences with varying degrees of contextual support while their eye movements were recorded. Measures of reading comprehension and spelling skill were also administered. Results indicated that low skill spellers were more likely to use context to support word recognition while high skill spellers relied more on lexical properties for meaning activation. Reading ability, however, produced a different pattern in the eye movement record. The data indicated that high skill readers made more efficient use of context while low skill readers appeared unable to resolve the ambiguity despite contextual support.
Email: Ashley Abraham, aabrah15@kent.edu

(1161)

Evidence for Simultaneous Syntactic and Semantic Processing of Multiple Words in Reading. JOSHUA J. SNELL, *Brain & Language Research Institute*, MARTIJN MEETER, *Vrije Universiteit Amsterdam*, JONATHAN GRAINGER, *Centre National de Recherche Scientifique* — A hotly debated issue in reading research concerns the extent to which readers process parafoveal words, and how parafoveal information may influence foveal word recognition. We investigated parafoveal word processing both in sentence reading and in reading of isolated foveal words when these were flanked by parafoveal words. In Experiment 1 we found a syntactic parafoveal preview benefit in sentence reading, meaning that fixation durations on target words were decreased when there was a syntactically congruent preview word at the target location (*n*) during the fixation on the pre-target (*n-1*). In Experiments 2 and 3 we used a flanker paradigm in which participants had to classify foveal target words syntactically (noun/verb) or semantically (living/not-living), when those targets were flanked by congruent or incongruent words. Shorter RT's in the congruent conditions suggested that higher-order information is integrated across foveal and parafoveal words. Taken together, current findings suggest that parafoveal information is processed beyond the sub-lexical level, and that higher-order processing may occur across foveal and parafoveal words simultaneously.
Email: Joshua Snell, joshua.snell@hotmail.com

(1162)

Complementary Role Activation and Perceptual Simulation in Compositional and Locative Relations. LARA L. JONES, RYAN D. CALCATERRA, LEE H. WURM and NOA OFEN, *Wayne State University* — Integrative priming refers to the facilitated recognition of a target word (*bench*) as a real word following a prime (*park*). Yet differences in the types of integrative relations may yield differences in the underlying explanatory processes of integrative priming. In this study, we compared the magnitude, time course, and three theoretically based correlates of integrative priming for compositional (*stone table*) and locative (*patio table*) pairs in a lexical decision task across four stimulus onset asynchronies (SOAs; 50, 300, 800, and 1600 ms). Priming magnitudes across these SOAs did not differ between these relations. However, our correlates (co-occurrence, integrative ratings, and perceptual simulation) were differentially related to target RTs. Overall, results provide support for both the Complementary Role Activation theory (Mather, Jones, & Estes, 2014) and the Embodied Conceptual Combination (Lynott & Connell, 2010) theory. Moreover, these results are consistent with prior evidence suggesting differences in the underlying neural correlates of compositional and locative relations.
Email: Lara L. Jones, larajones@wayne.edu

(1163)

Perceptual Grouping and Repetition Blindness. ANDREA M. JACKSON and LORI BUCHANAN, *University of Windsor* — Repetition blindness is the failure to detect or report repetitions among a series or display of items that are presented visually and rapidly (Kanwisher, 1987). In contrast, grouping of items has been found to reliably prevent RB in nonlinguistic stimuli (Goldfarb & Treisman, 2011) and variably prevent RB in linguistic stimuli (Jackson & Buchanan, 2016). The present study explored the effects of enhancing the saliency of the grouped words via established perceptual grouping principles. Five experiments compared displays of words presented in BSVP to displays of words grouped via one or a combination of grouping principles. Grouping based on item case demonstrated the strongest effect in the form of increased accuracy as compared to the non-grouped display. Grouping based on proximity and color similarity demonstrated somewhat increased accuracy, and grouping that contained a time component demonstrated no improvement in accuracy as compared to the non-grouped display.
Email: Andrea Jackson, jacksond@uwindsor.ca

(1164)

Individual Differences in Working Memory Influence Phonological Processing During Reading Comprehension. JACOB TAYLOR, *Kent State University*, MICHAEL A. ESKENAZI, *Stetson University*, JOCELYN R. FOLK, *Kent State University* — In two experiments, we embedded tongue twisters in sentences while participants read silently for comprehension. We manipulated the number of word-initial repeated phonemes in the sentences (0, 3, or 6) and measured working memory (WM) skill using the automated reading span task (Unsworth et al., 2005). Using moving window (E1) and eyetracking (E2) measures, we found that repeating phonemes in a silent reading task disrupts reading time and comprehension. However, these disruptions were moderated by working memory skill. Overall, participants with higher working memory skill were less affected by tongue twisters; reading time disruption only emerged in the six-repeated phoneme condition for the high WM skill readers but was found in the 3- and 6-repeated conditions for the low WM skill readers. Additionally, the low WM readers demonstrated more difficulty recovering from disruption caused by repeated phonemes. These findings are discussed in terms of the role of WM in reading comprehension.
Email: Jocelyn R Folk, jfolk@kent.edu

(1165)

Letter Frequency in an Artificial Script: We Learn and Use What We Learnt Very Rapidly. FABIENNE CHETAIL, *Université Libre de Bruxelles* — Evidence supporting the influence of orthographic regularities in visual word processing is mixed and the role of these regularities receives a peripheral status in current theories of visual word recognition. To examine the influence of regularities while avoiding their natural co-variations with other factors, we used an artificial script made of 22 pseudo-letters. The participants were exposed to a flow of artificial words (five characters) during a few minutes, with either two (Experiment 1) or four (Experiment 2) bigrams occurring very frequently. After exposure, participant sensitivity to these regularities was tested in a 2AFC task. Then, participants performed a letter detection task, letters being either very frequent in the exposure phase or not. The results showed that after only a few minutes of exposure, readers become sensitive to the positional frequency of letter clusters. Moreover, this new knowledge influenced the performance in the letter detection task, with high-frequency letters being detected more rapidly than low-frequency letters. We will discussed the implications of such results for models of orthographic encoding.
Email: Fabienne Chetail, fchetail@ulb.ac.be

(1166)

The Influence of Lexical and Semantic Variables on English Compound Word Recognition During Reading. BARBARA J. JUHASZ, *Wesleyan University* — Juhasz, Lai, and Woodcock (2015) provided ratings for over 600 English compound words on six lexical and semantic variables. The contribution of each these variables to lexical decision and word naming times was then assessed when included in a baseline regression model with the compound words' length, frequency, and lexeme frequencies. In the present eye movement study, 120 of these compound words were embedded in neutral sentences. Both rated familiarity and age-of-acquisition (AoA) exerted robust effects on the eye movement record. Familiarity influenced all fixation duration measures when added to the baseline regression model. This suggests that subjective frequency is important to consider in addition to optimal objective frequency measures when examining compound word processing. AoA influenced measures that took refixations into account when added to the baseline model. Taken together, these results suggest that a reader's experience with compound words has a significant impact on compound recognition.
Email: Barbara J Juhasz, bjuhasz@wesleyan.edu

(1167)

The Preferred Viewing Location in Top-to-Bottom Sentence Reading. REBECCA L. JOHNSON and EMMA L. STARR, *Skidmore College* — The preferred viewing location (PVL) is a robust finding that when fixating on a word during normal sentence reading, readers tend to land slightly to the left of the center of the word. This is in contrast to the optimal viewing location (OVL) in single word recognition, which falls at the center of the word. The current study examined whether the PVL can be attributed to oculomotor error or a processing advantage by using an experimental manipulation that separates tracking direction (left-to-right reading) and landing position (left-to-right within a word). Sentences were presented to participants from the top to the bottom of a computer screen with one word per line, while eye movements were recorded. In this presentation format, readers continued to land to the left of center, suggesting that the PVL in normal reading is not due solely to oculomotor error.
Email: Rebecca Johnson, rjohnso1@skidmore.edu

(1168)

Visual Word Recognition of Compound Words: A Megastudy Approach. SAY YOUNG KIM, MELVIN J. YAP and WINSTON D. GOH, *National University of Singapore* — Previous studies on visual word recognition of compound words have provided evidence for the role of lexical properties (e.g., length, frequency) and semantic transparency (the degree of relatedness in meaning between a compound word and its constituents) in morphological decomposition (e.g., *doorbell* into *door* and *bell*). However, there are still unresolved questions in this domain. For example, the extent to which the position of a constituent in a compound word influences morphological decomposition is still an open question. In order to provide a more complete picture of compound word recognition, we analyzed naming and lexical decision performances of over 2300 compound words from the English Lexicon Project (http://elexicon.wustl.edu). The results of both tasks indicated that semantic transparency of the second constituent plays a more prominent role than that of the first constituent – the higher the semantic transparency of the second constituent is, the higher/faster the response accuracies/latencies are.
Email: Say Young Kim, sayyoung.kim@gmail.com

(1169)

When Milliseconds Matter: The Effects of Word Frequency and Word Length on Visual Word Recognition While Driving. PILAR TEJERO, JAVIER ROCA and BEATRIZ INSA, *Universitat de València* — Visual word recognition is harder for low- than for high-frequency words, and also harder for long than for short words. We wondered if the effects of word frequency and word length on visual word recognition can be also found in situations in which the words have to be identified while performing the additional, highly-demanding task of driving. Participants were instructed to read aloud the word displayed on each of the 64 traffic information signs they encountered during a simulated driving task, as soon as possible without making errors. The stimuli were names of Spanish cities, towns and villages. Extending the generality of the effect of word frequency, accuracy in reading was significantly greater for high- than for low-frequency names, and participants began to read the name at a significant farther distance from the traffic sign for high- than for low-frequency names. Such patterns were observed in both the short and long-word conditions. Beyond their intrinsic, theoretical interest, these results have practical implications: a number of milliseconds in the processing of written information may make a relevant difference in the time available to make critical driving decisions.
Email: Pilar Tejero, pilar.tejero@uv.es

BILINGUALISM I

(1170)

The Role of Monolingual and Bilingual Language Profiles in Distracted Driving. ISIS CHONG and THOMAS Z. STRYBEL, *California State University, Long Beach* — Bilinguals have been shown to outperform monolinguals across a variety of cognitive tasks, yet investigations of the bilingual advantage in driving have been inconclusive. We investigated differences between monolingual and bilingual drivers using a simulated driving task. The Lane Change Test was used to assess driving performance in the presence of a peripheral detection task (PDT), combined with either a delayed digit recall task (the 2-back task), or a visuospatial task (the clock task). Results showed that both monolinguals and bilinguals performed equally across all tasks. Simultaneously completing a cognitive task was found to be detrimental to both driving performance and the detection of peripheral stimuli for monolinguals and bilinguals, suggesting that the bilingual advantage may not be as robust as previously reported.
Email: Isis Chong, chong.isis.a@gmail.com

(1171)

Bilingual Language Control Can Be Initiated by General Interference – Evidence From Reduced Switch Costs With Spatially Incongruent Trials. MATHIEU DECLERCK and JONATHAN GRAINGER, *Aix-Marseille Université*, IRING KOCH and DENISE N. STEPHAN, *RWTH Aachen University* — Recent evidence shows that language control during bilingual language production is initiated by conflict monitoring, which detects interference and gives a signal to initiate interference resolution. Since conflict monitoring is assumed to be domain general, it is likely that it is also used during comprehension-based language control. Yet, none of the existing comprehension-based models of language control implement conflict monitoring. To investigate conflict monitoring during comprehension-based language control, we implemented a Simon task, which is a measure of executive control, next to language switching of written words, which is a measure of language control. In two experiments with different bilinguals (Spanish-German and French-English bilinguals), we found that switch costs were reduced in spatially incongruent trials relative to spatially congruent trials. This finding is not in line with existing models, but is in line with an important role for conflict monitoring during comprehension-based language control.
Email: Mathieu Declerck, mathieu.declerck@blri.fr

(1172)

The Effects of Language Experience on the Modulation of Cognitive Control: Evidence From the AX-Continuous Performance Task. ANNE BEATTY-MARTÍNEZ, MEGAN ZIRNSTEIN and JUDITH F. KROLL, *Pennsylvania State University* (Sponsored by Paola Dussias) — Bilinguals are capable of efficiently negotiating task demands, especially when the task requires engagement of cognitive control. For example, bilinguals have been shown to outperform monolinguals on the AX-Continuous Performance Task (Morales et al., 2015), which pits proactive monitoring against reactive/inhibitory control (Braver et al., 2001; Braver, 2012). While some have hypothesized that language switching experience can enhance proactive control in bilinguals (Zhang et al., 2015), others have proposed that switching will have an impact on reactive control processes (Green & Abutalebi, 2013). We conducted an aggregate analysis of the AX-CPT in monolinguals, bilinguals, and L2 learners (N=818) to investigate how language experience may modulate cognitive control processes. While bilinguals

overall exhibited slower RTs relative to L2 learners and monolinguals, only bilinguals immersed in the L2 performed as or more accurately across conditions. We discuss these results with respect to language immersion and dominance, as well as codeswitching experience.
Email: Anne Beatty-Martínez, anne.beattymartinez@gmail.com

(1173)

The Effects of Unimodal Bilingualism on Reducing Prejudicial Tendencies. ALEX J. TITUS, *Rutgers, The State University of New Jersey - Camden* (Sponsored by Robrecht van der Wel) — Recent findings suggest that there may be a bilingual advantage pertaining to executive functions. For example, bilinguals perform better on standard inhibitory control tasks. Bilinguals may make more rational decisions in their second (L2) versus their native (L1) language, as well as compared to monolinguals. Here, we asked whether bilinguals also show a reduction in implicit racial biases in a categorization task. In particular, we tested whether bilinguals show a reduction of prejudicial tendencies in both their L1 and L2 as compared to monolinguals. Monolinguals and unimodal bilinguals performed a mouse tracking task to measure the dynamics of continuous categorization of stereotypical words when compared to neutral categorization words. If the hypothesis is supported, it will extend the effects bilingualism has on executive functioning. Findings may also inform the dual processing models of language and the extent to which the effect of bilingualism can be tracked using a continuous measure.
Email: Alex Titus, ajt167@scarletmail.rutgers.edu

(1174)

Nuanced Explorations of the Proposed Association Between Bilingualism and Task Switching. ALENA STASENKO, *San Diego State University and University of California, San Diego,* TAMAR GOLLAN, *University of California, San Diego* — Bilingual language switching may increase general switching efficiency, but the evidence on this question is mixed. We hypothesized that the switching advantage might be strongest at a long cue-target interval (CTI), which may better tap general switch abilities (Yehene & Meiran, 2007). Eighty Spanish-English bilinguals and 80 monolinguals completed a color-shape switching task that varied CTI, and bilinguals also completed an analogous language-switching task. Bilinguals exhibited significantly smaller task-switching costs than monolinguals, at long but not short CTI, but only in the first half of trials. Groups did not differ in mixing costs; however, across CTIs and tasks, correlations between mixing costs were more robust than correlations between switching costs. These results confirm an association between bilingualism and switching efficiency that can be magnified with manipulations that target general switching ability, but might also partially reflect a fleeting and more conservative approach to mixed-task blocks.
Email: Alena Stasenko, astasenk@ucsd.edu

(1175)

The Adjustment of Bilinguals' Cognitive Control in Code-Switching Environments. RACHEL M. ADLER, *University of Maryland*, JORGE R. VALDES KROFF, *University of Florida*, JARED M. NOVICK, *University of Maryland* — Whether bilinguals show cognitive-control advantages relative to monolinguals is controversial, and the findings are mixed. Discrepant results raise questions about linking assumptions: What processing demands does bilingualism impose that might yield benefits? Prior research suggests that bilinguals who routinely switch languages enjoy advantages over non-switchers and monolinguals. But, is switching between languages itself a cognitive-control task? Given difficulties with across-group comparisons (monolinguals and bilinguals differ in many ways), we do not address cognitive advantages here. Instead, we compared 34 Spanish-English bilinguals with *themselves*, testing whether cognitive-control functioning differs across linguistic contexts. Subjects completed a nonverbal conflict task (Flanker) interleaved with sentence reading in four blocks. Blocks contained either intra-sentential code-switches; between-sentence language switches; English-only sentences; or Spanish-only sentences. Subjects' Flanker-conflict cost was reliably smallest in the code-switching block. Thus, processing code-switches enhances cognitive-control performance in ways that single-language input and even between-sentence language switches do not.
Email: Rachel Adler, radler1@umd.edu

(1176)

Won't Get Fooled Again? Lie Perception in Native and Non-Native Languages. LELA S. IVAZ, *Basque Center on Cognition, Brain and Language,* ALBERT COSTA, *Center of Brain and Cognition, Universitat Pompeu Fabra; ICREA, Institució Catalana de Recerca i Estudis Avançats,* JON ANDONI DUNABEITIA, *Basque Center on Cognition, Brain and Language, Donostia* — Lies are an everyday occurrence in our society, yet we are notoriously bad at recognizing them. Lie detection is a complex task with typically low accuracy rates and generally governed by different heuristics. The most common heuristic is the truth bias - perceivers' belief that most statements are truthful. In the current study we explored how perceivers' lie detection performance and the truth bias are modulated when individuals perceiving and producing lies are native or non-native speakers of the language. Native and non-native participants listened to auditory statements (produced by native and non-native speakers) and judged them for their truthfulness. Native-speaking perceivers of non-native speakers' statements showed the poorest lie detection performance. Results also showed a significant truth bias of similar magnitudes across all groups. These findings speak to the universality of some mechanisms that govern lie detection, while also highlighting important differences as a function of nativeness.
Email: Lela Ivaz, l.ivaz@bcbl.eu

(1177)

Examining Taboo Effects in Native and Non-Native Speakers of American English. SAMANTHA E. TUFT, SARA INCERA and CONOR T. MCLENNAN, *Cleveland State University* —

Bilingual speakers report experiencing less emotion when using their second language (Pavlenko, 2005). However, results from laboratory research using an emotional Stroop task are inconsistent, with some studies obtaining significant differences between the first and second language (Eilola & Havelka, 2011; Winskel, 2013) - and other studies reporting no such differences (Eilola, Havelka, & Sharma, 2007; Sutton, Altarriba, Gianico, & Basnight-Brown, 2007). These inconsistent findings could be due, at least in part, to a lack of sensitivity in traditional measures. In the present study, we used computer mouse tracking to examine visual Stroop interference effects of taboo English words compared to neutral English words in native and non-native speakers of American English. The mouse-tracking paradigm allowed us to evaluate the continuous dynamics of the responses over time. These results have important theoretical consequences for emotional language processing in adults' native and non-native languages.
Email: Samantha E. Tuft, s.tuft@vikes.csuohio.edu

(1178)

The Effect of Bilingualism on Age-Related Cognitive and Language Declines. HAOYUN ZHANG, *Pennsylvania State University*, EMILY CHIEKO KUBOTA, VICTORIA LEA ANDERS and DEBORAH BURKE, *Pomona College*, MICHELE DIAZ and JUDITH KROLL, *Pennsylvania State University* — Considerable evidence suggests that bilingualism improves cognitive functions. In contrast, bilinguals lag behind monolinguals in some language production functions. We compared performance of older bilinguals and monolinguals (age 60-80 years, English is either L1 or L2) on an English picture naming task with pictures presented in same semantic category blocks, same initial phonemes blocks or unrelated picture blocks. Participants also performed an AX-CPT task and a non-language switching task. Bilinguals produced significantly longer RTs and lower accuracy on the naming task, with comparable semantic interference and smaller phonological facilitation effects compared to monolinguals. On the AX-CPT task, bilinguals were more accurate than monolinguals during conditions requiring proactive control. On task switching, bilinguals produced longer RTs but higher accuracy than monolinguals, indicating a speed-accuracy trade-off. Thus, older bilinguals showed some deficit compared to monolinguals in language-specific phonological processes, but also superior performance in attentional control when language production was not required.
Email: Haoyun Zhang, haoyunzhang89@gmail.com

(1179)

Bilingual Experience and Executive Control Over the Adult Lifespan: Evidence From the Wisconsin Card Sort Task. SIVANIYA SUBRAMANIAPILLAI and M. NATASHA RAJAH, *McGill University*, STAMATOULA PASVANIS, *Douglas Hospital Research Centre, McGill University*, DEBRA TITONE, *McGill University* — A topic of recent controversy is whether bilingual language experience in older adults buffers normal age-related declines in executive function (reviewed in Baum & Titone, 2014). Some studies show reduced age-related decline using behavioural measures (e.g., Gold et al, 2013; Kavé et al., 2008, Bialystok et al., 2004), some show altered neural recruitment using brain measures (e.g., Luk et al., 2011, Grady et al., 2010; Park et al., 2010; Bak et al., 2014), and some fail to show an impact of bilingual language experience on executive control using either behavioral or neural measures (e.g., Kousaie & Phillips, 2012; Kousaie et al., 2014; Zahodne et al., 2014). Here, we investigate this issue using the Wisconsin Card Sort Task (WCST; Grant & Berg, 1948) in an adult lifespan sample (n = 152) ranging from 19 to 76 years of age. Interestingly, women showed the greatest age-related cognitive decline across WCST measures, and were more likely than men to show improved performance (e.g., fewer perseverative errors) with increased bilingual experience (i.e., number of languages known, percentage non-L1 usage). We consider implications of this finding for questions regarding the relationship between bilingualism and cognition, and the effects of biological sex on cognitive aging.
Email: Sivaniya Subramaniapillai, sivaniya.subramaniapillai@mail.mcgill.ca

(1180)

Bilingual Word Selection During Text Comprehension. JOSEPH A. NEGRON and ANA I. SCHWARTZ, *University of Texas at El Paso* — According to the BIA+ model (Dijkstra & van Heuven, 2002) language membership of words does not influence the activation of words within a language, which is supported by single-word recognition and sentence processing studies. In the present study highly-proficient Spanish-English bilinguals read an expository text in L2 followed by a prime passage that was either related or unrelated in topic and either in the L1 or in the L2. Critical terms in the target passage were cognates that were either previously encountered in L1 or L2, or were not encountered previously. First-fixation durations on cognate terms were longer when preceded by an unrelated prime passage in the L1, reflecting a language switch cost. This suggests that context provided by a text allows for language selection. No switch cost was observed when cognate terms were previously encountered in the prime, suggesting that presence of cognates maintained activation of non-target language.
Email: Joseph Negron, janegron@miners.utep.edu

(1181)

Tip of the Tongue Phenomenon in Bilinguals: Is There an Effect of Bilingual Language Control? ELEONORA ROSSI and ALEXANDRA RIVAS, *California State Polytechnic University, Pomona* — Tip of the Tongue Phenomenon -TOT- in bilinguals has been proposed to reflect the relative lower use of one of the languages. At the same time, the Inhibitory Control Hypothesis posits that bilinguals need to temporarily inhibit their L1 to allow fluent speech production in L2. The goal of this study is to take the first steps to investigate whether the rate of TOTs in bilinguals can be modulated by more language general inhibitory control processes. So far, 7 Spanish-English bilinguals were tested during a TOT blocked language switching paradigm (i.e., L1-L2-L1). We hypothesize that after speaking in the L2, participants will show higher rates of TOTs in their L1. Preliminary results support this hypothesis showing higher frequencies of TOTs after performing an intervening TOT

block in the L2. Results will be discussed in the frame of recent psycholinguistic literature on bilingual language processing and control.
Email: Eleonora Rossi, eleonoraros@gmail.com

(1182)

Is There a Bimodal Advantage in Language Switching? SIMONE SCHAEFFNER and ANDREA M. PHILIPP, *RWTH Aachen University* — Typically, language switching refers to unimodal switching between two spoken languages both performed vocally. In bimodal language switching, the languages are assigned to different output modalities: one language is performed vocally and one is performed manually (e.g., a sign language). We compared unimodal switching with two different kinds of bimodal switching for non-signers. Experiment 1 consisted of switching between a spoken language and manual responses similar to a sign language. Participants of Experiment 2 switched between two originally spoken languages in a bimodal way (i.e., switching between speaking and writing). Interestingly, we found a bimodal advantage in terms of reduced switch costs for bimodal compared to unimodal switching in Experiment 1 but not in Experiment 2. This speaks for different language control mechanisms: Less costly output channel inhibition for switching between speaking and signing (Experiment 1) and more costly lexical inhibition for switching between speaking and writing (Experiment 2).
Email: Simone Schaeffner, Schaeffner@psych.rwth-aachen.de

(1183)

Interlingual Homographs and Cognates: Do Bilinguals Process Them Similarly? OMAR GARCIA, *Texas A&M University*, ANNA B. CIESLICKA AND ROBERTO R. HEREDIA, *Texas A&M International University* — Are interlingual homographs processed similar to cognates under the bilingual language mode and as a function of language dominance? Extending Garcia et al.'s (2015) study, we revisit bilingual lexical access in Spanish-English bilinguals varying in language dominance. In Experiment 1, interlingual homographs (i.e., words across languages with identical spellings but different meanings, such as RED, *net* in Spanish but *a color* in English) were presented along with matched controls. In Experiment 2, cognates (i.e., words across languages with identical spellings and meanings, such as NOBLE) were used in place of homographs. In both experiments, participants made lexical decisions to word and non-word targets, as they were exposed to a bilingual language mode. Results suggest that homographs and cognates are processed similarly under specified task demands but show asymmetrical processing tendencies which are moderated by language dominance.
Email: Omar Garcia, ogr1986@tamu.edu

(1184)

Current L2 Experience Has a Reduced Impact on Eye Movement Measures of L1 and L2 Reading Performance in Bilingual Children. VERONICA WHITFORD and MARC F. JOANISSE, *The University of Western Ontario* — Prior eye movement work has found that word frequency effects (FEs), an index of lexical access, are larger during L2 versus L1 reading in bilinguals across the adult lifespan, that is, in younger and older adults (Whitford & Titone, 2012, 2016). This work has also found that greater current L2 experience reduces L2 word FEs (reflecting increased lexical access), but increases L1 word FEs (reflecting reduced lexical access) in young adulthood only. Here, we examined whether a similar relationship would be found in childhood. English-French bilingual children (aged 7-12) read L1 and L2 texts while their eye movements were monitored. Consistent with prior work, we found that word FEs were larger during L2 versus L1 reading; however, greater current L2 experience had a more limited impact, reducing L2 word FEs during late-stage reading only. Thus, L1 and L2 lexical representations may be less sensitive to current L2 experience in childhood.
Email: Veronica Whitford, Ph.D., vwhitfor@uwo.ca

(1185)

Are Bilinguals on the Same Emotional Page as Monolinguals? SAMIRA A. AMIRAZIZI and CONNIE SHEARS, *Chapman University* — If emotions are learned through language acquisition in early childhood (Blanchette, 2006), is the first language more emotionally-connected than the second language (Caldwell-Harris, 2015)? We hypothesize that valenced stories (negative or positive) would have a similar response time and comprehension accuracy for bilingual participants (versus monolingual) in comparison to neutral stories. Previously, readers were more accurate responding to questions following positive vs. negative stories. However, this data was only analyzed for monolingual, native English speakers. Using archival data, we test the differences between native English speakers, native English speakers with a second language from birth, and native English speakers who had second language expertise later in life, for comprehension across positive, negative, or neutral valenced stories. Differences between monolinguals and bilinguals in the comprehension of English stimuli may provide evidence for comprehension of emotional language unique to bilingual participants.
Email: Samira Amirazizi, amira100@mail.chapman.edu

(1186)

Phonological Processing and Vocabulary Development in English Second Language (ESL) Bilingual Children. MARY LAY CHOO LEE and SUSAN J. KIRBY, *National University of Singapore* — Phonological processing skills are critical for early language and literacy development but few researchers have examined the relationship between phonological processing and vocabulary development in ESL bilinguals with contrasting languages. We investigated the shared and separate contributions of short-term memory (PSTM, operationalised as nonword repetition) and phoneme awareness (PA) longitudinally, for English receptive and expressive vocabulary development in two groups of 5-6 year-old ESL bilingual children: Mandarin L1-English L2 (n = 31) and Malay L1-English L2 (n = 30). For the Mandarin L1 group, PA but not PSTM, contributed significantly to both receptive and expressive vocabulary, whereas for the Malay L1 group, both PSTM and PA explained unique variance for both receptive and expressive vocabulary. These disparate patterns of association

appear to be attributable to the linguistic relationship between the language pairs. This factor has often been neglected in previous work on bilingualism and it has important theoretical and practical implications.
Email: Susan Rickard Liow, entsrl@nus.edu.sg

WITHDRAWN

(1187)

The Consequences of Early and Late Bilingualism for New Language Learning and Generalization. ANDREA A. TAKAHESU TABORI and JUDITH KROLL, *University of California - Riverside* — Bilinguals are better word learners than monolinguals but early bilinguals may have a special advantage, suggesting that early language experience may benefit new learning. The current study asks whether monolinguals and bilinguals will process newly learned words differently in sentence context, and whether they will differ in how well they generalize new learning. English monolinguals, early and late Spanish-English bilinguals studied novels words that consisted of an English stem and a novel suffix along with its definition. All groups completed a behavioral recognition memory task and a battery of language and cognitive measures. A week after initial learning, they completed a sentence congruency go/nogo task while EEG was recorded, in which each sentence was read silently until the final word, marked by a color cue to indicate go or no-go. Final words contained studied suffixes, semantically congruent or incongruent with the sentence. Accuracy and reaction times on go trials and ERPs on no-go trials provide an index of successful generalization of learned suffixes. Data collection is in progress, but we hypothesize that the specific source of the learning advantage for early bilinguals may be localized to generalization.
Email: Andrea Takahesu Tabori, andreatakahesu@gmail.com

SPEECH PERCEPTION I

(1188)

Neural Correlates of Task-Irrelevant Perceptual Learning of Non-Native Speech Sounds. SAHIL LUTHRA, *Brown University*, PAMELA FUHRMEISTER, *University of Connecticut*, SARA GUEDICHE and SHEILA BLUMSTEIN, *Brown University*, EMILY B. MYERS, *University of Connecticut* — Studies of non-native phonetic category learning typically employ explicit training paradigms that include category labels, and these studies often show recruitment of frontal areas linked to category-level representations (e.g., LIFG, MFG; Callan et al., 2003; Golestani & Zatorre, 2004). It is unknown whether frontal areas also contribute to the retuning of perceptual categories in the absence of an overt label. To examine this question, we employed a task-irrelevant perceptual learning paradigm (Vlahou, Protopapas & Seitz, 2012), to train listeners on the distinction between dental and retroflex stop consonants, using a task that does not use category labels. Using fMRI, we compared changes in brain activity before and after training. Participants showed increased discrimination sensitivity to the two non-native categories. Of interest, frontal areas were sensitive to the learned non-native category distinction, providing support for their potential role in perceptual retuning even in the absence of an explicit label.
Email: Emily Myers, emily.myers@uconn.edu

(1189)

The Use Of Top-Down Knowledge By Second Language Learners. AMRITHA MALLIKARJUN, POORLA NEWMAN and JARED NOVICK, *University of Maryland - College Park* — Much of the language we hear occurs in the presence of background noise. This noise can mask part of the incoming signal, reducing intelligibility. Understanding speech, despite this background noise, involves combining information from the signal with top-down information based on prior knowledge about the language. Second language (L2) learners show increased difficulty listening in noisy environments. One reason may be because they are less adept at using top-down knowledge from their L2 to fill in information. We tested L2 learners and monolinguals on word recognition in both constant noise and intermittent noise and silent gaps. L2 learners were worse overall at word recognition in noise, but they were able to restore phonemes in words masked by intermittent noise, which requires top down information. This indicates that L2 learners difficulty is not purely the result of reduced ability to utilize top down knowledge.
Email: Amritha Mallikarjun, amritham@umd.edu

WITHDRAWN

(1190)

Visual Speech Influences Lexical Access in Infants. DREW WEATHERHEAD (Graduate Travel Award Recipient) and KATHERINE S. WHITE, *University of Waterloo* — We explored how visual speech affects infants' word processing. 12-to-13-month-old infants were familiarized with four familiar b-initial words(e.g., *bottle*) . However, the words were mispronounced with p-onsets (e.g., *pottle*). Participants either saw the speaker produce these mispronunciations (Audiovisual Familiarization; n=18), or only heard the mispronunciations (Auditory Familiarization; n=18). In the Audiovisual familiarization, the visual percept matched the original word (i.e., pottle is visually identical to bottle). Following exposure, infants were tested on their recognition of a *different* set of familiar b-initial words, again mispronounced with /p/. Critically, the test presentation was auditory-only. Only infants who received the Audiovisual Familiarization recognized the mispronounced words at test, listening longer to those words than to a set of nonsense words (Audiovisual: $t(17) = 7.13$, $p < .001$, $d = .749$; Auditory: $t(17) = -.59$, $p = .558$, $d = .021$). Thus, visual speech information during familiarization altered infants' later perception of auditory words.
Email: Drew Weatherhead, deweathe@uwaterloo.ca

(1191)

Phonetic Category Activation Can Drive Rapid Speech Adaptation. CHARLES WU and LORI L. HOLT, *Carnegie Mellon University* — Listeners are sensitive to correlations among the acoustic dimensions that define speech categories. Highly diagnostic dimensions have the greatest impact on categorization, but correlated secondary dimensions also

contribute. Prior research has demonstrated that this relative 'perceptual weight' is very sensitive to regularities in short-term speech experience. When listeners encounter a correlation between dimensions that runs counter to long-term experience they rapidly down-weight reliance on the secondary dimension. Here, we test the hypothesis that phonetic-category-level activation via a highly diagnostic dimension drives this rapid tuning of how input maps to speech categories. We used noise-vocoding, a signal-processing technique, to manipulate the inherent relative informativeness of two acoustic cues to English vowel categorization. The pattern of results was driven by the effectiveness of an acoustic dimension in signaling vowel category membership, consistent with our hypothesis. These findings bear on models of speech categorization and rapid adaptive plasticity in perception, more generally.
Email: Charles Wu, yunanw@andrew.cmu.edu

(1192)

The Effects of Healthy Adult Aging on the Speed of Comprehension and the Cognitive Effort Required for Sentences Varying in Expectancy and Entropy. NICOLE D. AYASSE and ARTHUR WINGFIELD, *Volen National Center for Complex Systems, Brandeis University* (Sponsored by Elizabeth Stine-Morrow) — Although older adults can use context effectively to understand spoken language, at times the context may fit multiple semantic competitors, and choosing the correct one can be crucial for comprehension. Given the inhibitory control deficit common in aging, it is critical to understand how older adults comprehend sentences. An experiment is reported to explore the interaction of context (expectancy) and competition (response entropy) using sentences with either high or low expectancy for a sentence-final (target) word and with either high or low response entropy. These target words were then paired with either a high or low contextual competitor in a variation on a visual world eye-tracking paradigm. Results support the expectation that lower expectancy and higher entropy slow comprehension, and that expectancy and entropy interact. Results will be discussed in terms of aging and individual difference effects. Work supported by NIH Grants RO1 AG 019714 and T32 GM 084907.
Email: Nicole Ayasse, nayasse@brandeis.edu

(1193)

All Voices Aren't Equal: Memory for Words Depends on Talker Voice. MEGHAN SUMNER and ANDREA K. DAVIS, *Stanford University* — It is now well established that listeners recognize a word better when it is repeated by the same talker than when repeated by a new talker. It is also well established that some phonological variants (e.g. city with a tap or a [t]) benefit from repetition more than others. Both have motivated episodic approaches to form-based representation in language. We investigate one unexplored, but implicit assumption of current theory: no two voices are treated equally. We examine the repetition benefit for words & variants in a long-term repetition priming paradigm and ask whether differences arise for clearly uttered words produced by two female voices of American English with no regionally marked differences. Our stimuli included four conditions: No variation (e.g. funny), tap (e.g. city), schwa deletion (e.g. police) & post-nasal t-deletion (e.g. center), in a between-subject design where participants heard one voice. We show that for both voices, repeated words are recognized faster than new words after a delay, replicating past work. But, we also find that the repetition benefit for No variation, post-nasal t-deletion, and tap differed depending on the talker voice, despite the overwhelming similarities in our talker voices.
Email: Meghan Sumner, sumner@stanford.edu

(1194)

The Use of Phonological Representations in Guiding Eye-Movements in the Visual World Paradigm. JULIE GREGG and STANISLAV SAJIN, *Binghamton University, State University of New York* (Sponsored by Albrecht Inhoff) — Using the visual world paradigm (VWP), Salverda and Tanenhaus (2010) observed results which suggested that the mapping of spoken words onto printed word arrays may be mediated by orthography rather than phonology. In Experiment 1, the display included the target and one of two competitors with identical orthographic overlap with the target but differing degrees of phonological overlap. In Experiment 2, orthographic, but not phonological, overlap differed between the competitors. Surprisingly, an effect of orthographic overlap on the likelihood of fixating a competitor was observed in the absence of a phonological overlap effect, even though participants were processing spoken rather than printed words. We replicated these experiments, but manipulated overlap within rather than between displays. Contrary to the original findings, we observed an effect of phonological overlap, but no effect of orthographic overlap. Our findings suggest that the mapping of spoken words onto printed displays was primarily mediated by phonology.
Email: Julie Gregg, jgregg3@binghamton.edu

(1195)

Evaluating the Relationship Between Sublexical and Lexical Processing: Evidence From the Visual World Paradigm. HEATHER R. DIAL, *Rice University*, BOB MCMURRAY, *University of Iowa*, RANDI C. MARTIN, *Rice University* — Prior studies of aphasic individuals have reported strikingly better speech perception at the lexical than sublexical level (e.g., Miceli, et al., 1980), suggesting that lexical recognition is independent of sublexical processing (e.g., Hickok & Poeppel, 2000). However, using closely matched stimuli/tasks, we found a correlation between sublexical and lexical perception and no patient was better at lexical than sublexical tasks (Dial & Martin, 2015). The current study sought converging evidence using the visual world paradigm to measure speech perception online (e.g., McMurray, et al., 2008). Both aphasic individuals (n=8) and controls (n=10) showed a strong correlation between competitor fixations on sublexical and lexical tasks (patients: $r(6) = .67$, $p = .068$; controls: $r(8) = .67$, $p = .033$). Critically, patients within control range on the lexical task were also within control range on the sublexical task. The results are consistent with sublexical processing as a necessary prerequisite to lexical processing.
Email: Heather Dial, heather.raye.dial@gmail.com

(1196)

The Effects of Immersion on Foreign-Accented Speech Comprehension in Native Listeners: An Electrophysiological Study. CARLA FERNANDEZ, *Pennsylvania State University*, SARAH GREY, *Fordham University*, JANET VAN HELL, *Pennsylvania State University*, TAOMEI GUO, *Beijing Normal University* — Foreign-accented speech can challenge language comprehension. Although behavioral studies show that listeners adapt quickly to foreign-accented speech, ERP studies show distinct electrophysiological consequences for processing foreign-accented relative to non-accented speech, particularly for listeners with limited exposure to the foreign accent. In an auditory ERP study, we examined whether increased exposure to the foreign accent affects the ERP correlates of semantic and grammatical processing during sentence comprehension of foreign-accented speech. A group of American citizens living and studying in Beijing, China listened to Chinese-accented and American-accented speakers producing English sentences that contained semantic or grammatical errors, and matched correct sentences. Analyses show that Chinese-accented speech modulates semantic and grammatical processing relative to American-accented speech. These immersed listeners' data differ from previous work testing non-immersed listeners in the US (Grey & Van Hell, under revision). This shows that increased exposure to foreign-accented speech affects neurocognitive mechanisms of sentence comprehension.
Email: Carla Fernandez, cbf140@psu.edu

(1197)

What Architecture Underlies Lexical Effects on Perceptual Grouping? ADAM J. THOMAS and MARK A. PITT, *The Ohio State University* — The grouping of speech sounds into coherent streams is necessary for spoken word recognition, yet the nature of the interface between sequential integration and spoken word recognition is poorly understood. Bregman's (1990) ASA framework suggests lexical memory could achieve integration through schematic grouping. Another possibility is that lexical memory and perceptual grouping interact. Two experiments distinguished these possibilities using a task in which the [s] in word and nonword contexts was presented along a spatial continuum. On each trial, participants reported the location of [s]. Participants reported the [s] as being closer to its context in words than in nonwords, demonstrating that [s] was better integrated in words. Reaction time analyses revealed that these differences were time-locked to the available lexical context. These results favor a cognitive architecture in which the sequential integration of speech sounds and lexical memory interact.
Email: Mark Pitt, pitt.2@osu.edu

(1198)

Cognitive Audiology: Investigating Cognitive Load Interactions With Hearing Loss. STEFANIA CERISANO and JULIE CONDER, *McMaster University*, JEFF CRUKLEY, *Starkey Canada*, SHANNON O'MALLEY, KARIN R. HUMPHREYS and SCOTT WATTER, *McMaster University* — Sensory hearing loss and decline in fluid processing capacity are both common with normal aging. The increased attention and concentration needed to understand speech likely competes for available cognitive resources, and may suggest other cognitive methods could augment typical stimulus-enhancing hearing aid approaches. Our initial work explores these ideas using healthy young participants with simulated hearing loss and imposed additional cognitive loads. Participants performed an auditory word recognition task with varying difficulty, along with a secondary manual tracking task to manipulate resource/capacity limits. We discuss tradeoffs and interactions of noise type under increasingly limited attentional capacity, and assess real-time tracking error as a measure of attentional work in listening, along with rates and types of errors in spoken word recognition performance. We compare these data with measures of working memory capacity, listening effort objectively measured by pupil dilation, and subjective ratings of listening difficulty. Future directions, including work with older participants and possible cognitive approaches to this problem will be discussed.
Email: Stefania Cerisano, cerisas@mcmaster.ca

(1199)

Attention Modulates Cross-Modal Retuning of Phonetic Categories to Speakers. DAVID A. KAJANDER, ELINA KAPLAN, and ALEXANDRA JESSE, *University of Massachusetts Amherst* — In face-to-face communication, listeners utilize information obtained from hearing and seeing a speaker to recognize speech. Listeners also use information from one modality to adjust their phonetic categories to a speaker's idiosyncrasy encountered in the other modality. We examined whether attention is needed for this cross-modal retuning. In a standard retuning paradigm, participants were first exposed to a nonword that was ambiguous in one modality but disambiguated in the other modality as either "apa" or "ata". Participants' primary task was to attend to this audiovisual speech, while either monitoring a tone sequence for a target tone or ignoring the tones. At test, listeners categorized more steps of an "apa-ata" continuum in the critical modality in line with prior exposure. This retuning was reduced but not eliminated by attentional load during exposure, irrespective of whether the load was induced in the modality that contained the ambiguous or the disambiguating information. Attention thus modulates the cross-modal retuning of phonetic categories.
Email: David Kajander, dkajander@umass.edu

(1200)

Effects of Hearing Acuity on Use of Prosody in Speech Comprehension. ZOE M. BROWN, NICOLE AMICHETTI and ARTHUR WINGFIELD, *Brandeis University* — Speech prosody is a helpful feature as it signals syntactic markings to the listener and thereby reduces processing effort. This effect on processing effort was examined in the context of age and reduced hearing acuity. Normal-hearing young adults and older adults with good-hearing and with mild-to-moderate hearing loss listened to and recalled sentences with a prosodic pattern that coincided with the syntactically defined clause boundary and sentences where prosody was incongruent with the syntax. Pupil dilation was used as a measure of processing effort, with larger dilations reflecting larger amounts of effort. All

participants had significantly worse recall for the incongruent sentences than for the congruent sentences. This pattern was mirrored in the pupillometry data, with incongruent prosody eliciting larger pupil dilations than the congruent for all groups. Older adults showed consistently larger dilations than the young, with those with hearing loss displaying a unique response profile.
Email: Nicole Amichetti, namich@brandeis.edu

(1201)

Perceptual Learning of Accented Speech by First and Second Language Listeners. ANGELA COOPER, *University of Toronto - Mississauga*, ANN R. BRADLOW, *Northwestern University* — This study examined the impact of linguistic experience on perceptual adaptation to an English accent that included controlled deviations from the standard (e.g. /i/-to-/□/ yielding /kr□m/ instead of /krim/ for 'cream'). Following accent exposure with disambiguating feedback, listeners completed lexical decision and word identification tasks. Both L1 and L2 (L1 Dutch) listeners demonstrated adaptation, evidenced by higher lexical endorsement rates and word identification accuracy than control listeners for items containing trained accent patterns. However, adaptation was modulated by the phonemic contrast, that is, whether or not it was contrastive in the listeners' native language. Dutch listeners only showed adaptation for items containing contrasts that exist in Dutch, despite being able to identify items containing both Dutch and non-Dutch contrasts in a separate phonetic assessment task. These findings suggest divergence between phonetic identification and lexically-guided adaptation, possibly arising from heightened uncertainty about L2 lexical processing relative to L2 phonetic processing.
Email: Angela Cooper, angelacooper2016@u.northwestern.edu

(1202)

Individual Differences in Degraded Speech Perception. KATHY M. CARBONELL, *University of Florida* (Sponsored by Andrew Lotto) — A lasting concern in audiology is the unexplained individual differences in speech perception performance for individuals with similar hearing thresholds. One proposal is that there are cognitive/perceptual differences underlying this vulnerability and that these differences are present in normal hearing (NH) individuals but do not reveal themselves in studies that use clear speech produced in quiet (because of a ceiling effect). However, previous studies have failed to uncover cognitive/perceptual variables that explain much of the variance in NH performance on more challenging degraded speech tasks. This lack of strong correlations may be due to either examining the wrong measures or to the lack of reliable differences in degraded speech performance in NH listeners (i.e. measurement noise). The current work has 3 aims; the first, is to establish whether there are reliable individual differences in degraded speech performance for NH listeners that are sustained both across degradation types (speech in noise, compressed speech, noise-vocoded speech) and across multiple testing sessions. The second aim is to establish whether there are reliable differences in NH listeners' ability to adapt their phonetic categories based on short-term statistics both across tasks and across sessions; and finally, to determine whether performance on degraded speech perception tasks are correlated with performance on phonetic adaptability tasks.
Email: Kathy Carbonell, kathycarbonell@gmail.com

(1203)

Listeners Use Sentential Rate, but not Envelope Information, to Compensate for Speaking Rate During Spoken Word Recognition. DAVID SALTZMAN, *Villanova University*, ARIANE RHONE and BOB MCMURRAY, *University of Iowa*, JOE TOSCANO, *Villanova University* — A major issue in speech perception concerns how listeners overcome contextual variability. One source of variability is speaking rate, which affects phonetic cues (Allen & Miller, 1999), and in turn, listeners' perception (Summerfield, 1981). Recent work (Giraud & Poeppel, 2012; Peelle & Davis, 2012) argues that speaking rate compensation is based on a mechanism by which neural oscillations in the auditory system entrain to temporal envelope modulations of the input. We investigated the necessity of the envelope by creating stimuli that lacked slow temporal modulations, but were still intelligible. Listeners heard sentences ending in word-final voicing minimal pairs (*lab/lap*) varying along vowel length continua. Voicing judgments were affected by sentential rate ($p<0.05$), but this effect was not influenced by the presence or absence of envelope information. Thus, contrary to claims that slow temporal modulations are used to compensate for rate changes, listeners can adjust for speaking rate without intact envelopes.
Email: David Saltzman, dsaltzma@villanova.edu

(1204)

Gender Affects Early Perceptual Processes During Speech Perception: Evidence From ERPs and Eye-Movements. KAYLEEN E. SCHREIBER and BOB MCMURRAY, *University of Iowa* — Speech perception is computationally challenging because of variability that partially stems from speech production differences. For example, women use longer Voice Onset Times (VOTs) than men to differentiate voicing (/b/ vs. /p/). Listeners could use these tendencies to compensate for variability. Previous studies (Johnson et al., 1999) show listeners adjust their voicing boundary based on talker gender. We ask what processing stage this occurs. Gender could influence later stages when phoneme decisions are made (Nearey, 1990), or earlier stages when acoustic cues are encoded (McMurray & Jongman, 2011). To distinguish these, we used ERPs to measure the N1, an early component that tracks VOT (Toscano et al., 2010). Subjects (n=27) heard gendered carrier phrases followed by a gender-neutral word. Gender influenced the N1 from the neutral words, suggesting changes at the earliest stage of processing ($p<.01$). We next asked if these sensory differences affect lexical processing. Participants (n=26) heard the stimuli while eye movements were tracked. Gender influenced fixations to lexical candidates at the same time as VOT ($p>.1$). This shows gender affects perception at the earliest level and influences early lexical activation.
Email: Kayleen Schreiber, kayleen-hannaway@uiowa.edu

DECISION MAKING I

(1205)

Modeling the Influence of Response Modality on Conflict in the Stroop Task. ALEX B. FENNELL and ROGER RATCLIFF, *The Ohio State University* (Sponsored by Gail McKoon) — Conflict in the Stroop task is measured by both response time and accuracy. The amount of conflict differs depending on the response modality, verbal vs. manual. We applied a model for multichoice decision making (and confidence), the RTCON2 model (Ratcliff & Starns, 2013) to the data from three experiments, one with 2-choice manual responses, one with 4-choice manual responses, and one with 4-choice vocal responses. Changes in the rate of information accumulation captured conflict effects for the manual response versions, but not for the vocal response version. Thus the version of the Stroop task with vocal responses will require other sources of conflict above and beyond changes in information accumulation.
Email: Alex Fennell, fennell.50@osu.edu

(1206)

Effortful Processing Reduces the Attraction Effect in Multi-Alternative Decision Making: An Electrophysiological Study Using a Task-Irrelevant Probe Technique. TAKASHI TSUZUKI, *Rikkyo University*, YUJI TAKEDA and ITSUKI CHIBA, *National Institute of Advanced Industrial Science and Technology* — The attraction effect results in violations of rational choice during multi-alternative decision making and the underlying mechanisms warrant further investigation. We previously reported that the amount of cognitive resources allocated to processing visual information when simultaneously presented with a task-irrelevant auditory probe is reflected in the N1 amplitude elicited by the auditory probe; the amplitude decreases with increasing cognitive resource allocation to the visual alternative. Using this paradigm, we examined the attraction effect in multi-alternative decision making. Twelve participants solved 48 hypothetical purchase problems with three alternatives (target, competitor, and decoy) differing on two attributes. Analyses of the mean P1-N1 amplitudes indicated that, in the latter (the third) epoch of the experimental trials, these measures were significantly lower in the competitor-chosen trials than the target-chosen trials. This finding supports the theoretical hypothesis that the attraction effect relates to System 1 (intuitive) of the dual process theory.
Email: Takashi Tsuzuki, tsuzuki@rikkyo.ac.jp

(1207)

How to Poll From Memory? A Generalized Model of Probabilistic Instance-Based Inference. CHRISTIN SCHULZE, THORSTEN PACHUR and RALPH HERTWIG, *Max Planck Institute for Human Development* — How do people make inferences about the frequency of events in the world? The social-circle heuristic (Pachur, Hertwig, & Rieskamp, 2013) assumes that people decide which of two events is more frequent by sequentially searching in memory for relevant instances in different circles of their social network—e.g., family, friends, and acquaintances. Search is stopped as soon as the number of instances in one circle discriminates between the events. Thus, the social-circle heuristic is a noncompensatory strategy. We develop generalized versions of the social-circle heuristic and compare their predictive accuracy with that of a compensatory instance-based model which summarizes instances across all circles. Generalizations include subjective circle weights, probabilistic orders of circle inspection, dynamic decision thresholds, and probabilistic stopping and decision rules. Allowing for probabilistic search and decision processes in this way, we find that a generalized social-circle model can account for the judgments of a larger proportion of people than previously found. Moreover, this approach reveals considerable individual differences in the processes of sequential and limited search for instances in memory.
Email: Christin Schulze, cschulze@mpib-berlin.mpg.de

(1208)

Decision Strategies and the Deliberation-Without-Attention Effect. BRIAN M. FRIEL, TIMOTHY J. HOWELL and WINNIE W. THUKU, *Delaware State University* — Deliberation Without Attention (DWA) was examined in a decision task with 2 changes to the traditional unconscious thought paradigm (Dijksterhuis, 2004). Rather than a single "best" car, 3 candidates were created to assess decision strategy: a Most Positives (MP) option (traditionally "best"), an Important Positives (IP) option (fewer but more desired positives), and a Positive Most Important (PMI) option (fewest positives, but the only option with the most important dimension as a positive). The second change added a fourth group to the usual unconscious thought (UT), conscious thought (CT), and immediate decision (IM) groups. The new group was allowed to take notes as the car attributes were presented (NT), assuming that they would not rely on memory to make their decisions. Thus NT car selections were treated as a standard for comparison. All groups preferred the IP car, UT group choices most resembled the NT standard, and CT choices were least similar to the NT standard. Among the 3 non-NT groups, recall accuracy of each car's number of positive/negative attributes was best for the UT group and worst for the CT group. Results suggest a DWA benefit, but it may be due in part to greater forgetting during conscious deliberation.
Email: Brian M. Friel, bfriel@desu.edu

(1209)

Bridging the Gap Between Theory and Practice: Offers in the Ultimatum Game and Hiring Decisions. RENATA M. HEILMAN, *Babeș-Bolyai University* — The Ultimatum Game (UG) is used extensively to investigate resource allocation decisions between two individuals. It is also assumed that individual differences found in the UG regarding how people decide to share an amount of money are relevant for the gender pay gap that still persists in various activity domains. However, very few studies have directly investigated this assumption. On an undergraduate student sample (N = 174) we investigated participants' resource allocation decisions in the UG and their preference towards hiring a man or a woman for certain jobs. Our results indicate that participants offer higher amounts of money to men, compared to women. Also, we found that participants' offers in the UG predict their preference towards

hiring a man or a woman, as well as their initial salary offers. Our study indicates that behavior in the UG is predictive for real-life hiring decisions.
Email: Renata M. Heilman, renataheilman@psychology.ro

(1210)

Examining Decisions Following Impact vs. Non-Impact Based Tornado Warnings. MARK A. CASTEEL, *Pennsylvania State University - York Campus* — The National Weather Service recently implemented nation-wide enhanced tornado warnings known as Impact Based Warnings (IBWs). A main goal of these IBWs is to improve warnings and motivate appropriate responses by using more specific text about a tornado's potential impact and severity. Research recently published by the author (and reported at Psychonomics 2014) found that the IBWs did indeed promote more shelter in place decisions compared to non-IBWs. The present research expands on this earlier work and compares decisions made to tornadoes of potentially greater magnitude. A main goal was to identify which aspect(s) of the IBW were most effective at generating more shelter-in-place decisions. Participants adopted the role of a plant manager and read both IBWs and non-IBWs. At three different message points, participants made decisions about shutting the plant and sheltering in place. Results will be compared to those obtained previously and discussed within the context of NWS best practices.
Email: Dr. Mark A. Casteel, mac13@psu.edu

(1211)

Exploiting the Confidence in Your Decisions to Harness the Wisdom of the Inner Crowd. ALEKSANDRA LITVINOVA, STEFAN M. HERZOG and RALPH HERTWIG, *Max Planck Institute for Human Development* (Sponsored by Timothy Pleskac) — The "wisdom of crowds" describes the phenomenon that accuracy can be increased by aggregating independent judgments. We investigated whether individuals can avail the wisdom of their "inner crowd" by either (a) averaging the confidence judgments accompanying two decisions on the same topic or by (b) selecting the decision with the higher confidence (i.e., confidence rule); and where such accuracy gains—if any—come from (improved calibration or resolution). Across three studies we found that averaging first and second judgments improved accuracy (Brier score), while applying the confidence rule resulted in deterioration or slight improvements. Using the Brier score decomposition, we show that the averaging gains were driven by improved calibration in one study and improved resolution in the remaining two studies. Since improved resolution cannot be explained by noisy reporting of the same underlying confidence, our results suggest that individuals can access diverse knowledge that can be fused using the inner crowd.
Email: Aleksandra Litvinova, litvinova@mpib-berlin.mpg.de

(1212)

Moral Outrage Mediates the Interaction of Harm and Culpable Intent in Driving Punishment Decisions. LAUREN HARTSOUGH, MATTHEW GINTHER and RENÉ MAROIS, *Vanderbilt University* — Understanding punishment decision-making is critical due to its prevalence and cost to the criminal justice system and society. Studies have demonstrated that punishment decisions are primarily defined by a super-additive interaction between the actor's culpable mental state and the harm caused. However, it is unknown what emotion, if any, drives individuals to punish. We sought to answer this question using a task design where mental state and harm levels were parameterized while subjects were probed on their emotional response. Our findings demonstrate that – unlike anger, contempt, and disgust – moral outrage results from the interaction of a culpable mental state and severe harms. Further, moral outrage alone mediates the relationship between this interaction and punishment decisions. Finally, we observed that sadness has the opposite effect in that it mediates a dampening of punishment decisions. We conclude that moral outrage drives punishment decision-making by mediating the interaction between harm and intent.
Email: René Marois, rene.marois@vanderbilt.edu

(1213)

Does the Arbitrary Grouping of Physical Options Influence Children's and Adults' Choices? SHERI REICHELSON, ALEXANDRA ZAX, HILARY BARTH, ILONA BASS and ANDREA L. PATALANO, *Wesleyan University* — The partitioning of options into arbitrary categories is reported to influence adults' decisions about how to allocate resources or choices among those options; this phenomenon is called "partition dependence." In three studies, we asked whether children and adults exhibit partition dependence when choosing from a menu of options (physical bowls of candy). Participants chose five pieces of candy from three bowls containing four different types of candy; two bowls contained one type and the third bowl contained two types in distinct piles. The arbitrary partitioning of candy into bowls did not influence children's choices. Additionally, we failed to replicate previous findings of partition dependence in adults using closely matched methods.
Email: Hilary Barth, hbarth@wesleyan.edu

(1214)

How Uncertainty and Moral Utilitarian Ratios Predict Rationality. ROSE K. MARTIN and PETKO KUSEV, *Kingston University London* — Moral dilemmas involving a choice between saving the lives of 1 versus 5 have long been debated through utilitarian (e.g., Bentham, 1789) and deontological theories of moral choice (Kant, 1965). According to Greene et al.'s (2001) dual process moral utilitarian theory, moral involvement predicts utilitarian rationality in decision-making. Accordingly, Greene et al. proposed that emotional activations interfere with cognitive (rational) decision mechanisms. For example, personal involvement in moral scenarios (push a stranger) induces irrationality and decision time in choice. However, more psychological factors (e.g., utility ratios) have been found to predict rationality in personal dilemmas (Nakamura, 2012). Furthermore, theorists (Kusev et al. 2016) argued that elimination of moral uncertainty also predicts utilitarian responses. In one experiment we aimed to explore how (and whether) utility ratios, uncertainty, type of dilemma

and involvement predict moral utilitarian choice. The results revealed that eliminated uncertainty and high utility ratios induced utilitarian (rational) decision preferences.
Email: Rose Martin, k1404028@kingston.ac.uk

(1215)

Representing the Temporal Structure of Complex Decision Environments. JOSEPH T. MCGUIRE, *Boston University*, DARBY BRESLOW, THOMAS PETERSON and JOSEPH W. KABLE, *University of Pennsylvania* — In foraging or delay-of-gratification tasks, decision makers continuously choose whether to persist toward a temporally uncertain future reward or exit in search of other opportunities. Past work suggests people can adaptively calibrate persistence based on direct experience with the distribution of delay intervals in a given environment. However, it is unknown what cognitive strategies underlie this ability. One possible strategy would use feedback-driven learning to hone a task-specific policy (e.g. a giving-up time). A different strategy would aggregate statistical experience into a general-purpose mental model of the relevant probabilities, akin to a cognitive map. The present results collectively suggest a middle ground. Favoring a map-like representation, Experiment 1 suggests decision makers integrate temporal information from both experience and description. However, Experiments 2 and 3 find no benefits of either counterfactual feedback or implicit exposure to environmental statistics. These results have implications for understanding both under- and overpersistence, and for designing interventions to improve the accuracy of temporal expectations.
Email: Joseph T. McGuire, jtmcg@bu.edu

(1216)

Modeling Adaptive Exploration in Decisions From Experience: A Sequential Sampling Approach. DOUGLAS MARKANT and TIMOTHY PLESKAC, *Max Planck Institute for Human Development*, ADELE DIEDERICH, *Jacobs University Bremen*, THORSTEN PACHUR and RALPH HERTWIG, *Max Planck Institute for Human Development* — Research on "decisions from experience" (DFE) aims to understand how predecisional exploration influences a person's ultimate choice between options of uncertain value. Although existing models account for how sampled experiences relate to choices, they fail to explain people's decisions about how to explore (in particular, when to stop sampling information and make a consequential choice). This gap is especially notable in light of evidence that people adapt their exploration to different circumstances, collecting larger samples when they experience greater variability in outcomes, when higher payoffs are at stake, or when sampling costs are low. We propose that both exploration and choice in DFE arise from a sequential sampling process whereby decision makers sample information to form a preference over options and terminate sampling when their preference crosses a threshold. We describe the CHASE model of DFE, a sequential sampling framework which formalizes interactions between environmental structure, search strategies, and internal preference accumulation. The model offers a new approach for understanding a wide range of empirical findings in DFE in terms of a common process of adaptive exploration.
Email: Doug Markant, markant@mpib-berlin.mpg.de

(1217)

Social Contexts Modulate the Effects of Valued Outcomes on Decision-Making. SU HYOUN PARK and TIMOTHY VICKERY, *University of Delaware* — How does social context influence the psychological impact of rewards and punishments? To examine this question, we manipulated beliefs about social contexts while subjects performed a simple decision-making task. Subjects were assigned to cooperative, competitive, or non-social conditions, and then completed a series of visual discrimination tasks. On each trial, a grating was presented, and subjects made a difficult orientation judgment (leftward vs. rightward tilt). They received monetary rewards and punishments depending upon accuracy. To infer the incidental impact of outcomes on decision-making, we examined the choice repetition rate contingent upon the prior trial's outcome. Competitors were more likely to switch choices after punishment compared with cooperators, while cooperators showed no dependence upon prior trial outcome. Our results imply that social context modulates the psychological impact of valued outcomes, with punishment being more effective during competition than cooperation, suggesting that cooperation may 'blunt' the impact of punishment.
Email: Su Hyoun Park, spark@psych.udel.edu

(1218)

Influence of Self-Esteem on Stopping Rule Decision-Making. CAMERON J. BUNKER, MARIO FIFIC, NGUYEN PHAM and KATHERINE BULTHUIS, *Grand Valley State University* — One of the most important topics in the decision making domain is how individual subjects determine to stop evidence collection and make effective decisions. This is defined as the stopping rule problem. To answer this problem, researchers have focused on developing successful models for stopping rules, usually from the point of optimal (or suboptimal) decision performance. In the current study, we explored whether self-esteem could be used to explain individual differences in decision making. In particular, whether selfesteem could be used to develop personality-driven decision making strategies. We manipulated self-esteem, through false feedback on a "Critical Thinking" exam, to assess how participants' stopping decision behavior (deferred decision task, measuring decision accuracy, and the number of recommendations opened) would be affected. By exploring this relationship, we find that personality enables us to better understand decision-making processes involving stopping rules.
Email: Cameron Bunker, bunkerc@mail.gvsu.edu

(1219)

The Effects of Intensity-Based Time Pressure on Decision Making in a Complex Multi-Stimulus Environment. HECTOR D. PALADA and ANDREW NEAL, *University of Queensland*, RUSSELL MARTIN, *Defence Science and Technology Group*, RACHEL TAY, *University of Queensland*,

ANDREW HEATHCOTE, *Universities of Tasmania and Newcastle* (Sponsored by Shayne Loft) — We investigated the effects of intensity-based time pressure on decision-making processes in a complex, multi-stimulus environment. Participants completed a simulated unmanned aerial vehicle target detection task, where they had to classify target and non-target ships. We manipulated intensity-based time pressure by varying classification complexity (i.e., the amount of information requiring processing per ship) and the number of ships in a trial. We modeled observed choices and response times using the LBA model (Brown & Heathcote, 2008). Classification complexity influenced the mean drift rate differences between the matching and mismatching accumulators. In contrast, the number of ships requiring classification influenced threshold and non-decision processes. Our findings suggest that classification complexity affects the inputs to the decision-process, whereas the number of stimuli requiring classification results in a strategic shift in response caution. The study provides insight to decision-making under time pressure, and provides further support for the application of the LBA to complex and applied multi-stimulus scenarios.
Email: Hector David Palada, hector.palada@uqconnect.edu.au

(1220)

A Dynamic Paradigm for the Study of Effort Discounting. LISA VANGSNESS and MICHAEL YOUNG, *Kansas State University* — Traditional effort discounting paradigms involve decisions between static outcomes that are frequently dichotomous (e.g., choosing between a "hard" or an "easy" task). However, these paradigms do not model real-world decision making in a number of ways: reward is typically deferred until task completion, eliminating the opportunity to defect for a partial reward; and tasks do not represent a continuous range of difficulties, which may produce ceiling effects as subjects gain experience with a particular task. Furthermore, emerging evidence suggests that individuals behave differently when they experience – rather than read about – potential outcomes. This paradigm represents a departure from traditional approaches to the study of cognitive fatigue in that it indexes fatigue and individual choice in a dynamic environment that models real-world situations. During video game play, participants must balance environmental constraints with personal abilities and physical/cognitive state. This feature makes it ideal for studying the mapping between performance and subjective ratings of fatigue, especially during long-term tasks.
Email: Lisa Vangsness, lvangsness@ksu.edu

(1221)

Distorting Probability May Be Advantageous: An Agent-Based Model. KELLI L. JOHNSON and CHRISTIAN C. LUHMANN, *Stony Brook University* — A key component of Prospect Theory, the probability weighting function, describes how people distort probabilities. Specifically, people overweight small probabilities, underweight large probabilities, and are relatively insensitive to changes in moderate probabilities. Despite thorough descriptions of these distortions, there have been few explanations. These existing explanations assume that distortion is non-normative and suggest psychophysical or emotional "flaws" are responsible. Here, we instead propose that epistemic uncertainty (ambiguity) may play a critical role and describe an agent-based computational model designed to validate this proposal. Modeling results indicate that probability distortion can be optimal under at least some circumstances. Furthermore, the optimal degree of distortion appears to be dependent on the magnitude of ambiguity faced by agents. This indicates that probability distortion may not be a cognitive limitation, but instead an evolved or learned mechanism to make choices under ambiguity. Theoretical implications will be discussed.
Email: Kelli L. Johnson, kelli.johnson@stonybrook.edu

(1222)

Failure to Produce a Sunk Cost Effect for Short-Term Behavioral Investments. JEREMY S. NASH and KANA IMUTA, *The University of Queensland*, MARK NIELSEN, *The University of Queensland, The University of KwaZulu-Natal* (Sponsored by Jason Tangen) — A cognitive bias, known as the sunk cost effect, has been identified in a range of contexts. This bias drives the continued investment of time, effort, or money into an endeavor on the basis of prior investments into it. In Studies 1 and 2 we attempted to identify whether this effect occurs for short-term behavioral investments. In both studies either a reverse effect or no effect was found. In study 3 we employed hypothetical scenarios analogous to the behavioral investments presented in Study 1. This also failed to reveal an effect. Finally, Study 4 replicated a previously used hypothetical investment scenario; with results revealing the effect. A number of explanations for the results, such as participation and salient physical exertion, are discussed, with the possibility that the sunk cost effect does not arise in short-term behavioral investments.
Email: Jeremy Nash, jeremy.nash@uqconnect.edu.au

(1223)

Deadly Decision Making: Understanding Natural Hazard Myth Vulnerability. JINAN N. ALLAN, JOSEPH T. RIPBERGER, VINCENT T. YBARRA and EDWARD T. COKELY, *University of Oklahoma* — Experts at the National Weather Service suggest that common tornado and natural hazard myths may put families and communities at risk for deadly decision making errors during severe weather events (e.g., trying to drive away from a tornado instead of sheltering in place). Risk Literacy (e.g., the ability to evaluate and understand risk; RiskLiteracy.org), as measured by the Berlin Numeracy Test, is one of the most efficient predictors of skilled and informed decision making across a wide range of decisions under risk. How common are these dangerous natural hazard myths? In the face of potential natural hazards, how do various cognitive mechanisms inoculate some decision makers against these potentially deadly biases? This poster will address these questions and others by presenting findings from (i) a longitudinal Oklahoma MSIS-Net project that surveys more than 3000 residents quarterly, and (ii) Mechanical Turk surveys. Discussion will address how specific weather relevant

knowledge, decision making skill, experiences with extreme weather, and weather salience impact belief in these dangerous myths.
Email: Jinan Allan, jnallan@ou.edu

REASONING AND PROBLEM SOLVING

(1224)

Do Changes in Perceptual Fluency Enhance Problem Solving? JAMIE NAYLOR and CHRISTOPHER A. SANCHEZ, *Oregon State University* — Numerous studies have shown that changes in perceptual fluency can significantly impact judgments and metacognitive estimations related to the presented material. Recent research has suggested that these differences are likely a function of differential online processing, and it is this change in processing that subsequently influences later judgments. However, it has also been suggested that changes in online processing produced by disfluency can be leveraged to increase task performance, by causing participants to approach reasoning problems (i.e., Moses Illusion) more analytically. The current work seeks to expand on this suggestion, and extend it to a different domain, namely creative problem solving. Under different perceptually fluent conditions, participants completed a version of the Remote Associates Task (RAT), and it was found that changes in fluency directly impacted performance on the RAT, but this effect interacted with problem difficulty. This pattern of results is discussed and considered within current fluency theory.
Email: Christopher A. Sanchez, christopher.sanchez@oregonstate.edu

(1225)

Magicians Fix Your Mind: How Unlikely Solutions Block Obvious Ones. CYRIL THOMAS and ANDRE DIDIERJEAN, *University of Franche-Comté* — In everyday life, several factors limit the human capacity to think differently. The present study shows that implanting an unlikely and unfamiliar idea in the mind can prevent participants from finding a more likely and obvious one. To demonstrate this, we used a technique often adopted by magicians to misrepresent the method of a trick: the false solution. Our results reveal that a single exposure to an unlikely false solution (the magician can influence the spectator's choice with his gesture) before the presentation of a card trick can prevent participants from finding the real (more obvious) secret of a trick, even if they are invited to search for an alternative solution.
Email: Cyril Thomas, cyril.thomas@univ-fcomte.fr

(1226)

Representation Change as a Mechanism of Insight Problem Solving. Study on "Symmetrical Problems". ILYA YU VLADIMIROV, ALEXANDRA V. CHISTOPOLSKAYA and YULIYA G. SEKURTSEVA, *Demidov Yaroslavl State University*, ANTON A. LEBED, *Western Illinois University* — An idea that insightful solution consists in restructuring the problem representation was introduced by Duncker. However, the dynamics of this process remains poorly investigated. Knoblich, Ellis and some other authors have shown that eye-movements (focusing on key Area of Interest, AOI) change prior to solution report. In our study, we test the hypothesis that this effect exists in other types of visual insight problems. We used "symmetrical problems" - numerical sequences, where numbers are combined with their inverted version (number 1 looks like an arrow, 2 looks like a upside down goblet, etc.) To solve these problems, participant is required to understand that they deal with numbers. Twenty participants took part in the study (18.6, σ =.76). We compared amount of time spent looking at relevant and irrelevant visual AOI during the first 15, middle 15 and last 15 seconds of either insight or non-insight problem solving. Significantly more dwells in relevant AOI were found during the last stage of insight problem solving, $F(1, 28)=7.26$, $p=.01$, $\eta 2=.21$).The results suggest that restructuring precedes insight problem solving, but not non-insight problem solving, therefore, supporting the hypothesis. Supported by RSF 16-18-10030.
Email: Ilya Vladimirov, kein17@mail.ru

(1227)

Using a Fork as a Hairbrush: Parts-Based Processing Promotes Release From Functional Fixedness. DAWN R. WEATHERFORD, *Texas A&M University-San Antonio*, LAURA TEDDER, OLIVIA HITCHCOCK and LIBBY LANE, *Arkansas State University* — Functional fixedness occurs when a person focuses on an object's common use, thereby limiting creative possibilities. The Obscure Features Hypothesis predicts that mentally breaking down objects by their physical attributes may be more cognitively demanding, but should increase novel object use more than focusing on functions for the object as a whole. Prior to attempting to solve five insight problems, participants experienced one of three object processing orientations: Parts-based participants created object breakdown diagrams, functions-based participants created object functions lists, and free association (control) participants wrote a word that they associated with each of several concrete nouns. Despite no instructions to transfer their processing orientation to solve problems, parts-based participants had higher accuracy and longer response latencies than both comparison groups. Results suggest that parts-based processing increases cognitive load to support creative solutions. We discuss possible applications of parts-based processing to increase innovation in real-world problem solving domains.
Email: Dawn Weatherford, dawn.r.weatherford@gmail.com

(1228)

Investigating Rates of False Memory and Confirmation Bias for Believers of Anomalistic Phenomena. MICHELLE M. ARNOLD, NIKKI L. KLINDZIC, JACK H. HODGE and TOBY PRIKE, *Flinders University* — Several studies have demonstrated a negative relationship between anomalistic (e.g., paranormal) beliefs and cognitive abilities such as reasoning. The current studies focused on expanding these findings by looking at anomalistic belief and rates of false memory and confirmation bias. Participants in Experiment 1 studied thematic word lists related to unpresented critical lures before completing both free recall and recognition tasks (DRM paradigm). Experiment 2 explored the relationship between

anomalistic and complementary alternative medicine (CAM) beliefs using a newly developed CAM scale. Further, these beliefs were used to predict performance on a confirmation bias task (judgments-of-quality for experimental results that did or did not confirm the beliefs). The results are discussed in terms of both overall anomalistic belief (i.e., average anomalistic beliefs score), as well as the specific belief factors that predict performance; for example, the important role of experiential belief (vs. theoretical belief) for predicting rates of false memory.
Email: Michelle Arnold, michelle.arnold@flinders.edu.au

(1229)

Examining the Influence of Social Categories on Logic and Reasoning Skills. NATASHA THALLA and DOMINIC J. PACKER, *Lehigh University* (Sponsored by Jessecae Marsh) — The present research examines how social categories can influence reasoning and decision-making processes. People can quickly and accurately categorize others into known, stable social categories like gender and race (Cosmides, Tooby & Kurzban, 2003; Stangor, Lynch, Duan & Glas, 1992; Ito & Urland, 2005). Using an adaption of Wason's (1966) 4-card selection task (in which participants select what information is necessary to determine if a rule has been violated), we demonstrate that people's reasoning skills are influenced by the social category that is presented alongside the rule. Specifically we found that people produced a greater proportion of false alarms to number of responses when rules are paired with black faces compared to white and a greater proportion of hits to responses when rules were paired with male faces as opposed to female faces. Taken together, these results demonstrate how social information influences cognitive reasoning processes.
Email: Natasha Thalla, nat213@lehigh.edu

(1230)

Anomalistic Belief, Base Rates, and Perception of Randomness: Relationships Vary Depending on Type of Anomalistic Belief. TOBY PRIKE, MICHELLE M. ARNOLD and PAUL WILLIAMSON, *Flinders University* — Previous studies have found anomalistic believers (e.g., paranormal believers) perform more poorly on reasoning tasks than non-believers. The current study used the recently developed Anomalistic Belief Scale (ABS; Prike, Arnold, & Williamson, 2016) to investigate whether it was general anomalistic belief that was associated with poorer performance, or only certain types of belief. We measured reasoning ability using two tasks: perception of randomness and base rate fallacy. Results showed participants higher in general belief performed more poorly on both reasoning tasks. However, further analyses using the factors of the ABS showed that type of belief mattered. For example, only beliefs about having experienced anomalistic events (themselves or by someone they know) predicted perception of randomness performance. Thus, the results suggest one key factor to understanding the negative relationship between anomalistic belief and reasoning ability is to take into consideration the type of belief people hold (e.g., experiential vs. theoretical).
Email: Toby Prike, toby.prike@flinders.edu.au

(1231)

Progression in Primary School Children's Reasoning About Everyday Chemistry. MARIA TSAPALI, CONNOR QUINN and MICHELLE R. ELLEFSON, *University of Cambridge*, ANNE SCHLOTTMANN, *University College London*, KEITH S. TABER, *University of Cambridge* — Various studies explore the object/substance distinctions of physical world, but there is very little work specifically on the domain of chemistry. Here, the goal was to explore the development of verbal reasoning about liquids (water), and solids (sugar), and mixtures of liquids and solids. We included 147 participants from five different age-groups (n = 27 5-year-olds, n = 33 7-year-olds, n = 32 9-year-olds, n = 35 11-year-olds, n = 20 adults). Participants had to reason about both the perceptual and compositional characteristics of the materials as our purpose was to see whether they conceptualise them as objects (unity and organisation) or substances. The findings showed different progression patterns for each material and suggest that children start understanding materials in terms of their perceptual properties and their functions and properties in daily life, and as they grow up they attend to their composition and chemical properties.
Email: Maria Tsapali, mt637@cam.ac.uk

(1232)

Unconscious Incubation in Insight Problem Solving. ANTON LEBED, *Western Illinois University*, OLGA LEBED, *Yaroslval State University*, VIRGINIA A. DIEHL, *Western Illinois University* — Insight problem solving is considered to have a period of incubation that precedes its solution. Researchers disagree on the exact processes occurring during incubation as they are mostly unconscious. Evidence suggests that the insight solution exists in one's mind before awareness. Thus, people focus on relevant problem pieces (Ellis, Glaholt, & Reingold, 2011), and show specific brain activation immediately before experiencing insight (Bowden, Jung-Beeman, Fleck, and Kounios, 2005). Based on the assumption that the insight solution develops unconsciously, we hypothesized that participants would show faster reaction time (due to the priming effect) and preference (due to the mere exposure effect) for words that are strongly associated with the solution if presented shortly before the solution. The results revealed no difference in reaction time, but increased preference for words associated with the solution, $t(33) = 2.63$, $p = .013$, $d = 0.58$. Therefore, the mere exposure effect prediction was supported.
Email: Anton Lebed, a-lebed@wiu.edu

(1233)

Insight Problem Solving After Social Exclusion: Self-Regulation Leads to Inhibition. OLGA LEBED, *Yaroslavl State University*, ANTON LEBED and KRISTINE KELLY, *Western Illinois University* — Previous studies show that social exclusion can negatively affect cognitive performance and analytical problem solving in particular (Baumeister, Twenge, &Nuss, 2002). However, there is no evidence suggesting that insight (creative) problem solving is inhibited by social exclusion as well, taking its non-analytical nature into consideration. Insight problem solving has been shown to benefit from inhibition of executive functioning by means of alcohol intoxication

(Jarosz, Colflesh, & Wiley, 2012) and working memory deficit (Wiley, &Jarosz, 2012). This allowed us to hypothesize that insight problem solving performance might benefit from social exclusion. Our results indicate that excluded participants solved insight problems significantly slower than their included counterparts, $t(31) = 2.3$, $p = .28$, $d = 0.55$. These results support the idea that rejection depletes self-regulatory ability, which leads to decrements in cognitive performance not only in analytical problem solving, but in insight problem solving as well.

Email: Olga Lebed, olgavlebed@gmail.com

(1234)

Effects of Information About the Victim on Decision Making in Moral Dilemmas. GUSTAVO GAUER and BRUNA W. FRITZEN, *Universidade Federal do Rio Grande do Sul* — Moral dilemma tasks have been a preferred paradigm in studies of the psychological processes underlying moral judgment and decision making. This study aimed to investigate how positive and negative information about the victim influences decisions in trolley-type moral dilemmas. The 63 participants were randomly assigned to two groups, respectively responding to personal (footbridge) and impersonal (trolley) dilemma formats. In each dilemma, positive, negative or no information about the victim was presented. The information consisted in a single opinion with moral tenor (e.g., John thinks that it is acceptable to open fire amidst a large group of people). Results indicate that the information about the victim was enough for the participants to make decisions significantly more utilitarian when the information was negative. Results corroborate a hypothesis that morally toned information provided about a person can interfere in decisions regarding their life or death, both in personal and in impersonal moral dilemmas.

Email: Bruna Wagner Fritzen, brunawfritzen@gmail.com

(1235)

Does Background Music Stint Creativity? Evidence From The Compound Remote Associate Task. EMMA THREADGOLD, JOHN E. MARSH and LINDEN J. BALL, *University of Central Lancashire* — Research is presented that focused on the impact of varying types of background music on the performance of a task thought to tap creativity: The Compound Remote Associate Task (CRAT). Findings from three experiments revealed that background music with foreign lyrics, familiar lyrics and instrumental music without lyrics all significantly impaired CRAT performance, in comparison to a quiet condition. Furthermore, the background music impaired CRAT performance regardless of whether the music induced positive mood, was liked by the participants, or whether participants typically studied in the presence of background music. Inasmuch as solutions to CRATs are believed to tap creativity, the results challenge the popular view that background music enhances creativity, and instead provide evidence that background music might stint creativity. The findings are interpreted in the context of leading theories of distraction.

Email: Dr Emma Threadgold, ethreadgold1@uclan.ac.uk

(1236)

Dissociating Distracters Drives Division Decrements. ANDREW F. JAROSZ, *Mississippi State University*, ALLISON J. JAEGER, *Temple University* — Recent work (Mattarella-Micke & Beilock, 2010) on solving mathematical word problems has suggested that the foregrounding of irrelevant, distracting information through an association with a protagonist can have a negative impact on success, while a disassociation with the protagonist mitigates that distraction. This is proposed to be the result of increased accessibility of the irrelevant information in memory. The present studies test an alternative hypothesis: that the words used in the associative and dissociative forms of the problem can prime solvers to utilize incorrect mathematical operations. In two experiments, multiplication and division word problems either associated ("Helga bought 5 potatoes") or disassociated ("Helga sold 5 potatoes") problem-irrelevant numbers with a protagonist. While no effects were found on multiplication items, performance decreased on dissociative division problems, supporting the idea of priming incorrect operations rather than the foregrounding hypothesis. Results are additionally discussed in terms of the role of working memory capacity.

Email: Andrew F. Jarosz, afj62@msstate.edu

(1237)

Thinking Outside the Box: Neural Correlates of Conceptual Learning From Induced Insight. JASMIN M. KIZILIRMAK, *University of Hildesheim*, BJÖRN H. SCHOTT, *Leibniz Institute for Neurobiology, Magdeburg*, HANNES THÜRICH and CATHERINE M. SWEENEY-REED, *Otto-von-Guericke University of Magdeburg*, ANNI RICHTER, *Leibniz Institute for Neurobiology, Magdeburg*, ALAN RICHARDSON, KLAUS EHN, *Otto-von-Guericke University of Magdeburg* — Evidence suggests that sudden insightful problem-solving can enhance later memory, but the underlying neural processes are mostly unknown. We investigated neural correlates of learning from insight using functional magnetic resonance imaging (fMRI). We found highly increased activation of hippocampus, medial prefrontal cortex (mPFC), amygdala, and caudate nucleus during insight as compared to non-insight, controlling for simple item novelty and emotional value of the stimuli. Notably, not hippocampal, but lateral PFC fMRI responses were associated with later memory for insight solutions. More difficult problems were associated with activations of the ventral tegmental area (VTA) and greater later learning. Thus, insight may reflect the sudden understanding of a novel relationship (hippocampus-dependent) that is consistent with existing knowledge (schema-consistency; mPFC-dependent), and intrinsically rewarding (caudate nucleus, amygdala, VTA). Moreover, our data suggest that learning from insight mainly relies on the detection of schema-consistency, which has previously been found to accelerate/ shortcut hippocampal encoding via signals from mPFC, and on the intrinsic reward of comprehending what previously seemed incomprehensible.

Email: Jasmin M. Kizilirmak, kizilirmak@uni-hildesheim.de

(1238)

Working With Incomplete Information: Problem Solving in Design. ALEKSANDRA KASZOWSKA, WILLIAM MESSNER, MATTHIAS SCHEUTZ and HOLLY A. TAYLOR, *Tufts University* — Human factors design provides an interesting venue for understanding problem solving. Designed solutions address the problem at hand and also ideally account for end user characteristics. But what happens when the designer possesses little knowledge about the end user, yet must still design a solution? We invited 45 engineering students to design a device aiding mundane task completion for one of three end users: a person, a robot with unknown technical specifications, and a team consisting of the two. Participants thought aloud during an hour long design session. Analyses of these verbalizations investigated how knowledge gaps about the end user influence the design process. More specifically, analyses explored the approaches people take to fill such knowledge gaps, their choice for the design starting point, and adjustments as the design process unfolds. Results will be discussed in context of cognitive heuristics and human robot interaction.
Email: Aleksandra Kaszowska, aleksandra.kaszowska@tufts.edu

(1239)

Predicting Adoption of New Technology Based on Problem-Solving Style. PETRA BRADLEY and ERICA B. MICHAEL, *University of Maryland Center for Advanced Study of Language* — Many factors influence an individual's decision to adopt new technology; the current study investigated whether there is a systematic relationship between technology adoption and problem-solving style. Xu and Tuttle's (2012) Adaption-Innovation Scale distinguishes between Adaptors, who are more likely to work within the established system, and Innovators, who are more likely to design their own solutions. Bagozzi and Foxall (1995) characterize Adaptors as methodical, prudent, disciplined, conforming, and focused on "doing things better," whereas Innovators are impractical, unconventional, undisciplined, nonconforming, risk seeking, flexible, and focused on "doing things differently." We hypothesized that Innovators would be more likely to be early adopters of new technology. Participants completed the scale as part of an experiment examining use of machine translation (MT) for translation and comprehension tasks. Analyses will focus on whether individuals' preferred problem-solving style is associated with their reported use of MT and with their general interest in adopting new technology.
Email: Petra Bradley, pbradley@casl.umd.edu

(1240)

Pathways to Promoting Spontaneous Analogical Transfer: The Role of Category Status. SEAN SNODDY and KENNETH J. KURTZ, *Binghamton University* — Comparison of analogs promotes spontaneous transfer by encouraging a more abstract representation that may be easier to retrieve in memory. The category status hypothesis states that: if knowledge is represented as a relational category, then it is easier to activate the knowledge as a result of categorizing (as opposed to cue-based reminding). The processes of schema abstraction via structural alignment and relational category construction may be closely related. To investigate these pathways to analogical transfer, participants experienced one of four study conditions before receiving an analogical problem-solving task: (1) cold baseline; (2) standard comparison of two analogs; (3) standard comparison followed by a second comparison of two new analogs; (4) a guided category-building task based on positive cases with no simultaneous presentation. Category-building showed reliably higher spontaneous transfer rates than baseline and standard comparison (and marginally higher than double-comparison). The only other significant effect was double-comparison over baseline.
Email: Sean Snoddy, ssnoddy1@binghamton.edu

(1241)

Going the Distance: The Effects of Testing on Analogical Transfer. TIM GEORGE and JENNIFER WILEY, *University of Illinois at Chicago* — While high rates of transfer can occur between similar domains, people are often unable demonstrate *far* transfer between semantically dissimilar concepts. Yet it is these cross-domain connections that represent the creative leaps thought to underlie discovery and innovation. Two experiments tested the prediction that retrieval practice of previously studied four-term analogies (*flock:goose :: pack:wolf*) would lead to greater transfer of relations to new instances than restudying. The semantic distance of the transfer analogies and the studied analogies was manipulated (within-domain vs. cross-domain). Transfer to new cross-domain instances benefited from testing, but only when the initially studied analogies were also dissimilar from each other and participants were prompted to notice relations. Results suggest that retrieval practice can enhance the transfer of analogical relations to new instances.
Email: Tim George, tgeorg7@uic.edu

FUNDING FROM US DEPARTMENT OF EDUCATION

(1242)

Funding Opportunities for Cognitive Psychologists Through the Institute of Education Sciences. ERIN HIGGINS, *Institute of Education Sciences* — The Institute of Education Sciences provides funding support for researchers to apply theories and recent findings from psychological science to education practice through the National Center for Education Research and the National Center for Special Education Research. For example, through the Cognition and Student Learning topic within the Education Research Grants program, the Institute supports research that capitalizes on our understanding of how the mind works to inform and improve education practice in reading, writing, mathematics, science, and study skills. Erin Higgins, the program officer for the Cognition and Student Learning topic, will be available to answer questions and talk to attendees about their proposed work at the Friday night and Saturday at noon poster sessions.
Email: Erin Higgins, Erin.Higgins@ed.gov

DIGITAL CONTENT EDITOR POSTER

(1243)

The Psychonomic Society and Social Media: Putting the Public Into Science and Making Science Public. STEPHAN LEWANDOWSKY, University of Bristol (Digital Content Editor), and the PSYCHONOMICS DIGITAL TEAM — The Psychonomic Society has been extending its digital presence for the last two years, and our blog posts at www.psychonomic.org have gathered a growing readership. Two "digital events" carried the scientific discussion from special issues of the Psychonomic Bulletin & Review into the public domain, and some of the Society's research has elicited increasing media interest. At a time when science and scientists are increasingly subjected to scrutiny by the public, politicians, and other stakeholders, the Society is committed to provide the public with information about its research and to solicit public commentary. Join the digital team at our poster to contribute to the discussion and to learn more about the Society's engagement on digital and social media.

Email: Stephan Lewandowsky, Stephan.Lewandowsky@bristol.ac.uk

POSTER SESSION II

Friday Noon
Hynes Convention Center, Grand Ballroom A-C
Viewing 11:00-1:30, Author Present 12:00-1:30

ACTION

(2001)

Are Multi-Modal Judgments of Difficulty Based on Time? CORY A. POTTS, *Pennsylvania State University*, DAVID A. ROSENBAUM, *University of California, Riverside* (Sponsored by Robrecht van der Wel) — Without a common unit of measure, it is difficult to reliably compare the relative difficulty of different kinds of tasks, such as ones that are mainly cognitive or mainly physical. Here, we asked whether the common unit of measure is task-completion time. We asked participants to choose either to perform a mainly physical task (reaching for a bucket with different physical weight loads and carrying it some distance) or a mainly cognitive task (counting aloud by ones to a target number). In critical trials, the cognitive task took less or more time than the physical task. We found that participants usually chose the task that took less time. Still, there are problems with a time-based account. A more promising alternative is that the unit of task-difficulty measurement is the time requiring attention to the task.
Email: Cory Adam Potts, cap5342@psu.edu

(2002)

The Relation Between the Sense of Agency and the Experience of Flow. MATTI VUORRE (Graduate Travel Award Recipient) and JANET METCALFE, *Columbia University* — How are people's feelings of agency and their feelings of flow related? In the dominant model describing how people are able to assess their own agency—the comparator model of agency—when the person's intentions match perfectly to what happens, the discrepancy between intention and outcome is zero, and the person is thought to interpret this lack of discrepancy as being in control. The lack of perceived push back from the external world seems remarkably similar to the state that has been described as a state of flow. However, when we used a computer game paradigm to investigate the relation between people's feelings of agency and their feelings of flow, we found a dissociation between these two states: Bayesian regression analyses revealed that these two states are differentially influenced by task difficulty. Although these two states may, in some ways, seem to be similar, our data indicate that they are governed by different principles and phenomenology.
Email: Matti Vuorre, mv2521@columbia.edu

(2003)

Attention Solves the "Apples-and-Oranges" Problems of Judging Task Difficulty and Task Order. DAVID A. ROSENBAUM, *University of California, Riverside*, CORY ADAM POTTS and MICHELE A. MUIR, *Pennsylvania State University* — The ability to judge task difficulty and task order for tasks of different kinds, such as intellectual and physical tasks, suggests a common currency for comparing them. We hypothesized that this common currency is the time attention is paid to tasks. We tested three groups of participants. One group gave estimates of attention time proportions (ATPs) for "more intellectual" tasks (counting) and "more physical" tasks (locomotion). Two additional groups made 2-alternative-forced-choice decisions about the relative ease and preferred ordering of the same pairs of tasks. We found that ATPs grew with task duration, rate, and complexity for both types of tasks, and ATPs predicted participants' judgments of task difficulty and task order. The results are consistent with the hypothesis that attention solves the apples-and-oranges problem of judging task difficulty and task order.
Email: David A. Rosenbaum, rosenb13@gmail.com

(2004)

"Back-Off, Get Your Own Coffee": The Amount of Facilitation in Object Passing Is Modulated by Object Ownership Status. MERRYN D. CONSTABLE and TIMOTHY N. WELSH, *University of Toronto*, ANDREW P. BAYLISS, *University of East Anglia*, STEVEN P. TIPPER, *University of York*, ANA SPANIOL, *Universidade Federal do Rio Grande do Norte*, JAY PRATT, *University of Toronto* — Humans often sacrifice some of their own sensorimotor comfort, control, and efficiency to promote the comfort, control and efficiency of a co-actor. This study demonstrates that the relationship between the ownership status of an object being passed and the individual's engaged in the task plays a role in these processes. Across two experiments, participants exhibited facilitatory behavior by orienting the handle of a mug towards their co-actor when they passed the mug across a table. The ownership status of the mug, however, influenced the degree of facilitatory behavior. The handle of the mug was oriented towards the co-actor more when the self-other distinction was large (experimenter's mug vs. participant's own mug) compared to small (friend's mug vs. participant's own mug). Thus, individuals promote the efficient movement of a co-actor, but to a lesser degree when the co-actor will interact with the individual's own object than anyone else's object.
Email: Merryn Constable, merryndconstable@gmail.com

(2005)

How Are Cognitive and Physical Demands Compared? IMAN FEGHHI and DAVID A. ROSENBAUM, *University of California Riverside* — To study how people compare cognitive and physical task demands, we used tasks that had a physical component (carrying an empty box through a wide or narrow gap) and a cognitive component (memorizing 6, 7, or 8 digits). In Experiments 1 and 3, participants had two options defined by different combinations of digits and gaps. In Experiments 2 and 4, participants were asked to go through a specific gap and memorize a specific digit list. We also tested if having digits in visual form (Experiments 1 and 2) interacts more with physical demands than having digits in auditory form (Experiments 3 and 4). Participants chose gap and digit combinations that reflected accurate appreciation of the demands of both.

Participants also recalled no more poorly with visual digits than with auditory digits. Based on these results, we suggest that cognitive and physical task demands are compared with respect to attention requirements.
Email: Iman Feghhi, iemanifk@gmail.com

(2006)

Role of Visual Self-Monitoring in Resolving Competition Between Tool Actions. LOUISA L. SMITH, CORTNEY M. HOWARD and LAUREL J. BUXBAUM, *Moss Rehabilitation Research Institute* — We hypothesized that resolution of competition between possible tool actions requires the cooperation of two neurocognitive pathways that are differentially specialized for feedforward versus feedback control of action. We assessed this hypothesis by testing whether visual self-monitoring aids in resolving competition between potential actions and enables correct action selection when feedforward processes are damaged, as is the case in limb apraxia. We administered an action selection task with low- and high-competition-inducing items with and without visual feedback of the limb to left-hemisphere stroke patients with limb apraxia. High competition items induced more error overall. On these items, patients produced more attempts at the target action with visual feedback, and correctly resolved a higher proportion of such trials. Extending prior two route models of praxis, these data suggest that visual self-monitoring may play an enhanced role when action competition is strong.
Email: Laurel Buxbaum, lbuxbaum@einstein.edu

(2007)

Action Selection by Temporally Distal Goal-States. MORITZ DURST, ROLF ULRICH and MARKUS JANCZYK, *University of Tübingen* — In line with ideomotor theory, numerous response-effect compatibility (REC) studies found evidence that action effects are anticipated prior to action initiation, as indicated by an REC effect: a response is given faster when its effect occurs on the same compared to the opposite side. So far, REC studies only applied immediate effects, i.e., effects occurring immediately after the response was given. However, it may be argued that in everyday life many actions cause effects which do not occur immediately. Additionally, as actions can have more than one effect, desired effects occurring in the future may only be arrived at by achieving fundamental effects first. The present study investigated whether temporally more distal effects are anticipated in order to initiate actions, and how multiple, serially occurring effects are represented. To this end, a spatial REC paradigm was extended in a way that a first immediate effect (that immediately followed the response; E1) was 500 ms later followed by another visual effect (E2). An REC effect was only observed for the temporally more distal effect E2, and this result suggests that also temporally more distal effects can be anticipated during action selection.
Email: Moritz Durst, moritz.durst@psycho.uni-tuebingen.de

(2008)

When Is a Cursor Like a Hand? Hand and Cursor Actions in Interpersonal Space. JILL A. DOSSO and ALAN KINGSTONE, *University of British Columbia* — When, and where, one reaches is affected by nearby others. Our previous work finds that this is true for both reaches to real items and reaches to on-screen items. We investigated whether actions performed with a cursor would be sensitive to social context in the same way as those performed by a hand. Participants played a game on a large horizontal touchscreen that involved contacting virtual tiles in a self-selected order using their hand or a computer mouse. As a social manipulation, a peer was located within or outside of the participant's peripersonal space. Overall, the action sequences differed between hand and cursor. However, both hand and cursor showed delayed movement time when the peer was located within (rather than outside) peripersonal space. Proxemic rules governing body actions in social situations may extend to actions performed with virtual tools.
Email: Jill Dosso, jill.dosso@psych.ubc.ca

(2009)

Modelling Optic Ataxia Via Attentional Loading in Central Vision. HARRIET E. INGLE and ROBERT D. MCINTOSH, *The University of Edinburgh* (Sponsored by David Donaldson) — This study investigates the effect of attentional load on central vision upon pointing responses to targets at different eccentricities. The aim was to address whether attentional load would modulate pointing errors, and whether this would mimic the character of optic ataxia. The prediction was that attentional load would increase errors towards the point of fixation, and that this effect would be greater for more eccentric targets. The results supported this hypothesis, and demonstrated that increased attentional load tended to amplify the underlying pattern of errors, with the most pronounced errors being toward fixation for the most eccentric targets. Interestingly, at the smallest eccentricity, errors tended to be further from fixation under high attentional load. Inspection of prior literature suggests that similar patterns may be observed at near eccentricities in at least some patients with optic ataxia. These data therefore suggest a possible 'model' of optic ataxia in the normal brain, and provide further support for a causal role of attention in these visuomotor symptoms.
Email: Harriet Ingle, s1265588@sms.ed.ac.uk

EMBODIED COGNITION

(2010)

Handedness Effect in Mental Rotation Task. JAN P. DE RUITER and GABRIELE PASCHEK, *Bielefeld University* — One of the most convincing demonstrations of the existence and role of Embodied Cognition is a body specificity effect that manifests itself in mental manipulations during a cognitive task. Such an effect would provide strong evidence for one interpretation of embodied cognition, namely "body-based off-line cognition" (M. Wilson, 2001). We asked participants to indicate whether two three-dimensional objects that are displayed on a screen in 2 dimensions are identical. This is a task that involves mental rotation (Shepard & Metzler 1971). However, we manipulated the stimuli in such a way that the participants were encouraged to rotate the shapes either with their ipsilateral or their contralateral "mental hand". The results

show that participants perform the mental rotation task faster when they are encouraged to mentally rotate the shape at the side of their preferred hand. We interpret this as evidence that is strongly supporting body-based off-line cognition, and by implication, Embodied Cognition.
Email: Jan P. de Ruiter, storkchen@gmail.com

(2011)

Thinking About Acting: How Action-Related Thought Shapes Environmental Representations in Spatial Memory. HOLLY C. GAGNON and CHRISTOPHER C. DAVOLI, *Central Michigan University* — Our spatial representations of an environment are sensitive to the actions we perform within it. For instance, we remember a room as being smaller if we interact with versus just inspect objects in that room. Nevertheless, it remains unknown whether simply thinking about using objects, which does not entail overt demands on the perceptual system for subsequent action, similarly leads to compressed representations of the surrounding environment. Based on recent results stemming from embodied cognition, we hypothesized that participants' memories for the environment would be compressed when they thought about using objects but not when they thought about identifying them. Across multiple measures, we found evidence to support that hypothesis. These results suggest that people do not need to physically interact with their surroundings, nor formulate overt action plans to do so, in order to exhibit compressed environmental representations. Merely thinking about interacting with objects may be enough to evoke compression effects, highlighting the importance of action-related thinking on spatial memory.
Email: Christopher Davoli, davol1cc@cmich.edu

(2012)

Does Smelling Pine Cones Make it Harder to Think About Strawberries? PETER BODDY and PEDRO M. PAZ-ALONSO, *Basque Center on Cognition Brain and Language*, EILING YEE, *University of Connecticut* — Sensorimotor accounts of conceptual knowledge hold that an object's representation is distributed over brain regions that are active during experience with it. Accordingly, they predict that representations of objects with which people have substantial olfactory experience (e.g., strawberries) involve olfactory brain areas, and thus, the ability to think about such objects could be hindered when an inconsistent odor (e.g., pine) is present (due to competition for shared neural substrates in brain areas supporting both online olfaction and access to these objects' representations). In a behavioral task (animal judgment), participants responded to visual words referring to objects that varied in how much they are experienced via olfaction (e.g. "strawberry"=more, "mailbox"=less). The task was performed either in "strong-ambient-odor" or "normal" conditions. Results show more interference when responding to "more-olfactory-objects" than "less-olfactory-objects" as a function of the odor context. The pattern suggests that the representations of "more-olfactory-objects" make use of the olfactory system.
Email: Peter Boddy, p.boddy@bcbl.eu

(2013)

Perception of Spatial Distance Between Two People After Reading Metaphor. ALBERT N. KATZ and JEFFREY N. REID, *University of Western Ontario* — The present research examined the effects of reading metaphor on the perception of the physical distance between two people. Participants judged the distance between pairs of people shown in pictures after either reading a series of metaphorical sentences or literal sentences and , in a second study, a third group read nothing aside from instructions. Participants who read metaphor perceived the models in the pictures to be farther apart on average when compared to reading literal language or not reading anything aside from instructions. Construal level theory posits that there are multiple dimensions of psychological distance (e.g., spatial, temporal, social, hypothetical) and that these dimensions are all cognitively related. We propose that semantic distance is another dimension of psychological distance. Metaphor is unique in that it consists of two unlike, or semantically distant things. We suggest that participants projected this semantic distance associated with metaphor onto their judgments of spatial distance.
Email: Jeffrey Nick Reid, jreid256@uwo.ca

(2014)

Is It Possible to Update Mental Simulations? LARA N. HOEBEN MANNAERT, KATINKA DIJKSTRA and ROLF A. ZWAAN, *Erasmus University Rotterdam* — Much research has been done that suggests we create mental simulations during language comprehension. The current series of experiments aims to go one step further and to see whether we can update these mental simulations over the course of 2 sentences, where the first sentence implies that an object has a certain shape/color, and the second sentence implies a change in this color/shape. Participants in Experiment 1 saw a picture either after the first or after the second sentence, and they had to verify whether this object was mentioned in the previous sentence or not. This picture either matched or mismatched the shape/color that was implied by the sentence. There was a significant match advantage after sentence 1, but no significant match advantage after sentence 2. Experiment 2 replicated Experiment 1 but showed only a picture after the second sentence and found a significant mismatch advantage. These results suggest that an initially formed representation (in sentence 1) stays strongly activated and perhaps merely implying a change in an object feature (in sentence 2) is not enough to update it. An alternative explanation is that 2 sentences are not enough to implement this change in a representation.
Email: Lara Hoeben Mannaert, hoebenmannaert@fsw.eur.nl

(2015)

Observer's Body Movements Affect Ability to Process Gestures. ACACIA L. OVEROYE and MARGARET WILSON, *University of California - Santa Cruz* — Gesture comprehension, and further it's encoding in memory, may rely on an individual's ability to simulate an observed gesture in their own mind. In our study, participants watched a video of an actor saying short phrases with gestures and were given a cued-recall test on what was said in the video. While watching the video, participants

were instructed to produce movements that may interfere with the simulation of gesture (arm movements), movements that would interfere less with simulation of gesture (leg movements), or just watch the video (baseline). We found that participants who were in the arm movement condition recalled less gestural information than those in the other conditions, suggesting that embodied simulation may be key for comprehension and memory for gestures.
Email: Acacia Overoye, aoveroye@ucsc.edu

(2016)

Hand Proximity Influences Pitch Discrimination. KENDRA C. SMITH and RICHARD A. ABRAMS, *Washington University in St. Louis* — The effect of hand proximity on visual processing is well documented (e.g. Abrams et al, 2008). We sought to determine if audition is also affected by hand proximity. Participants completed several tasks in which we manipulated the proximity of their hands to an audio speaker through which experimental stimuli were presented: In some trials they responded by pressing response buttons mounted on the sides of a box in which the speaker was housed; in other trials they responded by pressing response buttons held on their lap far from the speaker. In one experiment, participants compared a reference tone to a subsequent comparison tone at the same or a slightly higher or lower pitch. Participants were significantly poorer at frequency discrimination when their hands were near the stimulus compared to when their hands were far away. In a second experiment, we examined loudness perception using a similar procedure and found no effect of hand proximity. The results may stem from tradeoffs in processing as observed for visual stimuli, reflecting the contributions of multi-modal mechanisms in the near hand space.
Email: Kendra Smith, kendrasmith@wustl.edu

(2017)

Somatically Perceived Slope, Range, and Rate of Static and Dynamic Floor Under Observers. ATSUKI HIGASHIYAMA, *Ritsumeikan University* — This study focused on somatic perception of the floor on which the observer is placed. In Experiment 1, the floor was inclined at 10° or less and 21 standing observers estimated the slope of the floor in degrees with or without visual exposure to the floor. The mean estimates were about 30-50% larger than the objective slopes. In Experiment 2, the floor rotated the range up to 20° at 2 rpm or less around the horizontal axis, and blindfolded observers estimated the range and rate of the moving floor while standing (N=12), sitting (N=12), or lying down (N=12) on the floor. As objective range increased, the mean judged range increased nearly as rapidly as the objective range: The mean exponent of the power function fitted to the estimates was 1.01. As objective rate increased, the mean judged rate increased but not as rapidly as the objective rate (the mean exponent of 0.48). The mean judged range enlarged when the objective rate was low; the mean judged rate enhanced when the objective range was large. Other 12 standing observers who were visually exposed to the floor judged the rate the moving floor to be larger than the standing observers with blindfolded.
Email: Frank H. Durgin, fdurgin1@swarthmore.edu

EMOTION AND COGNITION II

(2018)

Is Emotional Face-Body Context Integration Automatic? ASLAN KARAASLAN and SONIA AMADO, *Ege University* — Recent studies showed that recognition of emotional faces is influenced by contextual information. Two experiments were conducted to address whether this effect is controlled or automatic. Automaticity of emotional face-body context integration was examined using brief presentation (decreasing awareness) of congruent and incongruent emotional body cues before identification of emotional facial expressions. Anger, disgust, sadness and neutral emotional stimuli were utilized using FACES for facial expressions and BESST data sets for body context stimuli. After a brief (33ms) presentation of the emotional body picture, congruent or incongruent emotional faces were presented (150ms) and subjects were requested to label emotions (Exp1) or perform a two choice detection task (Exp2). Results of preliminary analysis of accuracy and reaction times show that congruent face-body context presentations were significantly more accurately identified compared to incongruent pairs. This finding suggests that body contexts and facial expressions are integrated without awareness, relatively automatically.
Email: Sonia Amado, sonia.amado@ege.edu.tr

(2019)

Flowers and Spiders in the SRC and Simon Tasks: Response Selection or Mapping Selection? JING CHEN, *New Mexico State University*, MOTONORI YAMAGUCHI, *Edge Hill University* — Responses are faster to stimuli that are spatially compatible than to stimuli that are incompatible with the responses. This stimulus-response compatibility (SRC) effect occurs even when the stimulus location is irrelevant to the task (i.e., the Simon effect). A recent study reported that the SRC effect is reversed for stimuli with negative valence. The present study investigated whether stimulus valence affects response selection or mapping selection. In Experiment 1, participants responded to stimuli (flowers vs. spiders) compatibly or incompatibly based on stimulus valence; the SRC effect was reversed for spiders, and responses were slower when spiders required compatible mappings than when flowers required compatible mappings. In Experiment 2, participants made left or right responses based on stimulus valence; stimulus valence did not affect the Simon effect. The results imply that stimulus valence affected mapping selection, not response selection.
Email: Jing Chen, jingchen@nmsu.edu

(2020)

Self-Bias, Shapes, and the Perception of Time. CLAUDIO MULATTI, *University of Padova*, REMO JOB, *University of Trento* — Some events, often those enjoyable and engaging, lead to the feeling of "time flying by", whereas others, perhaps those more distressing, lead to the experience of "time standing still" or "dragging". That is, emotions alter the subjective experience of time (see, Droit-Volet & Meck, 2007, TiCS). Self-salient events might be seen as emotionally tagged, and thus the perception of their duration might be altered (see, Craig, 2009, Nature

Reviews). In two experiments, we show that the processing of arbitrary geometrical shapes associated to the self (vs. stranger) is prioritized (see, Sui, He, & Hymphreys, 2012, JEP:HPP), and that the perception of the time associated to events involving self-related shapes (compared to stranger-related shapes) is altered.
Email: Claudio Mulatti, claudio.mulatti@unipd.it

(2021)

Emotion Reading Through Outward Emotional Expression Across Independent and Interdependent Cultures. EUNHEE JI, *Yonsei University*, LISA K. SON, *Barnard College*, MIN-SHIK KIM, *Yonsei University* — The current study investigated whether cultural difference would influence on reading others' minds. Participants played a prisoner's dilemma game with a computer pre-determined as a defector, believing it another participant. They exchanged facial expressions (joyful, neutral, or regretful) at the end of every round. The computer showed facial expressions matched with their action (e.g. a joyful face after winning more points and a regretful face after winning less point) or not with them. Experiment 1 was conducted respectively for Koreans and Americans. We found that Americans in the match condition were less cooperative to the counterpart compared to those in the mismatch condition, and this difference was smaller for Koreans. In Experiment 2, Korean participants were induced to believe that the opponent was either a Korean or a foreigner. The result was that participants were susceptible to the consistency between emotional expression and behavior only when they believed to playing the game with a foreigner. These findings suggest that other's cultural backgrounds and their own culture are both important factors when people reason other's mental states through other's emotional expression.
Email: Min-Shik Kim, kimm@yonsei.ac.kr

(2022)

Emotion and Emotion-Laden Words Differ on Both Hits and False Alarms: Insights From the DRM Paradigm. KRISTEN A. DILIBERTO-MACALUSO, *Berry College*, STEPHANIE A. KAZANAS, *Tennessee Technological University*, JEANETTE ALTARRIBA and EMILY O'BRIEN, *University at Albany, State University of New York*, EDWIN RIVERA and JOELLE SMITH, *Berry College* — Previous research on the influence of emotion on the production of DRM false memories has yielded mixed results. This may, in part, be explained by a failure across studies to distinguish between emotion and emotion-laden word types and an inconsistency in equating DRM lists on key variables known to influence lure production. The current study aims to examine false recall for neutral, emotion, and emotion-laden word lists presented either visually or auditorily while controlling for backward associative strength (BAS), forward associative strength (FAS), word frequency, word length, number of syllabus, concreteness, imageability, valence, and arousal. Overall, we found that the proportion of false alarms to lure items was higher for neutral than for emotion and emotion-laden list types. A separate analysis examining list valence revealed that the proportion of false alarms to lures items was higher for emotion than for emotion-laden lists, irrespective of valence.
Email: Kristen Diliberto-Macaluso, kdiliberto@berry.edu

(2023)

Exploring the Dynamic Relationship Between Mood and Referential Communication. JANET F. MCLEAN, DAVID J. MOULDS, HANNAH BALSILLIE and VERA KEMPE, *Abertay University* — Previous research has demonstrated a link between mood and language production in individual speakers. However, in dyadic exchanges, the duration of communicative exchanges and the process of communication may also alter mood. To explore this reciprocal link, we induced particular moods in dyads of participants prior to a referential communication task. In study 1, dyads were induced into "happy", "neutral", or "sad" moods. Happy participants produced more ambiguous initial descriptions than neutral participants. Surprisingly, sad participants were almost identical to the happy ones, but, they also exhibited mood improvement and more turn-taking during the task, potentially to elicit further interaction. Studies 2 and 3 sought to investigate this mood improvement effect by varying interactivity and dyadic mood match. Our results suggest that shared negative affect may promote cooperation by rewarding communicative interaction with mood improvement. Implications for the role of emotion in the evolution of communicative cooperation will be discussed.
Email: Janet McLean, j.mclean@abertay.ac.uk

(2024)

Comparing Emotional Information Changes Neural and Behavioral Emotional Responses. ALANA M. CAMPBELL, *University of North Carolina at Chapel Hill*, DEANA DAVALOS, *Colorado State University* — Interactions between emotional and cognitive processes are known to yield differential impacts; enhancing a system in some conditions while disrupting it in others. This current study investigated interactions between emotional valence and working memory, using electroencephalography (EEG) to index neural communication across a variety of emotional conditions. Participants completed a modified delayed match to sample task using stimuli spanning the emotional range of the International Affective Picture System (IAPS). Participants compared the emotionality of the sample and target images. The late positive potential (LPP) indexed emotional responses elicited from the images. Consistent with previous research, negative emotional stimuli appeared to elicit more robust and more easily influenced LPPs than positive stimuli. Both the participant ratings of, and LPPs in response to, negative and positive target images varied based on the valence of the sample image. Additionally, spectral analyses will be discussed.
Email: Alana Campbell, Alana_Campbell@med.unc.edu

(2025)

The Co-Occurrence of Cognition and Affect in Biofunctional Mutual Exclusion: A Cross-Disciplinary Meta-Analysis. CATANYA G. STAGER, *The University of Alabama* —

Decades of biofunctional embodiment research suggest that biofunctional mutual exclusion (BME) is an experience-peaking categorization process that engages together distributed constellations of neural activity across diverse nervous and bodily systems (Iran-Nejad, 1987, 1986, 1987). A corresponding prediction of this suggestion is that the BME simultaneously engages both cognition as well as emotion. This presentation reports a meta-analytic investigation of studies across the separate fields of cognition and affect where cognition and emotion experiences co-occur contemporaneously in support of the above prediction. This study investigates disambiguation studies in search of cognition and affect embedded together in coherent experiential categories. We conduct a meta-analysis of disambiguation studies to classify examples of embedded biofunctional mutual exclusion events and propose that categorization is first, a biofunctional mutual exclusion process and then secondarily a psychological mutual exclusion process. This meta-analysis advances a more cohesive investigation of the co-occurrence of cognition and emotion in experiential embodiment.
Email: Catanya Stager, cgstager@crimson.ua.edu

(2026)

Alexithymia in Men: An Electrophysiological Investigation of Emotional Processing. ELLIOTT JARDIN, *Cleveland State University*, PHILIP A. ALLEN and RONALD F. LEVANT, *The University of Akron*, MEI-CHING LIEN, *Oregon State University*, ERIK MCCURDY, ANTHONY VILLALBA and JAMES R. HOUSTON, *The University of Akron* — The Normative Male Alexithymia Hypothesis proposes that men have more difficulty in displaying vulnerable emotion (e.g., fear and angry; Levant, 1992). We examined whether Alexithymics exhibit emotional recognition deficits using electrophysiological measures. We tested 15 males who scored above the 90th percentile rank on the Toronto Alexithymia Scale (the Alexithymia group), and 15 males with average scores (the control group), on a facial emotion recognition task (happy, angry or neutral). We assessed early repression (unconscious avoidance) and later suppression (conscious avoidance) loci using P1 and P3, respectively. Results showed that the Alexithymia group produced significantly lower P1 and P3 on all emotional faces than the control group. Also, the control group showed relatively higher amplitudes for negatively valenced stimuli than for neutral stimuli, whereas the "Alexithymic" group showed the reverse trend. This suggests that Alexithymic symptomology may stem from both early (perceptual) and later (cognitive) inhibition of vulnerable emotions.
Email: Elliott Jardin, e.jardin@vikes.csuohio.edu

(2027)

Virtual Reality Simulation as Supplemental Treatment in Cases of Seasonal Affective and Anxiety Disorders. TONI M. KAPLAN, AMY FORTIER-BROWN, CHRISTOPHER R. BENNETT and NICHOLAS A. GIUDICE, *University of Maine* — Seasonal Affective Disorder (SAD) is a depressive mood disorder that results from seasonal changes during the winter months. This condition is more prevalent in northern climates; according to Bates College Health Center, affecting 5-13% of college students in the Northeast. Current SAD treatment includes bright light therapy, which is effective for nearly 80% of patients. The premise of this research is to determine if the use of a virtual reality (VR) environment in conjunction with light therapy could provide a more effective treatment for SAD. Development of the virtual environment was done in Unity and focuses on summer beach exposure. The research is currently on-going; results will examine the level of effectiveness for the virtual reality enhanced treatment as compared to traditional bright light therapy. The goal of this work is to identify if VR exposure increases the efficacy of traditional bright light therapy for SAD patients.
Email: Nicholas Giudice, nicholas.giudice@maine.edu

(2028)

Virtual Reality Exposure Therapy for Veterans With PTSD. SCOTT M. RICHARDS, CHRISTOPHER R. BENNETT and NICHOLAS A. GIUDICE, *University of Maine* — As a veteran, I have seen firsthand the effects Post Traumatic Stress Disorder (PTSD) can have on an individual. One of the most efficient ways for treating PTSD involves the use of prolonged-exposure therapy. The emergence of virtual reality technology in the mainstream affords the ability to quickly build virtual worlds, which many organizations have begun using to treat veterans with PTSD. What this research has accomplished is the creation of a broadly applicable package of pre-constructed and immersive virtual models and assets. This package includes a plethora of sounds, objects, and effects, all of which can be used by anyone to build a realistic, immersive virtual environment catered to the unique experience of an individual with PTSD. On-going usability research aims to identify how therapists are able to interact with the software suite. Results from this work enhance the ability professionals have to personalize PTSD exposure therapies.
Email: Nicholas Giudice, nicholas.giudice@maine.edu

ASSOCIATIVE LEARNING II

(2029)

The Effect of Modality on SL Deficit Among Adults With Developmental Dyslexia (DD): Evidence From an AGL Task Study. SHANI KAHTA and RACHEL SCHIFF, *Bar-Ilan University* — It has been recently suggested that individuals with DD are deficient in SL, and that this deficit play an important role in their difficulties acquiring fluent reading and writing. However, the taucity of research leaves the nature of this deficit, particularly whether the deficit will show in both visual and auditory modalities. Therefore, the aim of the current study was to explore the effect of modality on the performance of adults with DD on SL tasks. Sixty three adults participated in two experiments, 31 in the DD group, and 32 in the control group. The stimuli for the visual task were letter sequences, and the stimuli for the auditory task were tone strings. Results showed that all participants exceeded chance level in both modalities, however, a significant difference was found between DD and controls in both visual and auditory tasks. A significant interaction revealed that difference in performance was significantly higher in the auditory experiment. These results

support the SL learning deficit hypothesis for individuals with DD, and expand it by showing that this deficit is constrained by the modality in which it is presented. Theoretical and clinical implications are discussed.
Email: Shani Kahta, shani360kahta@gmail.com

(2030)

Maximizing Accuracy Instead of Reward in Perceptual Category Learning. KAILEIGH A. BYRNE, *Texas A&M University*, TYLER DAVIS, *Texas Tech University*, DARRELL A. WORTHY, *Texas A&M University* — This study used a perceptual category-learning paradigm where people received monetary payoffs for correct classifications to examine whether people prefer to classify easier, but less rewarding stimuli over more difficult, but more rewarding stimuli. In the learning phase, participants learned to categorize perceptual stimuli that differed along two perceptual dimensions via trial and error. In the gains condition, participants received larger rewards for correctly categorizing more difficult items. In the losses condition, correct classification of difficult items led to fewer points lost, while incorrect classification led to the largest possible loss. During the test phase, participants chose one of two items to classify that varied in difficulty. Across both conditions, individuals had a strong bias toward choosing easier stimuli to categorize in the test phase even though those stimuli offered smaller possible payoffs and had lower normative expected values. These results were corroborated in a second study, and suggest that people are inclined to maximize accuracy rather than monetary reward. Thus, these results suggest that preference for certainty extends to learning tasks with deterministic rules.
Email: Kaileigh Byrne, kbyrne21@tamu.edu

(2031)

The Effects of Self-Generated Examples on Paired-Associates Learning of Name and Definition of Psychological Terms. KEIGO OSHIO, *Hosei University* (Sponsored by Tetsuya Fujita) — There are few research determining how effective self-generated examples is. Current research question is, will student's paired-associates learning of new name of psychological terms and definitions be promoted by self-generated examples, or by reading examples, when the name of term is changed original to irrelevant name, and when the test is Name-Definition matching test. Subjects were 36 undergraduate students. A 2 × 2 mixed factorial design was employed, with one between-subjects variable, order type (read-generate vs. generate-read) and one within-subjects variable, example type (read name, definition and generate example vs. read name, definition and example). After each study condition for 10 terms, participants were asked to answer the matching test for 5 minutes. The results from A mixed-multifactorial analysis of variance shows that there was a main effect of example type, $F(1, 34) = 4.36$, $p = .04$, $\eta^2 = .04$). Self-generating example is more effective than reading example.
Email: Keigo Oshio, o4o_k5@yahoo.co.jp

(2032)

Outcome Predictability Biases Human Associative Learning. OREN GRIFFITHS, MAY ERLINGER, TOM BEESLEY and MIKE LE PELLEY, *University of New South Wales* — Associative learning research (human and animal) has historically considered 'uncertainty' to be a property of cues. Much work has shown that learning about the predictiveness of cues (cue uncertainty) changes how those cues are treated subsequently. Yet logically 'uncertainty' could also be considered a property of outcomes. The present article presents the first experiments examining whether the predictability of outcomes (outcome uncertainty) changes the way outcomes are subsequently treated in a human associative learning task. An outcome's associative history was shown to bias subsequent learning in a manner comparable to that of a cue's associative history. This holds significant implications for how uncertainty is conceived and represented in both associative learning theories, and in cognitive theories in other domains.
Email: Oren Griffiths, oren.griffiths@unsw.edu.au

(2033)

Beyond Graph Topology: Walk Structure Influences Cluster-Level Surprisal Effects in a Continuous Learning Task. ELISABETH A. KARUZA, ARI E. KAHN, SHARON L. THOMPSON-SCHILL and DANIELLE S. BASSETT, *University of Pennsylvania* — Human learners exploit not only transitional probabilities but also the graph topology of sequentially experienced events as they develop representations of their environment. Here, we illustrate that learning is influenced, not only by the topological properties of a network, but also by the order ("walk") in which its edges are traversed. Participants responded via button press to a sequence of images generated by distinct walks on the same graph. When transitioning out of a dense cluster of nodes, learners exposed to a random walk on the graph showed the strongest surprisal effects: a sharp increase in reaction time upon entering a new cluster. However, this effect was reduced/reversed by introducing highly structured walks (i.e., those that sampled exhaustively from all nodes and edges in successive cycles). Thus, we show that learners are sensitive to multiple sources of information: the organization of a network and how its elements unfold in time.
Email: Elisabeth A. Karuza, ekaruza@sas.upenn.edu

(2034)

Remembering and Applying Psychology Course Content Mnemonically, Revisited. RUSSELL N. CARNEY, *Missouri State University*, JOEL R. LEVIN, *University of Arizona*, MY Q. VU, *Washington University in St. Louis*, REBECCA E. KNOPH, KATHERINE E. WHISENHUNT, CAITLIN M. DRUMMOND, SARAH C. ASHE and MEGAN E. KERN, *Missouri State University* — Extensive research has shown the keyword method to be an effective mnemonic technique. However, mnemonic strategies are often criticized as facilitating only rote memory. To date, only a handful of mnemonic studies have featured outcome measures requiring higher-order thinking. To further examine this issue, we randomly assigned undergraduates to one of three groups: own best method (control), or one of two mnemonic conditions (one

with a single provided keyword, and the other with two). After an introduction to their strategy, students used their respective techniques to study 22 psychologists and the theories or concepts with which they are associated (e.g., Sperling/Iconic Memory). On both immediate and 2-day-delayed psychologist-concept matching tests, students in both mnemonic conditions statistically outperformed control participants. Further, and importantly, students in both mnemonic conditions also statistically outperformed control participants on a 12-item multiple-choice test that required higher-order thinking (with no statistical differences between the two mnemonic conditions).
Email: Russell N. Carney, RussellCarney@missouristate.edu

(2035)

Statistical Learning Enhances Memory for Objects from Triplets and Impairs Memory for Objects Inserted Into Triplets. SACHIO OTSUKA, *Doshisha University*, JUN SAIKI, *Kyoto University* — We examined whether visual statistical learning (VSL) influences memory for objects from triplets and for inserted objects that break the regularity. In the familiarization phase, participants observed a stream of objects that consisted of structured triplets where three objects were always presented in the same order, and random triplets. In the last part of the familiarization phase, similar objects were inserted into the structured triplets, and between the structured and random triplets. In the subsequent memory test, participants were required to decide whether the presented objects were old or new. The results showed that objects from structured triplets were more likely to be remembered than those from random triplets, and objects inserted into the structured triplets were less likely to be remembered than non-inserted objects. These results suggest that VSL enhances memory for triplet elements and impairs memory for objects that break the regularity.
Email: Sachio Otsuka, sotsuka@mail.doshisha.ac.jp

(2036)

Sensical and Nonsensical Information May Help or Hurt Source Memory for Ambiguous Images. GABRIEL I. COOK, *Claremont McKenna College*, ARLO CLARK-FOOS, *University of Michigan-Dearborn*, J. THADDEUS MEEKS, *University of Southern Illinois-Edwardsville*, RICHARD L. MARSH, *University of Georgia*, CHRISTOPHER URBANIK, *University of Michigan-Dearborn* — Making sense of ambiguous information is important for understanding how we should interact with objects, the environment, and other people we encounter throughout our lives. Semantics also plays a role in how memories are formed, retained, and retrieved. However, research on source memory has not really focused on understanding the role of ambiguity in the context of episodic experiences. We set out to investigate how cognitive processing may differ for information that is either sensical or nonsensical in order to determine how that processing influences a later recollective experience for ambiguous information. We manipulated whether participants could make sense of ambiguous images by pairing them with sensical verbal captions, nonsensical verbal captions, or no captions (control) in order to determine how secondary information may either help or hurt memory for details of episodic events. Memory for various episodic attributes was measured using a source memory paradigm across experiments and as well as a remember-know paradigm. Source memory differs across ambiguity manipulations; encoding and binding mechanisms will be discussed.
Email: Gabriel Cook, Gabriel.Cook@ClaremontMcKenna.edu

(2037)

The Role of Experimental Proportions in the Novelty Mnemonic Effect: Prior Knowledge Perspective. NIV REGGEV, REUT SHARONI and ANAT MARIL, *The Hebrew University of Jerusalem* (Sponsored by Yonatan Goshen-Gottstein) — Conceptual congruency effects show how familiar stimuli (congruent with previous knowledge) facilitate improved memory performance compared to novel stimuli. However, the contribution of novelty to superior memory performance is a widely accepted convention. Here we examine the role of *experimental proportions* of novel and familiar stimuli as a potential explanation for these apparently conflicting findings. Across two experiments we demonstrate that semantic novelty is sensitive to experimental proportions but does not lead to a mnemonic advantage over familiarity even when extremely infrequent. Memory for semantically familiar items was similar across all experimental proportions, suggesting that encoding of familiar items is insensitive to list effects. Result suggest that the effects of different aspects of novelty and familiarity should be explored orthogonally.
Email: Anat Maril, anat.maril@mail.huji.ac.il

HUMAN LEARNING AND INSTRUCTION II

(2038)

Metacognitive Awareness and Judgments of Learning in Statistics Courses. ERIN M. BUCHANAN, KATHERINE D. MILLER, EMILY R. KLUG, REBECCA E. KNOPH, ELIZABETH KUSEL, CALEB Z. MARSHALL, NICHOLAS MAXWELL and RACHEL L. SWADLEY, *Missouri State University* — A judgment of learning (JOL) is defined as a judgment that occurs after we have learned new information, and they are predictions about future test performance on these newly learned items (Sundqvist, Todorov, Kubik, & Jönsson, 2012). JOLs were evaluated in terms of metacognitive awareness and types of knowledge estimated; predicting that metacognition, in addition to GPA, would be a significant covariate in the relationship between participant JOLs and actual test performance for both declarative (facts) and procedural (skills) knowledge. We asked university students from three statistics courses to provide their judgments of learning before each exam. As expected, JOLs significantly predicted performance with better predictions for procedural based knowledge than declarative knowledge, while GPA was a significant covariate only for declarative knowledge. Metacogntive skills including concentration, self-efficacy, and monitoring were predictors of JOLs where perceived concentration and self-efficacy increased JOLs, while perceived monitoring skills decreased overconfident JOLs.
Email: Erin M. Buchanan, erinbuchanan@missouristate.edu

(2039)

A New Framework for Understanding How Feedback Promotes Learning. ANDREW C. BUTLER and NATHANIEL D. RALEY, *University of Texas at Austin* — Over the past 50 years, the effects of task-level feedback on learning have been investigated within three relatively isolated research traditions: experimental laboratory research, applied research in the classroom, and research on using computers for individual instruction. Within each of these disciplines, the accumulation of empirical findings has far outpaced the development of theory. In addition, numerous discrepancies have emerged among these research traditions, which is problematic for existing theory and making recommendations for educational practice. We will propose a new theoretical framework that aims to unite a fragmented feedback literature that is rife with (seemingly) contradictory findings by introducing theory from other areas of human learning. We will discuss three well-replicated findings that are critical to understanding how people learn from feedback: the superiority of correct answer feedback relative to right/wrong and no feedback; the relationship between response confidence and error-correction; and the benefits of delaying feedback.
Email: Andrew C. Butler, andrewbutler@austin.utexas.edu

(2040)

Peer Assessment of Student Generated Questions. SOOJUNG BAE, JOOYONG PARK and CHEONGTAG KIM, *Seoul National University* — Students do not spontaneously raise many questions and the quality of questions are often superficial. One way to promote spontaneous questioning would be exposing students to various questions raised by their peers and having them assess these questions. As a preliminary step to that goal, the present study examined how to make sure that consistent and valid assessment takes place when students assess questions raised by their peers. We used two different rubrics: holistic and analytic. The analytic rubric had three dimensions: generation process, expression, and impact on learning. The results showed that ratings from the analytic rubric were more reliable than those from the holistic one. Furthermore, assessments made with analytic rubric had higher correlation with those by experts. These results suggest that students will be more likely to make reliable and valid assessments of questions raised by their peers when appropriate rubrics are provided.
Email: Soojung Bae, aaaaa124@snu.ac.kr

(2041)

Study Behaviors as a Predictor of Academic Achievement and Metacognitive Accuracy in College Courses. MICHAEL FRIEDMAN and SAMUEL MOULTON, *Harvard University* — Prior research into student study strategies has supported the claim that cognitively effective behaviors (e.g., retrieval practice) are associated with better achievement outcomes (GPA; Hartwig & Dunlosky, 2012). We expanded on this work by investigating the relationship between study strategies and measures of academic performance (test score, course grade, GPA), as well as metacognitive measures (predicted exam score, predicted course grade). We surveyed students in two psychology courses immediately following their final exam, in which they reported on the study behaviors they used to prepare for that test and predicted their performance. These data were linked to their course grades and analyzed using linear regression. While cognitively effective study behaviors were used less often overall, they were positively associated with some academic achievement measures. Interestingly, those behaviors were also negatively associated with metacognitive measures. Theoretical implications and the practical application of these behaviors to student study habits will be discussed.
Email: Michael Friedman, michael.charles.friedman@gmail.com

(2042)

Accompanying Corrections With Explanations: The Benefits of Additional Processing and Feedback Belief. PATRICK R. RICH and JOHN DUNLOSKY, *Kent State University*, MARIËTTE H. VAN LOON, *University of Bern*, MARIA S. ZARAGOZA, *Kent State University* (Sponsored by David Riccio) — Recent research has found evidence that when correcting misconceptions, an explanation of the correct answer helps increase knowledge revision (Kendeou et al., 2014). However, the exact mechanism for how explanations benefit knowledge revision remains unknown. In two experiments we investigated the contributions of two factors: (a) increased processing of the correct information, and (b) increased belief in the feedback. To address these factors, after reading corrective feedback participants either read an explanation for the correct answer or generated their own explanation. Both provided explanations and self-generated explanations increased accuracy on a delayed final test, indicating a role of increased processing. However, belief in the feedback mediated the effect of provided explanation on later accuracy, indicating a role of belief in the feedback. These results, replicated in the second experiment, indicate that explanations may benefit later accuracy through both increased processing and increased belief in the feedback.
Email: Patrick Rich, prich1@kent.edu

(2043)

Encountering the Unexpected: Coherence Break Detection in Scientific Explanations. BRENT STEFFENS, M. ANNE BRITT and KEITH K. MILLIS, *Northern Illinois University* — Readers do not appear to notice coherence breaks while reading scientific texts (Noordman et al., 1992) or become explicitly aware of the problems afterwards (Glenberg et al., 1982; Otero & Kintsch, 1992). To examine whether reading skill or task instructions that emphasize the situation model would mediate the spontaneous detection of causal coherence breaks, participants read short scientific explanations of different phenomena (e.g., how honey is formed) that did or did not include an inconsistency. We found that regardless of reading skill or task instructions, participants took longer to read the target sentences in the inconsistent than the consistent passages but generally did not report the inconsistency. These results suggest that readers monitor for local inconsistencies, but are not detecting the breaks in causal coherence at the

situation model level. Readers therefore may not be attempting to represent the causal relationships between events, which are critical for comprehension of explanations.
Email: Brent Steffens, bsteffens@niu.edu

(2044)

The Impact of Learning Approaches on Mental Models and Knowledge Transfer Within Arithmetic. REBECCA A. BONCODDO, *Central Connecticut State University*, CLINT A. JENSEN, APRIL D. MURPHY, TIMOTHY T. ROGERS, MARTHA W. ALIBALI, and CHARLES W. KALISH, *University of Wisconsin* — We report a series of studies in which both adult and child learners practice arithmetic problems either in a format that promotes item-specific representations of element combinations through standard symbol equation presentation (nominal), or in a format that promotes richer memory representations grounded in a system of magnitude relations presented as a number line (continuous). When learners are presented with standard mathematics equations there is little to support a deeper understanding of the relationship between the seemingly abstract symbols that make up the equation. We hypothesized that learners in the continuous conditions will show better transfer to related mathematics problems because their practice problems allow them to construct an integrated magnitude representation rather than simply learning a series of isolated facts. Additionally, we outline parameters to determine the mental models learners were constructing during training by analyzing participant's accuracy on transfer problems involving both novel quantities and problem presentations.
Email: Rebecca Boncoddo, boncoddo@ccsu.edu

(2045)

Test-Bank Quizzes Versus Quizzes Requiring Main Point Identification: Influence on Exam Performance Across Structure Building Abilities. RESHMA GOURAVAJHALA and MARK A. MCDANIEL, *Washington University in St Louis*, DAVID B. DANIEL, *James Madison University* — Knowing how to identify and integrate important parts of a narrative, while also suppressing irrelevant details, is a foundational skill for building a cohesive mental model of complex materials. Recently, this "structure-building" ability has been shown to predict success in introductory biology and psychology college courses (Arnold et al., in press). To help low structure builders (identified using Gernsbacher's Multimedia Comprehension Battery), we implemented a classroom intervention in an undergraduate psychology course. The intervention section was given pre-lecture online short-answer quizzes that asked students to identify the most important points in a chapter, and required metacognitive ratings of their understanding. The control section was given pre-lecture online multiple choice quizzes comprised of questions from a quiz bank. Post-intervention exam results showed no significant difference between the control and intervention sections, or between low and high structure builders within the intervention section. Possible explanations and educational implications will be discussed.
Email: Reshma Gouravajhala, rgouravajhala@wustl.edu

(2046)

Anchor Papers: An Effective Guide for Peer Review. HYUNJEONG LEE and JOOYONG PARK, *Seoul National University* — Anchor papers refer to sample essays graded by expert raters, used to provide a common standard for raters. The use of anchor papers has been recommended for a long time. Its effect, however, has so far been discussed only within the context of teachers or professional graders. In this study, we tested whether anchor papers improve the accuracy of rating in peer-review setting, where students make evaluations of other students' essays. The experimental group was given a rating guideline and two anchor papers to refer to, while the control group was simply given the rating guideline. Then, both group rated the same 20 essays. The validity of the rating scores of the experimental group was significantly higher than that of the control group. That is, the rating scores of the former group was more similar to the essay scores given by expert raters. The result suggests that using anchor papers can lead to more accurate rating in peer-review situations.
Email: Joo Yong Park, jooypark@snu.ac.kr

(2047)

Open-Note Testing and Lecture Pacing: Effects on Note Taking and Test Performance. BENJAMIN D. ENGLAND and ASHLEY SYLVARA, *Missouri Western State University*, FRANCESCA R. ORTEGREN, *University of Southern Indiana* — Note taking is important for encoding and recalling information, however, multiple factors—such as whether students paraphrase the presented information or write verbatim notes—may influence the quality of notes and subsequent test performance. We examined how lecture pace and open-note testing influenced students' note-taking approach and, as a result, performance on multiple question types. In the present experiments, participants listened to a lecture and were allowed to pause the lecture (or not) then answered questions over the material with or without their notes. Although both factors influenced students' note-taking approach, the effect on memory was somewhat mixed. We showed that unlike previous work (e.g., Mueller & Oppenheimer, 2014) verbatim note taking could improve conceptual test performance (but see Bui, Myerson, & Hale, 2013) under certain conditions. The present results highlight the importance of learners' expectation of an upcoming test prior to and control during learning on note quality.
Email: Benjamin D. England, bengland2@missouriwestern.edu

(2048)

Surprise, Your Final Exam Is Today: An Examination of Frequent Testing in a College Class. JOSEPH W. PIROZZOLO and DONALD J. FOSS, *University of Houston* — Frequent testing has been shown to facilitate learning. We investigated the effects of frequent "high-stakes" testing and practice quizzes (low-stakes testing) in two semesters of a college psychological methods course. Motivated by Keys (1934), we measured the outcome of these variables on both a "surprise cumulative exam" on the penultimate lecture day and on the regularly scheduled final exam. All exam items were either multiple choice or short answer. Some items on the final exam appeared on a previous

exam, some on both a previous exam and the surprise exam (repeated twice), and some were novel. Results indicate that students who took frequent exams and practice quizzes perform better on the surprise exam and the final exam. Frequent testing led to disproportionately better performance on short answer and novel items. Interestingly, the most powerful predictor of performance on the final exam was whether a student took the surprise exam.
Email: Joseph Pirozzolo, jwpirozzolo@uh.edu

(2049)

Different Sequences of Study for Different Types of Tests: The Sequence of Study Changes How Concepts Are Represented. PAULO F. CARVALHO and ROBERT L. GOLDSTONE, *Indiana University* — Previous research has demonstrated that the sequence of study changes what is encoded and remembered from study. During blocked study learners encode the similarities among items of the same categories whereas during interleaved study learners encode the differences between items of different categories. The aim of the present work was to investigate whether these differences in encoding lead to different representations of the studied materials. Participants studied natural categories either interleaved or blocked and were then given different probes about their knowledge of the categories. Participants perform better following blocked study in tests requiring isolated representations of the concepts (i.e., writing a definition), whereas for tests that require discrimination there is no difference between the two sequences of study. These results are consistent with the proposal that the sequence of study changes what is encoded and extend previous evidence by connecting differences in encoding to differences in how information is represented in long-term memory.
Email: Paulo Carvalho, pcarvalh@indiana.edu

(2050)

Cognitive Asymmetry and Alzheimer's Disease Risk at Midlife. LYSSA MANNING and M. NATASHA RAJAH, *McGill University* — This study examines the relationship between cognitive asymmetry (unbalanced visuospatial vs verbal capabilities) and AD risk factors (family history (FH), APoE 4 allelotype), and investigate their correlation with memory performance and cortical thickness. 93 healthy middle aged (40-59yrs) adults had their cognitive asymmetry was assessed, and were classified as +FH(N=37) or -FH(N=56). Of the 93, 75 were genotyped and classified as +e4 (N=27) or -e4 (N=48). A subset (N=57) underwent structural MRI scanning for cortical thickness analysis. Asymmetry was calculated as a difference score of visuospatial vs. verbal ability assessed by subtests of the Montreal Cognitive Assessment and category switching subtest of the Delis-Kaplan Executive Function System. We found a significant difference in asymmetry scores between +FH/-FH ($p=.011$) and +e4/-e4 ($p=.015$). Also, +e4 had significantly lower verbally ability as reflected by the direction of asymmetry scores. Chi-square tests revealed a significantly higher frequency of asymmetry among +e4 than -e4 ($p<.05$). Additionally, linear regression revealed that magnitude of asymmetry was negatively related to both memory performance ($p=.058$) and left and right hemisphere cortical thickness at FDR <0.05. We conclude that higher frequency of cognitive asymmetry is observed in middle aged adults at-risk of AD and is negatively related to memory and cortical thickness.
Email: M. Natasha Rajah, maria.rajah@mcgill.ca

(2051)

Stretching Achievement. SARA A. PETERS and RENÉE C. STUBBS, *Newberry College* — Stretch math courses have been introduced into college curriculums as an alternative to enrolling remedial students in non-credit bearing math courses. There are several stretch models available, but most include students meeting more than the traditional 2-3 times per week for the course, and include greater resources for struggling students. The current study followed students (n=14) involved in a stretch College Algebra course for a semester, to determine whether the supplemented learning environment provided created demonstrated gains in self efficacy toward mathematics, as well as in cognitive, memory, and attention-oriented tasks (flanker, n-back, number span) from semester beginning (time 1) to end (time 2). The additional resources for students within the stretch course included mandatory tutoring, the use of graphical organizers, and a supplemental instructor.
Email: Sara A. Peters, sara.ann.peters@gmail.com

(2052)

Does Testing Promote the Learning of Higher-Order Statistical Concepts? ANDREW LOGIUDICE, *McMaster University*, FARIA SANA, *Athabasca University*, JOSEPH A. KIM, *McMaster University* — To what extent does the testing effect, a robust finding in the memory literature, apply to complex learning materials? We examined whether testing enhances learning of higher-order statistical concepts. In the study phase, all participants studied various classes of statistical tests (e.g., Kruskal-Wallis) via example word problems, each of which were paired with brief explanations of their structural features (e.g., three or more independent variables, quantitative dependent variable). In the practice phase, those in the restudy condition studied each problem with its corresponding structural features again, whereas those in the test condition saw each problem, recalled the appropriate class and structural details, and then received the correct response. On the final test, all participants identified the class and structural features of previously studied (old) and never-before-seen (new) problems. If testing enhances the processing of structural features and superordinate classes embedded within these statistics materials, performance on the final test should be better in the test condition than in the restudy condition for both old problems (recall) and new problems (transfer).
Email: Andrew LoGiudice, logiudab@mcmaster.ca

(2053)

The Stability of the Interleaving Effect Across Time and Within-Participants. DEREK T. STOECKENIUS, *University of California, Los Angeles*, VERONICA X. YAN, *University of Southern California*, FARIA SANA, *Athabasca University*, ROBERT A. BJORK and ELIZABETH LIGON BJORK, *University of California, Los Angeles* (Sponsored by Geoff Norman) — Interleaving exemplars of to-be-learned categories,

rather than blocking exemplars by category, enhances category induction across multiple types of categories (e.g., artists' styles, butterfly species, math concepts, motor skills) and across different participant populations (children, younger and older adults). We examined the robustness of the interleaving benefit across time (Exp. 1), and across categories within a given participant (Exp. 2). In Exp 1, participants studied paintings from different artists that were either interleaved (uniform or expanding) or blocked by artist, and then—either immediately or 24 hours later—had to identify the studied artist responsible for each of a series of new paintings. Interleaving produced better classification performance than did blocking at both retention intervals. In Exp. 2, in three separate study-test cycles, participants had to learn—from blocked or interleaved exemplars—a given artist' painting style, a given cartoon-fish species, and a given butterfly species. Out of 178 participants, not a single participant benefited from blocked learning across all three categories. These results demonstrate the robustness of the interleaving effect across time and within participants.
Email: Veronica X. Yan, veronicy@usc.edu

AUTOBIOGRAPHICAL MEMORY I

(2054)

The Effect of Mood and Elicitation Technique on Autobiographical Memory Ratings. CARISSA L. BROADBRIDGE, *Saint Xavier University* — Fitzgerald (1988) argues that the reminiscence bump is due to the self-narrative being created during the time period of the bump. The stories included in this self-narrative are thought to remain stable over time because the interpretations of the events can change as one's view of the self changes (Fitzgerald, 1988). In the present study, participants were randomly assigned to a positive or negative mood condition. Once mood was induced using the Velten technique (Velten, 1968), four autobiographical memories were elicited through the cue-word method or by recalling four memories that belong in a book about their life. Each memory was then rated using the Autobiographical Memory Questionnaire. Results showed that cue type significantly moderated the effect of mood on memory valence, $F(1,94) = 3.95$, $p = .05$. There was no effect of mood manipulation on memory valence in cue-word memories, $t\ (49) = 0.42$, $p = .67$. For life book memories, negative mood induction ($M = 1.14$, $SD = 1.27$) led to significantly less positive memories the positive mood induction ($M = 0.17$, $SD = 1.22$), $t(41) = 2.55$, $p = .015$. These results suggest that the self-narrative is somewhat malleable, as Fitzgerald (1988) predicted.
Email: Carissa Broadbridge, broadbridge@sxu.edu

(2055)

Age-Related Effects on the Tendency to Focus on the Positive and Negative Aspects of a Highly Negative Public Event. JACLYN H. FORD and ELIZABETH A. KENSINGER, *Boston College* — The current study examined the effects of age and flashbulb-related variables on both the negative and the positive aspects of a highly negative event. 267 participants (ages 19-85) completed a survey focusing on their memories for and emotional reactions to the 2013 Boston Marathon bombings. Structural equation modeling was used to examine how flashbulb-related characteristics of one's initial experience (i.e., surprise, arousal, and personal consequentiality) contribute to the enhancement of positive and negative details, and how one's age alters these relations. The models revealed distinct age-invariant effects of emotional importance and personal involvement on emotional response, with emotional importance enhancing focus on negative aspects and personal involvement enhancing focus on positive. In addition, age was associated with increased focus on positive aspects of the event. These findings suggest particular mechanisms that may naturally allow individuals to think about the positive elements of an otherwise negative experience
Email: Jaclyn Ford, JaclynHFord@gmail.com

(2056)

Linguistic Content of Autobiographical Memories Cued by Popular Music and Words. KRYSTEN D. ZATOR and ALBERT N. KATZ, *University of Western Ontario* — Young adults were presented with either verbal or musical stimuli and asked to provide a typed description of a specific event autobiographical memory that came to mind. Two groups of participants were verbally cued by events that took place when they were 5, 10 or 16 years of age or by a general verbal lifetime cue directing them to that period in their life. A third group received 30 second long musical clips of songs popular during the same time periods. The memory descriptions produced were subjected to analysis by the Linguistic Inquiry and Word Count program. Differences in the reports produced suggests that listening to music is embodied in motor-perceptual systems, and this is reflected in the memories that come to mind, in contrast to memories produced to specific real-life events. Finally, relative to music cues, lifetime specific cues produced memories with reliably more uses of personal pronouns, past tense terms, and negative emotions, suggesting the access to larger discourse-structures is also reflected in the use of the language employed to describe a specific event-level autobiographical memory.
Email: Krysten Zator, kzator2@uwo.ca

(2057)

The Ontogeny of Relational Memory and Pattern Separation: A Radical Change in Performance Between Ages 4 and 6. CHI T. NGO, NORA S. NEWCOMBE and INGRID R. OLSON, *Temple University* — Episodic memory relies on memory for the relations among multiple elements of an event and the ability to discriminate among similar elements of episodes. The latter phenomenon, termed pattern separation, has been studied mainly in young and older adults with relatively little research on children. To study the contributions of relational memory and pattern discrimination to episodic memory development, we created a relational memory task assessing what-where relations and modified the Mnemonic Similarity Test (Lacy et al., 2011; Stark et al., 2013, 2015; Toner et al., 2011) for use with preschool children. Results showed that 4 year-olds performed significantly worse than 6 year-olds and adults on both tasks, whereas 6 year-olds and adults performed comparably, even though there were no ceiling effects. However, performance

on the two tasks did not correlate, suggesting that two distinct mnemonic processes with similar developmental trajectories may contribute to changes in episodic memory.
Email: Chi Ngo, chi.ngo@temple.edu

(2058)

Semantic Structure of Collective Representations. AYSU MUTLUTÜRK, AYSECAN BODUROGLU and ALI İ. TEKCAN, *Bogazici University* — Collective memory has been attracting increasing attention from memory psychologists. We specifically investigated the semantic structure of collective memory representations to identify how people cluster public events. We asked participants to judge the overall similarity of different pairs of 15 public events from Turkey's recent history. These events had been identified by an earlier nationally representative sample. We also asked all participants to rate each public event on a number of variables such as vividness, centrality-to-self, recollection etc. Using multidimensional scaling we found that people in Turkey represented and clustered public events based on three critical dimensions: humanitarian plights, ethnicity-related conflicts, and the secularity debate. Voting behavior reflecting political identity influenced how people clustered public events. These findings provide an insight about the evaluative criteria that individuals employ when thinking about public events constituting their collective memories.
Email: Aysu Mutlutürk, aysu.mutluturk@boun.edu.tr

(2059)

The Reliability of Visual Perspective During Mental Time Travel. JEFFREY J. BERG, KATHLEEN B. MCDERMOTT and ADRIAN W. GILMORE, *Washington University in St. Louis* — When remembering or imagining, people can experience an event from two vantage points: first-person perspective, in which the event is viewed from one's own eyes; and third-person perspective, as if one was watching oneself participate in the event. The visual perspective from which a person tends to remember or imagine has been related to numerous individual difference characteristics (e.g., trait anxiety). Such studies assume that people consistently adopt the same visual perspective across instances of mental time travel. Nonetheless, little evidence exists regarding the reliability of visual perspective, especially across multiple time-points. In two studies, we examined the degree to which people took the same visual perspective across two-day (Study 1) and two-week (Study 2) intervals. In both studies, the visual perspective ratings demonstrated good-to-excellent reliability. These results suggest that people consistently adopted similar perspectives across occurrences of mental time travel.
Email: Jeffrey Berg, bergj@nyu.edu

(2060)

Characterizing the Role of the Hippocampus During Episodic Simulation and Episodic Encoding. PRESTON P. THAKRAL, *Harvard University*, ROLAND G. BENOIT, *Max Planck Institute for Human Cognitive and Brain Sciences*, DANIEL L. SCHACTER, *Harvard University* — The hippocampus has been consistently associated with episodic simulation (i.e., the mental construction of a possible future event). Previous functional imaging studies have shown that simulation-related hippocampal activity is also associated with successful episodic encoding (i.e., the subsequent recall of simulated event components). The current study was conducted to assess whether hippocampal encoding effects during simulation vary as a function of time (i.e., whether activity is transient or sustained), and also whether they vary as a function of the amount of information simulated (i.e., an event with fewer or more components). During scanning, participants simulated future events comprising 3, 4, or 5 event components. A post-scan cued recall test was used to classify events as either successfully or unsuccessfully encoded. Preliminary analyses revealed a subsequent memory effect (i.e., successful > unsuccessful encoding) in the anterior hippocampus. Critically, the subsequent memory effect was transient and did not vary as a function of the number of components simulated. The hippocampal effect may reflect an initial transient binding process necessary for subsequent memory for simulated future events.
Email: Preston P. Thakral, prestonthakral@fas.harvard.edu

(2061)

Investigating Age-Related Changes to Open-Ended Problem Solving. SARAH L. PETERS, CARINA L. FAN and SIGNY SHELDON, *McGill University* (Sponsored by Daniel Levitin) — Episodic memory processes contribute to many tasks beyond remembering, including open-ended social problem solving. Here, we extend upon prior reports linking age-related changes in episodic memory with impairment in open-ended problem solving by testing how healthy aging impacts different phases of problem solving in distinct open-ended scenarios. Two problem-solving phases were of interest: option generation, in which potential solutions are produced, and the elaboration phase, where a chosen solution is supplemented with detail. Younger and older adults were given eight social problems, half were framed as retroactive (*a friend is angry with you*) and half were prospective (*plan a vacation*) scenarios. For each problem, participants generated multiple solutions (generation phase) and then described one solution in detail (elaboration phase). No age differences were found in the generation phase. Consistent with previous studies, aging impaired the elaboration phase in that older adults described solutions with fewer relevant steps and episodic detail than younger adults. This effect was most prominent for the retroactive problems. These findings are discussed in terms of episodic memory process contributions to problems solving.
Email: Sarah L. Peters, sarah.peters@mail.mcgill.ca

(2062)

Investigating the Phenomenology of Fictional and Personal Memories. BRENDA W. YANG and ELIZABETH J. MARSH, *Duke University* (Sponsored by Tobias Egner) — Autobiographical memory extends beyond remembering one's personal past: it includes projections into one's future and memories that happened to other people (vicarious memories; Pillemer et al., 2015). Little work, however, has addressed whether fictional memories are part of this autobiographical

record. Fictional memories are defined here as memories of events that occurred in novels, films, television shows, etc. We examined whether fictional memories serve similar functions and/or have similar phenomenological characteristics as personal memories. We used a modified autobiographical memory paradigm to elicit both types of memories, which subjects rated on a number of dimensions. Memories of fictional events were perceptually rich, but did not elicit the same feeling of reliving as personal memories. Memories of fictional events served a number of purposes, albeit at lower levels than was true of personal memories. Overall, this work suggests that fictional memories are similar to vicarious memories and potentially part of the autobiographical record.
Email: Brenda Yang, brenda.yang@duke.edu

(2063)

The Role of Semantic Knowledge in Simulating Coherent and Detailed Future Events: Insights From an Experimental Recombination Procedure. SUSHMITA SHRIKANTH and KARL SZPUNAR, *University of Illinois at Chicago* — Recent work on episodic simulation—the ability to imagine a specific future scenario—has begun to focus on the supporting role of semantic knowledge. In the present studies, we made use of an adapted experimental recombination procedure that allowed us to vary the degree to which simulation cues were supported by background semantic knowledge. In Experiment 1, we showed that greater semantic support, as indexed by ratings of plausibility and explicit reasoning about cue elements, was associated with the construction of more coherent and detailed simulations of the future. In Experiment 2, we verified that reasoning about the future in relation to these recombination cues was predominantly supported by semantic as opposed to episodic knowledge. Together, our findings lend support to the semantic scaffolding hypothesis, which asserts that episodic simulations of the future can be aided by relevant semantic knowledge structures. We conclude by discussing circumstances that may invite scaffolding from episodic knowledge and also the relevance of our data for understanding the cognitive architecture that supports clinical anxiety.
Email: Sushmita Shrikanth, sshrik2@uic.edu

(2064)

You Had to Be There: How Experience Affects People's Beliefs About Life-Script and Script-Divergent Transitions. LIANGZI SHI and NORMAN R. BROWN, *University of Alberta* — Life-script events refer to normative life transitions (e.g., begin grade school, get married, or begin retirement), whereas script-divergent events are unexpected transitions that cannot be mapped onto a normative life script (e.g., move to a distant city, change careers, or get divorced). In this study, we investigate people's beliefs about these two types of transitional events, and the ways that experience and age affect these evaluations. We predict that life-script and script-divergent events differ in prevalence, temporal predictability, and emotional valence, but are equivalent in terms of the transitional impact on life. The younger adults and older adults are presented with thirty potential transitional events one at a time, and asked if they have experienced each personally. For the experienced events, participants briefly describe their experience and estimate their age at occurrence. For both experienced and unexperienced events, participants assess the importance, valence, prevalence, hypothetic age and transitional impact. The discrepancy between experienced and unexperienced events indicates that people's beliefs about life transitions are influenced by their personal experience.
Email: Liangzi Shi, liangzi@ualberta.ca

(2065)

Social Shaping of Emotional Autobiographical Memories. RAEYA MASWOOD, *Stony Brook University*, ANNE S. RASMUSSEN, *Aarhus University*, SUPARNA RAJARAM, *Stony Brook University* — People frequently engage in conversation about shared autobiographical events, particularly those with emotional significance. Although such discussions can influence the memory and emotions associated with the event, these potential consequences of collaborative remembering have not been studied systematically. We examined these consequences for a shared, real-life autobiographical event by asking students to recall their memory of taking a recent exam. Using the collaborative memory paradigm, we asked students to provide a group and/or personal narrative of the event. Students first recalled the event either collaboratively (C) or individually (I), followed by a final individual (I) recall by all. Valence ratings as well as the recalled details and emotional tone of the narratives converged to show that prior collaborative remembering regulated emotional valence, enhanced positive emotional tone, and increased recall of external details in memories. We discuss the role of collaborative remembering in shaping memory and emotion for autobiographical events.
Email: Suparna Rajaram, suparna.rajaram@stonybrook.edu

WORKING MEMORY II

(2066)

Part-Set Cuing and Strategy Congruence. SAMUEL D. CURRY and MATTHEW R. KELLEY, *Lake Forest College* — Leading explanations of part-set cuing inhibition and facilitation appeal to the idea that, when participants encode a set of information, they form individual retrieval plans for the upcoming test that may or may not be congruent with the part-set cues provided at test. When the cues are congruent with the encoded strategy, facilitation occurs; when they are incongruent, inhibition occurs. Past research has lacked precision when measuring and manipulating the congruence between these encoded retrieval plans and part-set cues. The present study sought to enhance this precision by requiring participants to encode a set of 25 words (5 rows of 5 items) using a serial chaining strategy for items within each row. We manipulated test congruence by varying the structure of the reconstruction test, as well as the presence or absence of cues at test. Generally, the results were consistent with the above predictions.
Email: Matthew Kelley, kelley@lakeforest.edu

(2067)

Distinctive Responding Protects Against Forgetting Associations: Role of Working Memory. VIVIAN I. SCHNEIDER, ALICE F. HEALY and CAROLYN J. BUCKGENGLER, *University of Colorado Boulder*, JAMES A. KOLE, *University of Northern Colorado*, IMMANUEL BARSHI, *NASA Ames Research Center* — In a continuous memory-updating paradigm, subjects studied name-location associations and were tested later for the location most recently associated with a given name. The default location responses were made on a map at one side of the display, but on designated trials the responses were made on a map at the other side of the display. Memory for the location associated with a given name was assessed after short and long retention intervals when both default and distinctive responses were required. Participants completed the task under conditions where working memory was or was not occupied with a secondary counting backwards task. Memory for the location associated with a given name was better overall with short than with long retention intervals and was better when distinctive (rather than default) responses were to be made, especially at the long retention interval, even when counting backwards was required. Thus, distinctive responding protects against forgetting associations, and this protection is not simply due to holding the information from the distinctive trials in working memory.
Email: Vivian I. Schneider, vicki.schneider@colorado.edu

(2068)

Evidence of Near Transfer Effects in Low Working Memory Capacity Individuals, Using Both Working Memory-Based and Non-Working Memory-Based Cognitive Training Tasks. JASON F. REIMER, *California State University, San Bernardino*, AARON R. SEITZ, *University of California, Riverside*, EUGENE H. WONG, VANESSA CARLOS, MEAGHAN R. ROMO, MINA S. SELIM, KEVIN ROSALES, CANDICE TAGGART, KRISTY RENDLER and GIA MACIAS, *California State University, San Bernardino* — Recent studies have examined the effectiveness of working memory (WM) training in young adults. Regarding far transfer effects, results have been inconsistent, with some studies finding evidence for far transfer effects (Au et al, 2015) and others finding no evidence (Melby-Lervåge et al., in press). In terms of near transfer, findings appear to be more consistent in providing evidence of positive training effects (e.g., Harrison et al., 2013; Melby-Lervåg et al., in press). The purpose of the present study was to extend these findings by examining whether near-transfer training effects can be found in individuals with low working memory capacity (WMC) using "gamified" versions of *n*-back and contrast sensitivity (adaptive control) training tasks. Participants were pre- and post-tested (and compared to a no-contact control group) on measures of WMC, cognitive control, and visual acuity. The results indicated that there was positive near transfer of training to measures of WMC with the *n*-back training group *and* the adaptive control group. These results provide evidence that both WM-based and non WM-based training tasks may be beneficial for individuals who possess deficits in WMC.
Email: Jason Reimer, jreimer@csusb.edu

(2069)

N-Back Versus Complex Span Working Memory Training. KARA J. BLACKER, SERBAN NEGOITA, JOSHUA B. EWEN and SUSAN M. COURTNEY, *Johns Hopkins University* — Working memory (WM) is the ability to maintain and manipulate task-relevant information in the absence of sensory input. While its improvement through training is of great interest, the degree to which WM training transfers to untrained WM tasks (near transfer) and other untrained cognitive skills (far transfer) remains debated. Here participants completed 10hrs of adaptive training on one of three tasks: dual n-back (n=24), symmetry span (n=25), or permuted rule operations (n=20; active control group). We found evidence of near transfer in all three groups; however, far transfer did not emerge. Both training performance (i.e., maximum level reached) and baseline task performance were significant predictors of near transfer gains, whereby higher training performance and lower baseline task performance were associated with greater near transfer gains. Counter to the "rich get richer" notion in cognitive training, our results suggest that individuals with low baseline WM can improve via training.
Email: Kara J. Blacker, kara.blacker@jhu.edu

(2070)

Individual Differences in Working Memory Training: A Data Mining Approach. SHAFEE MOHAMMED, *University of California Irvine*, BENJAMIN KATZ, *University of Michigan*, MARTIN BUSCHKUEHL, *MIND Research Institute*, SUSANNE M. JAEGGI, *University of California Irvine* — One's ability to perform, learn and improve at working memory (WM) intensive tasks is critically important for the success in school and complex cognitive activities across the lifespan. WM training has shown to lead to improvements in important cognitive tasks. One's performance on an adaptive and challenging longitudinal WM intervention may serve as an assay of cognitive plasticity. With over 400 participants having completed a minimum of15 sessions of WM training, we have a rich dataset that allows investigating individual differences and other factors that might determine training outcome. Preliminary results suggest that factors such as age, type of n-back, and baseline abilities significantly impact one's ability to improve in training. Other factors such as gender and whether or not training was supervised did not have a significant impact. Finally, our model allows prediction of training gain with 75% accuracy. (MB is employed at MIND Research Institute and SMJ has an indirect financial interest in the Institute.)
Email: Shafee Mohammed, shafeem@uci.edu

(2071)

Process-Specific Effects of Working Memory Updating Training. CARLA DE SIMONI, *University of Zurich*, CLAUDIA C. VON BASTIAN, *Bournemouth University* — Previous research yielded inconsistent findings regarding the effectiveness of working memory (WM) updating training, possibly caused by the variability in processes targeted by the training regimes. In this study, we therefore evaluated process-specific effects of updating training on maintenance, updating, and removal of WM contents, and whether such would generalize

to inhibitory control, task switching and mixing, and reasoning. Young adults were randomly assigned to the experimental or an active control group practicing visual search. Before and after five weeks of training, performance was assessed across 28 tasks measuring the cognitive processes and abilities of interest. Results showed that updating training had selective benefits for the maintenance of WM contents and the efficiency to rapidly update bindings, but not for the removal of no longer relevant information. Positive effects on other cognitive abilities were inconsistent at best, rendering the potential of this intervention to induce generalized improvements negligible.
Email: Carla De Simoni, carla.de.simoni@psychologie.uzh.ch

(2072)

Cognition Under Stress: The Impact of Social-Evaluative Stress During Cognitive Task Performance. DAVID B. SMITH, RACHAEL HUFF, GABRIELA PERALTA, KIMBERLY HERRON, SHAWN W. ELL and SHANNON K. MCCOY, *University of Maine* — The impact of acute stress on cognition has typically been investigated by examining how a stressor affects performance on a subsequent, unrelated task. In many real-world settings, however, it is common for a stressor to co-occur with, and be related to, task performance. The present experiment addresses this issue by developing a social-evaluative stressor that can be administered during task performance. Specifically, participants were either evaluated by others (i.e., nonverbal behavior and task performance), or not, while performing tasks dependent upon working memory (i.e., memory scanning) and rule-based learning (i.e., Wisconsin Card Sorting Task). For participants in the social-evaluation condition, a pattern of cardiovascular stress reactivity characteristic of thriving under stress was predictive of improved rule-based learning, but was unrelated to working memory. These results provide preliminary support for the use of a concurrent stressor and highlight the importance of considering variability in stress reactivity when investigating the stress-cognition relationship.
Email: David Smith, dsmit1728@gmail.com

(2073)

Testing Predictions of the Binding Pool Model. GARRETT S. SWAN and BRAD WYBLE, *Pennsylvania State University* — An important role of computational models is the development of testable predictions. Here, we tested predictions of the Binding Pool, a neurocomputational model of visual working memory. Prediction 1. Three repetitions of a color will be reported less precisely than a single color. However, we found subjects' responses had similar precision between three repetitions and a single color. Prediction 2. Two similar stimuli should bias the report of a third feature more than two dissimilar stimuli. To test this prediction, participants encoded three luminance values and we manipulated the similarity of two of them while asking for report of the third. However, we found similar responses regardless of the difference in luminance of the other two unreported items. Prediction 3. Swap errors in delayed estimation tasks should be high confidence responses. This prediction was supported using standard color-array reports with an explicit confidence query that allowed participants to report a confidence range. The failed predictions suggest the need for ensemble encoding in the memory encoding process.
Email: Garrett Swan, gsp.swan@gmail.com

(2074)

Domain-Specific and Domain-General Storage in Working Memory. KIM LYNN UITTENHOVE, *University of Geneva*, LINA CHAABI and VALÉRIE CAMOS, *University of Fribourg*, PIERRE NOEL BARROUILLET, *University of Geneva* — Several models of working memory (WM) assume that an attention-based domain-general mechanism stores both verbal and visuospatial information. Yet, a recent study by Fougnie, Zughni, Godwin, and Marois (2015) found no interaction between simultaneous auditory and visual WM loads, suggesting an intrinsically domain-specific storage in WM and questioning the existence of a domain-general system. However, these latter experiments relied on recognition tasks that could allow responses based on familiarity instead of genuine recollection as it could be expected if items were retrieved from WM. We therefore replicated Fougnie et al. experiments with a recall procedure requiring active maintenance of information. In line with the hypothesis of a domain-general storage system, we found systematic bidirectional interference between auditory and visual WM loads. Our findings suggest that how WM performance is assessed (i.e., recall vs. recognition) can bias the way we understand WM functioning and structure.
Email: Kim Uittenhove, kim.uittenhove@unige.ch

(2075)

False Recognition in Short-Term Memory May Be Due to Encoding Errors. FREDERIK AUST and CHRISTOPH STAHL, *University of Cologne* — False recognition of items and events is a robust phenomenon often accompanied by strong feelings of confidence (Brainerd & Reyna, 2005; Gallo, 2006). False memories can also be elicited in short-term memory, as shown recently with DRM lists (Coane, McBride, Raulerson III & Scott, 2007; Flegal & Reuter-Lorenz, 2014) and pictures of faces (Iidaka, Harada, & Sadato, 2014; van Vugt, Sekuler, Wilson, & Kahana, 2013). In Experiment 1, we extended previous research by demonstrating false recognition effects in short-term memory using categorical word lists and object photographs, and by showing that these effects can be accounted for by global matching models (specifically the generalized context model; Nosofsky, 1989), which model recognition performance based on inter-item similarities. In Experiment 2, we observed false recognition for photographs and words immediately following masked presentation of a single category exemplar. Taken together, our findings show that false recognition in short-term memory is a general phenomenon that can be explained, at least in part, by imperfect encoding of items into memory.
Email: Frederik Aust, frederik.aust@uni-koeln.de

(2076)

Working Memory Efficiency Modulates Proactive Interference After Sleep Deprivation. CORRADO CAVALLERO and LAURA RIONTINO, *University of Trieste* — Previous research show that sleep deprivation has no significant adverse effects

on some dissociated executive functions: working memory (WM) and resistance to proactive interference. The purpose of this study was to investigate how individual differences in WM efficiency may modulate resistance to proactive interference after sleep deprivation. 35 participants underwent two sleep conditions: Baseline and 24h Total Sleep Deprivation. The tasks included a modified Sternberg task to measure resistance to proactive interference and Jonides' "2-back" task to evaluate WM. Consistent with previous literature, we found no overall impact of sleep deprivation on these executive functions. However, when we divided the participants into two groups according to WM efficiency after sleep deprivation, participants with greater WM efficiency were more susceptible to proactive interference in the Sternberg task, while those with lower WM efficiency showed a level of resistance to proactive interference similar to Baseline. The present results indicate that better WM after sleep deprivation allows for greater proactive interference, highlighting the importance of individual differences in sleep deprivation studies.
Email: Corrado Cavallero, cavaller@units.it

(2077)

Examining the Effects of Studying With Music: Turn Off the Verbal Music, Unless You're Studying a Concept Map. KENNETH J. BARIDEAUX JR and PHILIP I. PAVLIK JR, *The University of Memphis* (Sponsored by Roger Kreuz) — The irrelevant sound effect (Salamé & Baddeley, 1982), refers to the disruption of serial recall in the presence of auditory sounds. One theoretical explanation for this finding asserts that auditory sounds gain obligatory access to the phonological store and the visually presented verbal items also enter through subvocal rehearsal, ultimately creating interference. Of question is whether concept maps help attenuate this interference. In this experiment, participants studied a concept map or text summary in the presence verbal or non-verbal music. Results indicated that participants who studied the concept map with verbal music performed significantly better on a free recall task compared to those who studied a text summary. This finding was particularly salient for those with low to moderate prior knowledge. These results suggest that studying a graphical representation (e.g., a concept map) in the presence of verbal music may reduce the amount of disruption of recall, which is likely due to the reduced interference in the phonological store.
Email: Kenneth Barideaux Jr, kjbrdaux@memphis.edu

(2078)

Memory, Learning, and Strategies for Visual Signals in Time and Space. SUJALA MAHARJAN, *Brandeis University*, JASON M. GOLD, *Indiana University*, ROBERT SEKULER, *Brandeis University* — We compared short-term visual memory for information presented spatially and for similar information presented temporally. On each trial, a set of random luminances was presented either sequentially at 8 Hz or simultaneously as a horizontal array. Subjects judged whether items in each half-stimulus matched corresponding luminances in the other half. Accuracy was higher with spatial than temporal stimuli, even when spatial arrays were presented for just tens of milliseconds. In a second experiment, without warning to subjects, particular stimulus exemplars recurred intermittently, interspersed amongst non-recurring stimuli. Accuracy with recurring stimuli improved steadily and at equivalent rates for spatial and temporal stimuli. Logistic regression examined ensemble representations that subjects may have employed. Reliance on particular representations changed with the duration of spatial stimuli. Importantly, for both spatial and temporal stimuli, task-irrelevant information extracted from individual successive stimuli cumulates over at least several minutes.
Email: Robert Sekuler, sekuler@brandeis.edu

(2079)

Inhibitory Effect of Orbit Frontal Cortex During Emotional Complex Span Task of Working Memory: An FMRI Study. MARIKO OSAKA, *Osaka University*, KEN YAOI, *Kyoto University*, TAKEHIRO MANAMOTO and MIYUKI AZUMA, *Osaka University*, NAOYUKI OSAKA, *Kyoto University* — Using fMRI, we measured the brain activation in two conditions: reading sentences and reading sentences while memorizing target words (complex span task). The sentences included three kinds of emotional valence: positively biased, negatively biased, and neutral (see Osaka et al., 2013, Scientific Reports). According to the fMRI results, during the single task conditions, increased activation of the right orbit frontal areas were found in both positive and negative sentences compared with neutral ones. During RST condition, however, no significant activation increase was found in both conditions. When we subtracted activation during the dual task from those of the single task of both positive and negative conditions, we found activation differences in the medial orbitofrontal cortex in both hemispheres.These findings suggest that activation in orbitofrontal areas was suppressed during complex span task performance, which leads executive control to modulate and inhibit the emotional content for working memory performance.
Email: Mariko Osaka, mosaka@hus.osaka-u.ac.jp

RECOGNITION I

(2080)

Attention and Recognition: The Effects of Perceptual Blurring and Attentional Boosting. TAMARA ROSNER and MITCH LAPOINTE, *McMaster University*, JAVIER ORTIZ, *Universidad de Granada*, BRUCE MILLIKEN, *McMaster University* — Perceptual interference produced by pattern masking during encoding can enhance subsequent memory performance (Nairne, 1988). In a recent study that may tap similar mechanisms, words that were blurred at encoding were recognized more accurately than words that were intact at encoding (Rosner, Davis & Milliken, 2015). Both effects suggest that an up-regulation of attention in response to perceptual interference may enhance memory encoding. The attentional boost effect (Swallow & Jiang, 2010) also implicates transient up-regulations of attention in memory encoding. In the present study, we examined whether perceptual blurring and attentional boost effects in recognition reflect the same underlying mechanism. If so, then the attentional boost effect ought to be larger for clear than for blurry words. We

observed both attentional boost and perceptual blurring effects on recognition, but no evidence for the above interaction, suggesting that distinct attentional mechanisms underlie these two effects.
Email: Mitch LaPointe, lapoimrp@mcmaster.ca

(2081)

Retrieval-Induced Forgetting of Non-Verbal Visual Objects. MASANORI KOBAYASHI, *Kwansei Gakuin University*, JUN KAWAGUCHI, *Nagoya University* — Remembering a memory can cause forgetting of related memories. This phenomenon is known as retrieval-induced forgetting. Previous studies have shown that retrieval-induced forgetting occurs for a variety of materials such as words, personal traits, and categorical visual objects. However, it remains unclear whether retrieval-induced forgetting of non-verbal objects is observed. Thus, the present study investigated this issue by three experiments. Participants engaged in a retrieval practice task for similar non-verbal shapes in experiments 1 and 2. As a result, we observed retrieval-induced forgetting of non-verbal shapes in experiment 1 and successfully replicated this results in experiment 2. Furthermore, experiment 3 showed the lack of retrieval-induced forgetting when retrieval practice was replaced as restudying. These results supported the retrieval specificity of retrieval-induced forgetting. Given present results, we suggest the generality of the memory control mechanism.
Email: Masanori Kobayashi, kobayashi@cogn.jp

(2082)

The Effect of Varying Presentation Time on Long-Term Recognition Memory for Scenes. FAHAD N. AHMAD, *Wilfrid Laurier University*, MORRIS MOSCOVITCH, *University of Toronto*, WILLIAM E. HOCKLEY, *Wilfrid Laurier University* — Studies have shown participants have an exceptional long-term memory (LTM) for photographs of scenes (Konkle et al., 2010). We examined to what extent this memory is determined by presentation time during encoding. At retrieval, the nature of the lures in a forced-choice recognition task was varied, so that they resembled the target in gist or category information, but were distinct in verbatim information (exemplar test) or were unrelated (novel test). In Experiment 1, we found lower performance for shorter study presentation time (1 vs 4 s) in the exemplar test condition and similar performance for both study presentation times in the novel test condition. In Experiment 2, participants showed similar results in an exemplar test for which the lure was from a different category but one that was used at study. Experiment 3 was identical to 1, but presentation time was lowered to 500 ms. Here recognition accuracy was reduced in both novel and exemplar test conditions. When presentation time is reduced sufficiently, a less detailed LTM representation of the studied scene is retrieved which contained more gist than verbatim information. We conclude that our findings support fuzzy-trace theory.
Email: Fahad N. Ahmad, ahma2720@mylaurier.ca

(2083)

The Fidelity of Visual and Auditory Memory. MICHELE E. GLOEDE, *University of Wisconsin-Milwaukee*, MELISSA GREGG, *University of Wisconsin-Parkside* — Recent studies show that recognition memory for various types of sounds is inferior to memory for pictures. The purpose of this experiment was to determine whether the difference in auditory and visual memory is a product of different absolute capacities or the nature of the memory representations. Participants received a study phase with pictures/sounds, followed by a recognition memory test. During the memory test, participants were presented with pictures/sounds that were *old* (presented during study), *new* (not presented during study), or *new within-category* (variants of objects presented during study). Participants were instructed to classify each picture/sound as "old" or "new" by pressing a corresponding key. The memory task revealed fundamental differences in visual and auditory memory: auditory representations are coarse and gist-based, while visual representations are more fine-tuned and detailed. The results make an important contribution to our understanding of how the world is represented in auditory and visual memory.
Email: Michele Gloede, megloede@uwm.edu

(2084)

Investigating Nonverbal Visual Recognition Memory: Evidence for a Within Hemisphere Advantage. ALESSANDRA K. MCDOWELL, *University of California, Riverside* (Sponsored by Christine Chiarello) — Several approaches to understanding lateralization of memory encoding and retrieval have been presented (Bergert, 2013; Kelley et al., 1998; Tulving et al., 1994), but are unable to provide a cohesive interpretation of left and right hemisphere specialization for various aspects of memory processing. The aim of the present study was to investigate hemispheric mechanisms for encoding and retrieval during visual recognition memory, while minimizing the influence of a leftward language processing asymmetry. Forty-eight right-handed subjects participated in a divided visual field recognition memory task, which implemented modified Chinese characters as non-verbalizable stimuli. Participants viewed a series of characters, randomly presented to either the left or right visual field during a study phase. They were asked in a subsequent test phase to determine if each item (presented to the same or opposite visual field) was old or new. The results indicated a within hemisphere advantage (e.g., encoding and retrieval initiated by the same hemisphere) for both accuracy and response time. These findings imply when there is no strong asymmetry for language, each hemisphere may be able to perform a recognition task equally well.
Email: Alessandra McDowell, amcdo007@ucr.edu

(2085)

Serial-Position Effects for Basic Tastes. THOMAS A. DANIEL, *Westfield State University*, JEFFREY S. KATZ, *Auburn University* — Primacy and recency effects have been found in vision, hearing, touch, and olfaction, but they have yet to be systematically studied in taste. Using a serial-probe recognition task, participants reported whether a probe liquid was or was not present in a list of three liquids. Liquids were

clear and odorless concentrations of salty, sweet, bitter, and sour solutions. Recognition for these liquids was above chance across varying probe delays (15, 30, 45, and 60 seconds). Recency effects were strongest at short delays, and primacy effects were strongest at longer delays. These findings show that memory for taste is, like vision and hearing, susceptible to interference. These data also show that multiple basic tastes can be held in working memory simultaneously, adding to our understanding of working memory for nonverbal information.
Email: Thomas A. Daniel, tdaniel16@gmail.com

(2086)

Modeling Memory Dynamics in Visual Expertise. JEFFREY ANNIS and THOMAS J. PALMERI, *Vanderbilt University* — Visual expertise is accompanied by increases in visual object recognition performance within the expert domain. In the present work, we use a computational modeling approach that relates visual expertise and visual recognition memory performance via formally described mnemonic processes. Participants with a range of birding expertise completed a recognition memory task and a standard task designed to provide a measure of visual expertise. Using expertise as a covariate, the Linear Ballistic Accumulator model (Brown & Heathcote, 2008) was fit to recognition performance and revealed visual expertise was positively correlated with drift rates. We then modeled the underlying processes giving rise to drift rates with the Exemplar Based Random Walk model (Nosofsky & Palmeri, 1997; Nosofsky et al. 2014) and found expertise to be associated with overall increases in memory strength and increases in the distinctiveness of stored exemplars.
Email: Jeffrey Annis, jeff.annis@vanderbilt.edu

(2087)

Recognition Memory, Similarity, and the 6-Second Response Deadline. MOLLY B. MORELAND and STEVEN E. CLARK, *University of California, Riverside* — Tulving (1981) showed that similar target-distractor recognition memory test pairs, *A-A'*, increase accuracy but decrease confidence relative to dissimilar target-distractor test pairs, *A-B'*, in which dissimilar *B'* distractors are similar to a studied-but-untested item, *B*. Tulving's participants were required to make their response within six seconds. In the present Experiments, participants were tested on *A-A'* and *A-B'* pairs of scenic photographs. Experiment 1, which required participants to respond within six seconds, replicated Tulving's *A-A'* accuracy advantage. Experiment 2 gave participants unlimited time to respond, which resulted in a small *A-A'* advantage that was only present for responses made within six seconds. An *A-B'* advantage emerged for responses made after six seconds. The results suggest that the well-established *A-A'* advantage may occur relatively early in processing, and may be enhanced by time-pressure. Further, the strategy and the type of information used to make memory-based decisions may change as response time increases.
Email: Molly B. Moreland, mmore010@ucr.edu

(2088)

A Hierarchical Bayesian Signal Detection Model for Confidence Ratings. HENRIK SINGMANN, *University of Zurich* — The unequal variance signal detection (UVSD) model is arguably the most prominent measurement model for separating memory and response processes in recognition memory. I present a hierarchical Bayesian version of the UVSD for confidence rating experiments employing the standard parametrization which fixes the lure distribution and freely estimates response criteria and old item distribution. I apply the model simultaneously to over 450 individual data sets from 12 experiments using 6-point confidence ratings (Klauer & Kellen, 2015, JMP) estimating one set of hyperparameters plus participant and experiment effects. In addition, I estimate the full correlation matrix of the parameters (using Klauer's, 2010, latent trait approach). The model provides a good account of the data and reveals that mu, sigma (both for old items), and the criteria locations are all positively correlated with each other.
Email: Henrik Singmann, singmann@psychologie.uzh.ch

(2089)

Implied Versus Actual Base Rates for Manipulating Response Biases in Recognition Memory. SIMONE MALEJKA and ARNDT BRÖDER, *University of Mannheim* — The experimental manipulation of response biases in recognition-memory tests—such as varying the actual base rate of old items—is an important means for comparing rival measurement models. Because extreme base rates always entail extreme ratios of old and new items, even minor changes in the response behavior can heavily affect the estimated model parameters. To avoid extreme ratios, some authors presented participants with 50% old items, but asked them to respond "old" in a different percentage of cases (e.g., 15%). We argue that these implied base rates lead to an inner conflict: Participants who recognize a moderate number of old items are compelled to respond "new" to items recognized as old. Our claim is supported by two empirical studies comparing implied to actual base rates followed by a post-experimental interview. The interview data clearly show that the majority of participants solve the conflict by ignoring their memory. The behavioral data show that recognition-memory performance was severely underestimated in the implied base-rate condition. We therefore strictly advice researchers against implying base rates, but to compensate for extreme old–new ratios by repeating study/test cycles with the same actual base rate.
Email: Simone Malejka, malejka@uni-mannheim.de

(2090)

Feelings of Familiarity: The Role of Visceral Feedback in Recognition Memory Judgments and Experiences. CHRIS M. FIACCONI, *University of Western Ontario*, ERIKA L. PETER, *Queen's University*, SAWAYRA OWAIS and STEFAN KÖHLER, *University of Western Ontario* — The present study examined whether bodily signals contribute to feeling states that pertain to recognition memory. Specifically, we asked whether visceral feedback arising from individual heartbeats informs such feelings. To investigate this issue, we employed a methodological approach that leverages phasic variation in

afferent visceral feedback occurring across the cardiac cycle (interval between heartbeats). Following exposure to novel faces during an encoding phase, we synchronized the presentation of test items in a recognition-memory task to distinct phases of the cardiac cycle to probe whether the difference in afferent signaling across these phases influences recognition memory decisions. As predicted, faces presented during cardiac systole (when visceral feedback is maximal) were more likely to be endorsed as 'old' relative to those presented during cardiac diastole (when afferent feedback is minimal). This pattern was present for targets and lures and held for both fearful and neutral faces. Using a Remember/Know procedure, we also found that this effect was specifically tied to feelings of familiarity. The current findings suggest that visceral information can inform feeling states that relate to memory experience.
Email: Chris M. Fiacconi, cfiacco@uwo.ca

(2091)

Examining Neighborhood Effects in Game-Based Passwords. CONOR T. MCLENNAN, SAMANTHA E. TUFT, SARA INCERA and PHILIP MANNING, *Cleveland State University* — Words with many similar sounding words (neighbors) are more difficult to recognize than words with fewer neighbors. We examined neighborhood effects in younger and older adults' recognition of game-based passwords. Participants viewed an assigned password (a Monopoly or chess board with four pieces) either in a block with neighbors (one piece changed) or non-neighbors (all four pieces changed). On each trial, participants used a computer mouse to indicate, as quickly and accurately as possible, whether or not the stimulus was their password. All participants were given two blocks, one with neighbors and one with non-neighbors, and all participants had both chess and Monopoly passwords. Our mouse-tracking data revealed that younger and older adults recognized Monopoly passwords less efficiently when presented in a block of neighbors than in a block of non-neighbors. These results further our understanding of neighborhood effects, and have important implications for graphical password systems.
Email: Conor T. McLennan, c.mclennan@csuohio.edu

(2092)

Recognition Memory of Visual, Audio, and Written Dialogue in Film. DEREK ELLIS and DONALD HOMA, *Arizona State University* — We recently demonstrated that recognition memory for individual, visual frames extracted from a cinema clip was accurate even when foils were taken from the same movie. Surprisingly, recognition accuracy was unaffected if the film was viewed in a jumbled, rather than coherent, order (Ferguson & Homa, 2016). In the present study, we explored recognition accuracy for spoken dialogue and written narrative as well, following presentation of a cinema clip in a coherent or jumbled order. Half the participants listened only to the audio of the same film. Following presentation, participants made recognition judgments to audio segments only, narrative segments only and, in the full condition, visual frames. The results showed enhanced recognition of audio and written narrative in full condition relative to audio-only, but again with little impact of jumbling in any condition. Results are addressed in terms of narrative processing generally and event boundary processing for naturalistic, temporally coherent events.
Email: Donald Homa, donhoma@asu.edu

(2093)

Differential Forgetting in Item Versus Source Memory Over a 1-Hour Delay: Perfect Maintenance of Source Memory, Even in Older Adults. BEATRICE G. KUHLMANN, *University of Mannheim* — The distinction between item and source memory (e.g., memory for a word vs. its screen position during study) is widely accepted and supported by dissociations such as greater age-related differences in source than item memory. However, few studies have compared item versus source forgetting over a delay or examined whether older adults' source-memory deficit extends to faster source forgetting. In the present study, 64 younger (18-30 years) and 64 healthy older adults (60-85 years) studied words on the screen's top or bottom. Either immediately or 1 hour after study, participants completed a source-monitoring test requiring recognition of studied words among distractors and screen-position attributions for all words claimed to have been studied. Multinomial model-based analyses revealed a significant decline in item recognition but stable source memory over the 1-hour delay. Despite the older participants' typical deficits in immediate item and source memory, forgetting/maintenance rates did not differ between age groups.
Email: Beatrice G. Kuhlmann, kuhlmann@psychologie.uni-mannheim.de

(2094)

Music as a Memory Enhancer for General Content Information. KATHERINE A. MOONEY, ANDREW R. SANTANA and REBECCA G. DEASON, *Texas State University* — Popular belief holds that setting information, such as the U.S. states, to a musical melody can improve memory for that information. Empirical studies examining this music-enhancing effect have been mixed, but Simmons-Stern et al. (2012) suggested that music might more effectively enhance memory for general content rather than more specific information. The current study extends these findings by examining whether musical encoding enhances recognition memory for pictures related to the general content of novel lyrics. First, participants listened to 100 novel lyrics (half spoken, half sung). In the subsequent test phase, participants made old/new judgments about 200 pictures (old: 100 pictures related to the lyrics heard previously, new: 100 unrelated pictures). Memory performance was significantly enhanced for pictures related to the sung lyrics compared to the pictures related to the spoken lyrics. These findings provide further evidence that music can be used to enhance memory for general content information.
Email: Rebecca G. Deason, rdeason@txstate.edu

(2095)

Recollection and Familiarity for Music in Patients With Alzheimer's Disease. JESSICA V. STRONG, *VA Boston Healthcare System*, MICHELLE J. TAT and SEAN FLANNERY, *Boston University School of Medicine*, REBECCA G. DEASON,

Texas State University at San Marcos, ANDREW E. BUDSON, *VA Boston Healthcare System* — Patients with Alzheimer's disease (AD) dementia have better memory for music compared to other materials, such as verbal information. However, this phenomenon is not well understood. The current study examined patients' memory for music using the dual process memory framework. A recognition memory paradigm was used in patients with mild AD dementia and in healthy older controls (OCs), across three conditions: instrumental, song (instruments and lyrics), and spoken lyrics. Confidence ratings were used to generate receiver operating characteristics (ROC), and estimates of familiarity and recollection. Both groups had higher memory discrimination in the spoken condition compared to all other conditions. OCs used more recollection in the spoken compared to the other conditions. Patients used less recollection and relied more on familiarity. Results suggest that memory for music in patients is complex, and improved memory for music may only be for specific types of melodies.
Email: Michelle Tat, mjtat@bu.edu

RECALL I

(2096)

Does Survival Processing at Encoding Help Older Adults Remember? MAEVE AXTELL, DANIELLA KIM, LINDSAY MCHUGH, MICHELLE OSNIS and LINA TRUONG, *Willamette University*, JUSTIN M. OLDS, *University of Lausanne*, JEREMY K. MILLER, *Willamette University* — The survival processing effect is the finding that information that is processed for its survival value is better remembered than information that has been processed through other encoding manipulations (Nairne, Thompson, & Pandeirada, 2007). Although the survival processing effect has been shown to be replicable and reliable in adult populations, there has been some debate regarding whether this effect is observed in older adult populations. We report the results of an experiment comparing older and younger adults on a survival processing task. Contrary to previous work (Stillman et al., 2013), our results demonstrate that the survival processing effect can be found in mentally active older populations. Further, we examined the self projection (Buckner & Carroll, 2007) abilities of our participants to determine whether self projection predicts the size of the survival processing effect. Overall, the results suggest that while aging does influence episodic memory, the survival processing effect is robust across age groups.
Email: Jeremy K. Miller, millerj@willamette.edu

(2097)

A Meta-Analysis of the Survival Processing Advantage. JOHN E. SCOFIELD, BOGDAN KOSTIC and ERIN BUCHANAN, *Missouri State University* (Sponsored by Russell Carney) — Studies have shown that processing words for survival value improved later performance on a memory test, which has significant adaptive value (Nairne, Thompson, & Pandeirada, 2007). The purpose of this project was to conduct a meta-analysis to review literature regarding the survival processing advantage, and to perform a synthesis of data to more clearly understand this phenomenon. The average effect size for experiments was $\eta^2 = 0.07$, 95% CI [0.069, 0.073]. *Post hoc* Statistical power was estimated for each study, which was .57. We also found evidence of publication bias across studies. These results suggest the need to reevaluate the robustness of the survival processing advantage. Even though these effects have been repeatedly replicated, many of these studies may be underpowered.
Email: John Scofield, John1551@live.missouristate.edu

(2098)

Induced Forgetting Is Not Affected By Phasic Alertness. MARIA JESUS MARAVER and CARMEN AGUIRRE, *University of Granada*, CARLOS J. GOMEZ-ARIZA, *University of Jaen*, MARIA TERESA BAJO, *University of Granada* — Inhibitory mechanisms relying on executive control seem to mediate Retrieval-Induced Forgetting (RIF). Thus, the RIF effect appear to diminish when participants engage in secondary tasks that overload executive control (Román et al., 2009). Attentional research has shown subtle interactions between alerting and executive control (Callejas et al., 2004) that may also be important for memory retrieval. In two experiments, we explored the relationship between alertness and inhibitory control during memory retrieval. In both experiments phasic alertness was manipulated within participants (young adults in Experiment 1 and older adults in Experiment 2) by presenting a tone before half of the category cues during retrieval practice. Results revealed significant RIF effects for both alertness and control conditions in the two experiments. In addition, we observed retrieval facilitation as a function of practice that was also independent of the alert signals. Our results suggest that memory retrieval and interference control are not modulated by phasic alert.
Email: Maria Jesus Maraver, mjmaraver@ugr.es

(2099)

Impact of Emotion on Recall Dynamics in the Presence of Interference. EDA MIZRAK and ILKE OZTEKIN, *Koc University* — Presence of interference in the retrieval context is a major cause of forgetting. Recently, we showed that emotion modulates forgetting due to interference over short periods of time (Mizrak & Oztekin, 2016). We extended this research by studying longer periods of time in a free recall setting. More specifically, we manipulated the presence of interference in a free recall paradigm by introducing two study lists consisting of both neutral and emotional (highly arousing) words. In the test phase, participants were asked to recall words from only one of the lists. We then modeled the full time course of recall using cumulative recall functions which allowed us to examine the impact of emotion on retrieval over longer periods of time. Our findings indicate that arousal is used as a shared feature among emotional items, which led to worse recall performance and more intrusions when both target and distractor lists are from emotion category compared to its neutral counterparts. Additionally, arousal spillover to encoding of neutral lists fastened retrieval speed parameters, while arousal spillover to retrieval of neutral lists slowed them down.
Email: Eda Mizrak, edamizrak@gmail.com

(2100)

Multinomial Estimates of Memory Processes in Healthy Aging and Alzheimer Dementia. PETER R. MILLAR and DAVID A. BALOTA, *Washington University in St. Louis*, ANTHONY J. BISHARA, *College of Charleston*, LARRY L. JACOBY, *Washington University in St. Louis* — Process dissociation estimates reveal deficits of recollection in healthy aging and in Alzheimer dementia (AD). In some tasks, these estimates may be contaminated by a capture process, a relatively early susceptibility to an interfering response before initiating recollection. Capture can be estimated using multinomial process tree (MPT) modeling. In the current study, participants incidentally encoded word pairs ("KNEE-BONE"). They then completed an explicit, cued fragment completion memory task ("KNEE-B_N_") with primes that were congruent ("BONE"), incongruent ("BEND"), or neutral ("&&&") with the correct response ("BONE"). MPT models indicated that both aging and AD were associated with increased likelihood of capture, decreased likelihood of recollection, and no change in accessibility bias. AD, but not aging, was associated with decreased word generation. These results suggest that although changes in capture and recollection may contribute to memory deficits in healthy aging and AD, change in word generation may be unique to AD.
Email: Peter R Millar, pmillar@wustl.edu

(2101)

Evidence for a Synesthetic Von Restorff Effect. KYLE A. PETTIJOHN and G. A. RADVANSKY, *University of Notre Dame* — Grapheme-color synesthesia is a condition in which one experiences certain colors with particular letters. Previous work has found that synesthetes have better overall memory for word lists, but they are less likely to show a von Restorff effect. The aim of the current experiment was to explore the possibility of a synesthetic von Restorff effect. Twenty synesthetes were presented lists of nouns based on their synesthetic experiences. Lists were constructed such that each word began with letters associated with similar colors, while the singleton began with a contrasting color (e.g., words that began with shades of blue and a singleton that began with red). Each synesthete's list was presented to 12 control subjects. Overall, synesthetes recalled more words than the controls, and both groups recalled singletons at a higher rate than other words. A significant Group (synesthete/control) x Word Type (singleton/other) interaction showed that the effect was larger for the synesthetes, $\eta^2_p = 0.44$, than the controls, $\eta^2_p = 0.06$. This suggests that synesthetic experience can aid later recall.
Email: Kyle Pettijohn, kpettijo@nd.edu

(2102)

Effects of Self-Pacing and Effortful Listening on Passage Recall for Older and Younger Adults. ERIKO ATAGI, EMILY COHEN, MAXIM A. BUSHMAKIN and ARTHUR WINGFIELD, *Brandeis University* — Increased perceptual effort due to hearing loss negatively affects listeners' comprehension and recall of speech—even when the words are audible (e.g., McCoy et al., 2005). Allowing listeners to self-pace through passages, however, can serve as a compensatory strategy for young adults with hearing loss (Piquado et al., 2012). The present study examines this effect of self-pacing in both young and older adult listeners when passages are presented at easy- or hard-to-hear levels. Each listener heard four passages: two presented at +10 dB from the listener's speech reception threshold and two at +25 dB. Passages played either continuously from beginning to end, or with pauses after each sentence allowing listeners self-paced through the passage. After each passage, listeners recalled the passage with as much detail as possible. Listeners' recall was analyzed for degree of detail recalled, using propositional analysis and semantic models including latent semantic analysis.
Email: Eriko Atagi, eatagi@brandeis.edu

(2103)

Testing Effects on Proactive and Retroactive Interference in the A-B/A-C Paradigm. STEPHANIE C. CROCCO and JAMES H. NEELY, *University at Albany, State University of New York* — We assess how testing A-B and/or A-C Swahili-English pairs affects both proactive interference (PI) and retroactive interference (RI) in an A-B/A-C paired-associate paradigm when both B and C responses are to be recalled to the A cues in a final test. We included a restudy control condition and D-B, E-C control pairs to establish that testing effects (TEs) and interference effects occurred. No TEs occurred for A-C testing. Relative to restudying A-B pairs, testing them produced a negative TE for A-B recall and a positive TE for A-C recall. However, when control-pair TEs were taken into account, A-B testing did not affect PI and actually increased RI relative to the retroactive facilitation observed for restudied A-B pairs. Our results provide insights regarding how testing affects encoding and retrieval in the A-B/A-C interference paradigm and highlights the need for proper control conditions when evaluating how testing affects interference.
Email: Stephanie C. Crocco, scrocco@albany.edu

(2104)

Memory as Discrimination: Increasing Encoding Retrieval Match Can Lead to Reduced Accuracy. MARIE POIRIER, *City University London* — Many would agree that retrieval from memory requires that the retrieval information elicit the recall target *and* allow the rememberer to reject other potential candidates (e.g. Neath & Capaldi, 1995). In other words, a cue's efficiency is a function of its discrimination power — It must allow one to separate the wheat from the chaff of memory. Nairne (2002, 2005) championed this view insisting that one of its implications is that encoding-retrieval match (ERM) cannot be considered to be in any way causally related to retrieval. However, ERM is widely called upon to interpret a variety of findings (see Poirier et al, 2015). The strongest prediction put forward by Nairne's portrayal of memory-as-discrimination is that an increase in ERM can lead to a drop in recall performance. Poirier et al (2015) did report evidence to this effect, but they relied on response times instead of more typical accuracy measures. Supporting the prediction when accuracy is called upon has proven to be an elusive goal (e.g. Goh & Lu, 2012). The study reported here revisited this issue through a new task. It involved learning word-pairs on a

background image that had to be processed as part of the task. Testing involved the first word of each pair as a cue, either alone or with the background presented at study. The findings provide a clear demonstration that increasing ERM can lead to a drop in performance when the increase involves a cue that has been associated with multiple targets.
Email: Marie Poirier, m.poirier@city.ac.uk

(2105)

How Sleep Affects Relearning and Long-Term Retention: Age Matters. EMILIE GERBIER, *Universite Nice Sophia Antipolis*, STEPHANIE MAZZA, *Universite Lyon 2*, THOMAS C. TOPPINO, *Villanova University* — In young adults, sleeping after learning has been shown to facilitate relearning and long-term retention, compared to staying awake (Mazza et al., in revision). Children (aged 8) and elderly people (aged 71) learned Swahili-French word pairs to criterion during a learning session taking place in the morning or evening (Wake and Sleep group, respectively). Participants spent 12 hours filled with wakefulness or a night of sleep, then performed a relearning session to criterion either in the evening (Wake) or the following morning (Sleep). One week later, retention was tested. Sleep appeared to affect memory differently according to age. The groups of children did not differ during the relearning session whereas the Sleep outperformed the Wake group after one week. In elderly participants, no effect of sleep was observed. Thus, the enhancing effect of sleep is most pronounced in adults, moderate in children, and weak in elderly people.
Email: Emilie Gerbier, emilie.gerbier@unice.fr

(2106)

Adaptive Memory: The Mnemonic Value of Contamination. NATÁLIA L. FERNANDES and JOSEFA N. S. PANDEIRADA, *University of Aveiro*, JAMES S. NAIRNE, *Purdue University*, SANDRA C. SOARES, *University of Aveiro* — Memory is "tuned" to remember information processed in fitness-relevant contexts (e.g., survival and reproduction). Accordingly, disgusting and disease-relevant stimuli are better retained than neutral-looking stimuli. This study investigates memory for objects touched by sick people. Objects were presented with the faces of people who touched and interacted with them; some of the faces were manipulated to contain cues indicative of contagious diseases; others contained no such cues. In Experiment 1, the altered faces were described as sick people and in Experiment 2 they were described as actresses who were playing patients in a TV-show. The encoding task was followed by a surprise free recall task for the objects. In Experiment 1 objects "touched" by "sick" people were remembered better than those touched by healthy people. In Experiment 2, no difference was found. These results reveal adaptive memory functioning as it promotes the retention of potential contaminants.
Email: Josefa N. S. Pandeirada, josefa@ua.pt

FACE PROCESSING

(2107)

Aging and Associative Recognition for Faces and Other Things. SHEILA R. MELDRUM and MITCHELL A. MELTZER, *The University of Texas at Dallas*, JOSHUA A. ARDUENGO, *Collin County Community College*, JAMES C. BARTLETT, *The University of Texas at Dallas* — Face recognition studies have found that young adults exceed older adults in distinguishing old from new faces, but not in distinguishing old faces from *conjunctions*—recombinations of parts of old faces. A possible explanation is that, due to holistic processing, conjunction faces are perceived as less familiar than old faces, and therefore old/conjunction discrimination is based on an age-invariant familiarity process. We addressed the contributions of familiarity and recollection in old/conjunction discrimination with faces as well as visual patterns and pseudo-compound words. With patterns and pseudo-words, old/conjunction discrimination was higher when the recognition instructions were to reject conjunctions than when they were to accept conjunctions along with old items. With faces, however, the instruction effect was absent, supporting familiarity-based recognition. Older participants performed more poorly with all three stimuli, suggesting age-related deficits in associative recognition can extend to faces under some conditions, even when familiarity is the basis for performance.
Email: Sheila Meldrum, sheila.meldrum@utdallas.edu

(2108)

Survival Processing of Face Memory. MEHMET GUNAL (Graduate Travel Award Recipient), HERVE ABDI and JAMES C. BARTLETT, *University of Texas at Dallas* — The mnemonic benefit of survival processing for words and objects is well established (Nairne, Thompson, & Pandeirada, 2007). However, a recent study suggests that the effect does not extend to faces (Savine, Scrullin, & Roediger, 2011). Here, we examined in two experiments whether survival processing improves face recognition when the recognition task requires recollection of contextual information about previously studied faces. In these experiments, participants viewed a set of faces that they rated for friendliness followed by a second set of faces that they rated for helpfulness in a survival related scenario or a control scenario. In the subsequent tests, we asked our participants to recognize faces from the helpfulness and friendliness rating tasks and reject new faces they had not seen before. We also asked our participants to recollect whether they have seen the face during the friendliness or helpfulness rating task, or neither. The results indicated that a survival processing advantage can be obtained with faces if the recognition task requires recollection of which rating task they have seen the face.
Email: Mehmet Gunal, mehmet.gunal@utdallas.edu

(2109)

Effects of Head Nodding and Shaking Motions on Perceptions of Likeability and Approachability. TAKAYUKI OSUGI, *University of Tokyo*, JUN I. KAWAHARA, *Hokkaido University* — Previous studies demonstrated that a tilting motion of portraits, simulating bowing, enhanced perceived physical attractiveness

(e.g., Osugi & Kawahara, 2015). Assuming that head nodding (and shaking) motions by a model would prime social signals of approval (and rejection), such motions may moderate perceived impressions (i.e., attractiveness, likability, and approachability) of model faces. The present study examined the effects of models' head nodding and shaking motions on perceived impressions by using movie clips of computer-generated three-dimensional female figures. The results indicated a robust positive effect of nodding. Specifically, the mean perceived likability and approachability of the nodding model were significantly higher relative to those of the head shaking and control (immobile) models. Additional experiments revealed that the nodding motion mainly increased likability attributable to personality traits rather than to physical appearance. These results suggest that nodding enhances perceived likeability by activating approach-related motivations.
Email: Takayuki Osugi, tosugi2010@gmail.com

(2110)

Active Affective Priming Produced by Both Words and Faces. DEAN G. PURCELL, *Oakland University*, ALAN L. STEWART, *Stevens Institute of Technology* — We found that Active Affective Priming produces interference effects under conditions that rely on working memory. An observer is presented two successive visual stimuli, the onset of the second stimulus (an emotional face) follows the offset of the first stimulus (an emotional face or word). The observer is required to judge if the two stimuli represent the same emotion. With typical priming tasks, and with stimuli that do not represent emotions, responses are shorter when the first and second stimuli are related. With our task response times are longer, and errors are more frequent, when an angry first stimulus is followed by an angry second stimulus. We have found this anger inferiority effect with stimulus intervals ranging from 300 out to 1,200 ms. Here we report that anger inferiority does not dissipate even when the second stimulus follows the offset of the first stimulus by 5,000 ms.
Email: Dean G. Purcell, purcell@oakland.edu

(2111)

Modeling Face-Type and Threat: Biased Decision Making in Expression Interpretation. SARAH WILLIAMS, *University of Central Florida*, ALESHA BOND, *Georgia State University*, COREY BOHIL, *University of Central Florida*, HEATHER KLEIDER-OFFUTT, *Georgia State University* — Prior research indicates stereotypical Black faces (e.g., wide nose, full lips) are often associated with crime and violence (Kleider, Cavrak, & Knuycky, 2012). In the current study, we investigated whether a stereotypical face may bias the interpretation of facial expression. Specifically, would stereotypical faces be judged as threatening? Faces were pre-rated in a separate study for level of stereotypicality and expression, and then divided into four categories: stereotypicality (high, low) and expression (neutral, threatening). We applied decision-bound theoretic analysis to explore perceptual and decisional interactions between the two dimensions. We found evidence for integration of perceptual dimensions. Stereotypical faces tended to be seen as more threatening than non-stereotypical faces. This was true for images depicting a neutral expression as well as for images displaying a threatening expression. This pattern held across participant gender and ethnicity. Overall results suggest that stereotypical faces are interpreted as threatening relative to non-stereotypical faces.
Email: Heather Kleider, hoffutt@gsu.edu

(2112)

The Persistence of the Low-Prevalence Effect in Unfamiliar Face-Matching. MEGAN H. PAPESH, LAURA L. HEISICK and KARYN WARNER, *Louisiana State University* — In visual search, rare targets are often undetected, a phenomenon called the "low-prevalence effect" (LPE; Wolfe et al., 2005). Target prevalence similarly affects unfamiliar face matching, such that observers fail to detect infrequent identity mismatches; this is reflected by conservative criterion shifts (Papesh & Goldinger, 2014). Across three experiments, observers made identity match/mismatch decisions to pairs of faces in four 50-trial blocks, maintaining mismatch prevalence at 10%. Between blocks 2 and 3, observers completed a mini-block of trials with mismatch frequency at 75% or higher, and in some conditions, those mismatches were also relatively salient (obvious). In each experiment, the LPE developed by the second block, and manifested as conservative criterion shifts in the absence of changes in sensitivity. Mini-blocks of high-prevalence training did not change performance; observers' criteria grew more conservative with repeated experience. Overall, these results suggest the LPE in face matching is robust and difficult to overcome.
Email: Megan Papesh, mpapesh@lsu.edu

(2113)

Like Father, Like Son: Stereotypical Facial Features in Children and the Loss of Innocence. ALESHA D. BOND and HEATHER KLEIDER-OFFUTT, *Georgia State University* — Research suggests that stereotypically Black facial features (e.g. broad nose, full lips) in adults are associated with criminality more so than atypical Black features. The goal of this present research is to investigate whether these heuristic biases associated with Black stereotypical face-types extends to Black child faces. Participants viewed groups of pre-rated child faces (i.e., stereotypically or atypically Black) paired with positive or negative class roles (i.e., peer mentor, troublemaker) and after distraction, were asked to recall the role each face was originally paired with. Participants also made punishment judgments (i.e., suspension, expulsion) for pre-rated school disturbances (i.e., cheating, pushing another student, etc.) as well as completing a dehumanization implicit association test. Preliminary results suggest, after controlling for attractiveness and age, stereotypical child faces are significantly more stereotypical than atypical faces and stereotypical child faces are more likely to be mis-categorized into negative roles compared to atypical faces.
Email: Alesha Bond, abond4@student.gsu.edu

ATTENTION: CAPTURE II

(2114)

Capture and Control: Counterproductive Nonspatial Attentional Capture by Task-Irrelevant, Reward-Related Stimuli. MIKE E. LE PELLEY, DANIEL PEARSON and STEVEN B. MOST, *University of New South Wales* — Visual search tasks show that neutral stimuli that have previously been paired with large monetary reward are more likely to capture our attention than those that have been paired with small reward. This *value-modulated attentional capture* (VMAC) effect demonstrates that reward learning can influence spatial selection of stimuli. We will describe recent studies using a Rapid Serial Visual Presentation procedure which shows that reward also influences *nonspatial* capture of attention, even when this is directly counterproductive to our goals and intentions. These studies build on showing nonspatial VMAC by stimuli that are only ever presented as distractors, and hence are always task-irrelevant. Subsequent evidence suggests that the size of the nonspatial VMAC effect is influenced by both automatic (capture) and goal-directed (control) processes: given sufficient motivation and information, participants are able to use cognitive control processes to overcome the effect of reward on capture.
Email: Mike Le Pelley, m.lepelley@unsw.edu.au

(2115)

Computational Modeling of Auditory Spatial Attention. EDWARD J. GOLOB, JAELLE SCHEUERMAN, MAXWELL T. ANDERSON, JEFFREY R. MOCK and KRISTEN B. VENABLE, *Tulane University* — The focus of auditory attention is the product of top-down and bottom-up influences. We are developing a computational model to examine these dynamics. The three main modules include a top-down goal map (GM), a bottom-up saliency map (SM). Both are inputs to a priority-map that generates attentional bias in the frontal horizontal hemispace (180°, 2° increments). Subjects (n=42) heard most sounds from a standard location (-90°, 0°, or +90°), but sounds occasionally shifted to another location. Reaction time increased for small shifts from the standard but decreased for larger shifts. A simple attention gradient (GM only) did not account for the behavioral data, and there was a left-to-right asymmetry in the extra SM contribution. The model also captured a subtle contraction of the extent of GM and SM in the 0° vs. ±90° standards, which may reflect scaling of the GM and SM to the range of available stimulus locations.
Email: Edward Golob, Edward.Golob@utsa.edu

(2116)

Learning to Attend and Ignore: Opposing Influences of Reward Learning on Attentional Capture and Suppression. DANIEL PEARSON, *University of New South Wales,* GEOFFREY HALL, *University of York*, MIKE E. LE PELLEY, *University of New South Wales* — Recent studies have demonstrated that pairing a stimulus with high-value reward increases the extent to which it will involuntarily capture attention. We have shown that this *value-modulated attentional capture* (VMAC) effect holds when attending to the reward-associated stimulus has never been task-relevant, in that orienting to the stimulus results in omission of the reward that would otherwise have been received. This finding suggests that attentional selection is automatically influenced by the signalling relationship between the features of a stimulus and reward magnitude. Recently, we have shown that this VMAC effect is immune to volitional cognitive control, in that it persists even if participants are explicitly informed of the omission contingency embedded in the task. However, we will present new evidence that *training* on the task allows participants to dampen the VMAC effect, without reversing it completely. This suggests an opposing influence of reward learning on attentional capture and suppression processes.
Email: Daniel Pearson, d.pearson@unsw.edu.au

(2117)

Can Associative Learning Undermine Top-Down Induced Task Preparation in Selective Visual Attention? ANNA SCHUBÖ and HANNA KADEL, *Philipps University Marburg*, TOBIAS FELDMANN-WÜSTEFELD, *University of Chicago* — Selective attention assigns priorities to stimuli in the visual world. Recent work has shown that learning has a substantial impact on selection in addition to bottom-up and top-down control. We examined how associative learning and top-down control work together in deciding where to attend and whether associative learning effects are modulated by top-down control. We induced associative learning by a categorization learning task which was combined with an additional singleton search task in the same experiment. Top-down control was enabled either by a task cue or by complete predictability of a continuous task sequence. Event-related potentials and behavioral performance measures served as indicators of attention deployment. RTs and ERPs for distractors congruent to observers' learning experience indicated a learning-induced attention bias in the search task which was modulated by preparatory top-down control, but never entirely overruled. These results show that learning experience considerably shapes attention deployment and can undermine preparatory top-down efforts.
Email: Anna Schubö, schuboe@uni-marburg.de

(2118)

Effects of Perceptual Load on a Simon Task. HIDEYA KOSHINO, DAVID BUITRON and HYE JI KIM, *California State University, San Bernardino* — Perceptual load (PL) hypothesis claims that PL determines the locus of attentional selection. We investigated whether the PL effect can be generalized to other interference tasks, such as a Simon task. Participants performed a discrimination task with three levels of PL (No, Low, and High PL). Four stimuli were arranged in a horizontal fashion, and a target appeared at a near or far location from the fixation. In our previous study with a letter discrimination task, we found Simon effects for the No PL and Low PL, but not for High PL condition. Here, we used a color discrimination task, and basically replicated our previous results, that there were Simon effect for No and low PL regardless of stimulus distance from the fixation. However, there

was a Simon effect for high PL for the far condition. The results suggest that stimulus discriminability affects the magnitude of the Simon effect.
Email: Hideya Koshino, hkoshino@csusb.edu

(2119)

Task Load Determines Awareness of Touch. SANDRA MURPHY and POLLY DALTON, *Royal Holloway, University of London* — The inattention literature investigates the links between attention and awareness, demonstrating that salient information can go unnoticed when attention is focused elsewhere. These findings have been reported in both the visual and the auditory modalities. Here, we present the first robust demonstration of an equivalent phenomenon in touch – inattentional numbness. We manipulated task load in tactile target discrimination tasks and investigated awareness report of an additional tactile stimulus as a function of load. This stimulus was either completely unexpected and awareness was measured straight after it occurred (Experiment 1) or it was presented with high frequency and its presence or absence was probed on every trial (Experiment 2). We consistently found a reduction in awareness report of the tactile stimulus with increased task load in the main tactile task. These findings suggest that the occurrence of inattentional numbness depends on the load of the relevant task.
Email: Sandra Murphy, sandra.murphy@rhul.ac.uk

(2120)

Do Dilated Pupils Orient Attention? GEOFF G. COLE and ANTONIA D'SOUZA, *University of Essex*, PAUL A. SKARRATT, *University of Hull* — It is now well established that an observer's attentional processes can influence pupil size, and pupil dilation is often used as an index of attention. For instance, a stimulus of interest typically induces dilation. However, whether (and how) the observation of other people's pupils influences an observer's attention has not yet been examined. The present paper presents a summary of nine experiments using standard attentional/orienting paradigms (e.g., gaze cuing, flanker task) together with manipulations of pupil size. Overall, we find that when dilated pupils do shift attention, this effect is no greater than control conditions in which large as opposed to small round discs shift attention. These findings suggest that although dilated pupils can modulate attention, there is nothing particularly special about pupil dilation per se.
Email: Geoff Cole, ggcole@essex.ac.uk

(2121)

Neural Markers of Suppression of Irrelevant Information From Working Memory. TOBIAS FELDMANN-WÜSTEFELD and EDWARD K. VOGEL, *University of Chicago* — In order to efficiently process incoming visual information, selective attention acts as a filter that enhances relevant and suppresses irrelevant information. In this study we used an event-related potential (ERP) approach with systematic lateralization (Hickey et al., 2009) to investigate enhancement and suppression during encoding of information into visual Working memory (WM) separately. We used a change detection task in which observers had to memorize some items while ignoring other items. We found that the amplitude of the PD, reflecting active suppression, increases with distractor load and with the ability to group distractors according to Gestalt principles. This suggests that the PD can be used as an indicator of how efficiently items can be suppressed from entering WM. Furthermore, while lateral memory-targets elicited a 'traditional' CDA (starting ~300 ms), lateral memory-distractors elicited a sustained positivity contralateral to memory-distractors (CDAp, starting ~400 ms), but only if memory-target load was sufficiently low. In sum the results suggest that inhibition of irrelevant information is an important factor for efficient WM and is reflected in spontaneous (PD) and sustained suppression (CDAp).
Email: Tobias Feldmann-Wüstefeld, tobiasfw@uchicago.edu

COGNITIVE CONTROL II

(2122)

Response Speed and Response Force in the Simon Effect. AKIO NISHIMURA, *Yasuda Women's University*, KAZUHIKO YOKOSAWA, *University of Tokyo* — Reaction times (RTs) are faster when a stimulus and a response are on the same side (compatible trial) than when they are on the opposite side (incompatible trial), even when the stimulus position is irrelevant to the task (Simon effect). The present study investigated response force (RF) as well as RT in the Simon effect. Participants made left or right speeded response based on the shape of the target appearing at left or right side of the screen. The Simon effect in RTs showed decreasing function across RT bins, whereas no RF difference was obtained between compatible and incompatible trials across RT bins. Sequential analysis revealed partial repetition cost in RTs. On the other hand, RF was enhanced by each feature repetition independent of the other feature repetition. The findings indicate that response speed and response force are measures that reflect different aspects of cognitive control.
Email: Akio Nishimura, nishimura-ak@yasuda-u.ac.jp

(2123)

Is Conflict Induced Filtering Responsible for Location-Specific Cognitive Control? BLAIRE J. WEIDLER and JULIE M. BUGG, *Washington University in St. Louis* — Proportion congruency (PC) can be manipulated in a list-wide or location-specific manner: flanker interference is reduced in the list or location of space associated with more conflict. By interspersing visual search trials amongst flanker trials in a list-wide PC paradigm, recent research demonstrated that *conflict induced filtering* (CIF) is a mechanism underlying list-wide PC effects. Our goal was to examine if this mechanism also supports location-specific PC effects. First we replicated the CIF effect–relatively slower RTs for search targets appearing in the region of the flankers (versus the central region) in the MI list–in a list-wide PC paradigm in which flanker stimuli appeared unpredictably in two locations. Experiment 2 was similar but location-specific PC was manipulated. The evidence for a CIF effect was limited to the second half of the task and to participants who demonstrated a location-specific PC effect in that half. Theoretical implications will be discussed.
Email: Julie Bugg, jbugg@wustl.edu

(2124)

Flanker Congruency Effects Can Be Completely Determined By Observer's Expectations. ROTEM AVITAL-COHEN and YEHOSHUA TSAL, *Tel Aviv University* — In a modified flanker task **S** and **4** were mapped onto one response and **F** and **5** onto another. Ambiguous characters that could be perceived as either the letter **S** or the digit **5** were presented as distractors, embedded in different conditions among either unambiguous letter or digit distractors. When expecting letter distractors, the ambiguous character was perceived as **S**: It behaved as a congruent distractor (short RTs) when the target was **S** or **4**, and as an incongruent distractor (long RTs) when the target was **F** or **5**. When expecting digits, the ambiguous character was perceived as **5**, producing the opposite pattern. Thus, the exact same displays produced either congruent or incongruent responses, depending on expectation. These results strengthen our previous conclusions (Avital-Cohen and Tsal, 2016) that participants apply top-down processing to distractors independently of that applied to targets, suggesting that distractors are processed very similarly to the target.
Email: Rotem Avital-Cohen, rotemav1@post.tau.ac.il

(2125)

Keep Flexible - Keep Switching. KERSTIN FRÖBER and GESINE DREISBACH, *University of Regensburg* — In voluntary task switching (VTS) participants typically show a bias towards repetitions, especially so when they are absolutely free to choose between both tasks. Here, we present a VTS experiment (122 participants in a between subjects design) with such unrestricted task instructions. The critical manipulation was the proportion of forced task choices (repetitions and switches) and free choices: Participants were free to choose a given task on 75 %, 50 %, or 25 % of all trials. Results show that the voluntary switch rate increases with increasing forced choices. This suggests that a context of frequent (forced) switches changes global meta-control parameters towards more flexible behavior.
Email: Kerstin Fröber, Kerstin.Froeber@psychologie.uni-regensburg.de

(2126)

Sensitivity to Perceptual Similarity Is Associated With Greater Sustained Attention Ability. DAVID ROTHLEIN, *VA Boston Healthcare System*, JOSEPH DEGUTIS, *Harvard Medical School*, MICHAEL ESTERMAN, *Boston University School of Medicine* — We explored the relationship between perceptual processing and sustained attention ability by having a large web-based sample (N>20,000, testmybrain.org) perform the gradual onset continuous performance task (gradCPT). Participants were instructed to respond to frequently presented non-target cities (90%, 10 exemplars) and withhold to rare target mountains (10%, 10 exemplars). The images gradually transitioned from one to the next every 800ms. We assessed which city exemplars were most "mountain-like" and which mountain exemplars were most "city-like". We predicted that RTs for city images that were more "mountain-like" would be slower and "city-like" mountain images would be more prone to erroneous button presses. The results were consistent with our predictions. Notably, individuals who displayed greater sustained attention ability were more likely to be influenced by stimulus similarity, suggesting enhanced perceptual processing is associated with greater sustained attention ability. Ultimately, stimulus similarity provides a new means to explore perceptual processing during sustained attention.
Email: David Rothlein, david.rothlein@gmail.com

(2127)

The Effect of Impulsivity on Attention Networks and Implicit Learning. JULIA WOLSKA and ADRIAN VON MUHLENEN, *University of Warwick* — Impulsivity is a multi-faceted construct, which can broadly be summarised with the three factors: attentional, motor and non-planning. The aim of the first study was to investigate how impulsivity influences the three functions of attention: alerting, orienting, and executive control using the attention network test. Eighty participants filled in the Barratt Impulsivity Scale before running the attention network task. Results showed that more impulsive participant shows less executive control than less impulsive participants. In a second study eighty new participants filled in the Barratt Impulsivity Scale before running a contextual cueing task. More impulsive participants took longer to learn the repeated displays that less impulsive participants. Thus, more impulsive could make better use of the learned context to improve their search than less impulsive participants. These results suggest that impulsivity might affect the focus of attention, which has been linked to executive control as well as contextual cueing.
Email: Adrian von Muhlenen, a.vonmuhlenen@warwick.ac.uk

(2128)

Diffusion Modelling of Drivers and Passengers Reveals Cognitive Load Effects on Caution and Non-Decision Processing. GABRIEL TILLMAN and AMI EIDELS, *University of Newcastle*, DAVID STRAYER and FRANCESCO BIONDI, *University of Utah*, ANDREW HEATHCOTE, *University of Tasmania* (Sponsored by Don van Ravenzwaaij) — Workload capacity refers to the ability to cope with increasing amounts of information. Cumulative evidence suggests that human capacity is limited, yet important situations of modern life – such as driving a car – require simultaneous processing of multiple signals. We explore how different capacity loads affect processing of peripheral signals whilst driving. Drivers were instructed to drive a car in a virtual driving simulator and at the same time detect a light in their peripheral vision (secondary task). Passengers were instructed to converse casually with the driver while next to the driver or over the phone from a separate room. Both driver and passenger were fitted with a Detection Response Time (DRT) device, which recorded response times from the secondary task. A single bound diffusion model was fit to the data from the secondary task to reveal how different cognitive loads affect caution, rate of processing, and non-decision processes.
Email: Gabriel Tillman, gabriel.tillman@newcastle.edu.au

(2129)

Ebb and Flow in the Battle for Attention. DAVID A. WASHBURN and J. ANTONIO SALAMANCA, *Georgia State University* — The moment-by-moment control of attention is

a competition between stimulus cues, associative constraints, and executive inputs. Tasks like Stroop and ANT highlight this competition by pitting prepotent cues in conflict with goals, and reveal individual differences in the capacity to bias the competition in favor of executive attention. However, this battle for control of selection and processing is not a static affair, but rather moves dynamically across time and trials, such that the efficiency of attention control varies systematically as a function of the sequence of stimuli and responses. In the present poster, undergraduate volunteers and rhesus monkeys alternated between trials designed to train "meanings" for novel symbols on the one hand, and Stroop-like trials in which those associated meanings competed against less potent response goals on the other. Modeling changes in accuracy and response time over trials reveals the ways that environmental, experiential and executive control of attention emerge, as well as stable individual and species differences in the degree of control form each form of constraint.
Email: David A. Washburn, dwashburn@gsu.edu

(2130)

The Effects of Cognitive Load on Distractor Interference. MICHAEL J. KING and BROOKE N. MACNAMARA, *Case Western Reserve University* — When does distraction capture attention, interfering with goal-directed behavior, and when are distractors successfully ignored? Distractor interference may depend on the type and amount of cognitive load being employed. Participants engaged in a task where they responded to a target letter that appeared simultaneously with a congruent or incongruent distractor letter. Slower RTs in incongruent conditions indicate distraction. Participants also viewed a memory set of one (low load) or four (high load) colored squares for later recognition. In addition to load amount, we examined the effects of three types of cognitive load: *perceptual load*—distractors were presented during memory encoding (while the square(s) were presented); *short-term memory load*—distractors were presented during memory maintenance (after encoding, before recognition); *working memory load*—distractors were presented during maintenance and participants were tasked with mentally rotating the square(s) 90º. This research provides the basis for further investigations on how cognitive load influences distraction.
Email: Michael J. King, mjk217@case.edu

(2131)

Switch Costs and Congruency Effects in Auditory Attention to Tone Dimensions. SOPHIE NOLDEN, KATHARINA BOLZIUS, SARAH SCHEEN and IRING KOCH, *RWTH Aachen University* — We investigated auditory task-switching and interference between tone dimensions. A visual cue that varied randomly from trial to trial indicated if participants had to classify pitch (low or high) or loudness (quiet or loud) of a tone. The irrelevant feature could be congruent, i.e., associated with the same response as the relevant feature, or incongruent, i.e., associated with a different response than the relevant feature, or be neutral, i.e., medium-high or medium-loud. The data revealed switch costs in reaction times and errors. In addition, participants responded more slowly and with more errors in incongruent trials than in neutral or congruent trials. In a follow-up experiment with non-overlapping responses we investigated if these incongruence costs were partly associated with a conflict at the stimulus level.
Email: Sophie Nolden, nolden@psych.rwth-aachen.de

(2132)

Disentangling Visual, Tactile, and Auditory Dominance Relations. MAGALI KREUTZFELDT, DENISE N. STEPHAN, KLAUS WILLMES and IRING KOCH, *RWTH Aachen University* — Flexibility of cognitive control is a driving factor in the adaptation of behavior. Presumably, modality appropriateness (visual-spatial and auditory-temporal dispositions) affects cognitive control robustly. We investigated the flexibility of switching between modalities in different processing requirements using the cued task switching paradigm. Participants switched between simultaneously presented tactile and visual (Ex. 1), or tactile and auditory (Ex. 2) stimuli in a spatial and a temporal task. The spatial task asked for a location judgment, the temporal task for a duration judgment of congruent or incongruent tactile vibrations, visual objects, or sounds. Results indicated asymmetric modality congruency effects depending on task requirements: In the spatial task, congruency effects were larger for the tactile than the visual modality and comparable for the tactile and auditory modality. Yet, in the temporal task, they were larger for the visual modality compared to the tactile and larger for the auditory compared to the tactile modality.
Email: Magali Kreutzfeldt, kreutzfeldt@psych.rwth-aachen.de

(2133)

Examining the Influence of Cues on Shifts of Auditory Selective Attention. JULIA C. SEIBOLD, SOPHIE NOLDEN, JOSEFA OBEREM, JOCHEN MÜSSELER, JANINA FELS and IRING KOCH, *RWTH Aachen University* — The goal of the study was to investigate preparation of auditory attention shifts. Two spoken digits from 1 to 9 (without 5) were presented simultaneously via headphones. One digit was spoken by a female voice and one by a male voice, and they were presented to one ear each. Participants had to decide if the target digit was smaller or larger than five. A visual cue presented before the spoken digits indicated which voice participants had to attend to. In one half of the experiment, participants had to attend to the male or to the female voice, whereas in the other half of the experiment, participants had to attend to the left or the right ear. By using a 2:1 cue-to-target mapping, cue repetitions were excluded, so that 'pure' attention shift costs were obtained. In two further experiments the influence of cue-modality was examined as well. Those 'pure' attention shift costs did not interact with preparation (i.e., cue-target interval) and therefore may be mainly due to passive attentional inertia. Moreover, ear-based preparation of auditory attention shifts was more effective than voice-pitch based preparation, which documents the importance of location information for auditory attention allocation.
Email: Julia C Seibold, julia.seibold@psych.rwth-aachen.de

(2134)

High Body Mass Index Is Associated With Impaired Cognitive Control. ROBERTA SELLARO, BERNHARD HOMMEL and LORENZA S. COLZATO, *Leiden University* — The prevalence of weight problems is increasing worldwide. There is growing evidence that high body mass index (BMI) is associated with frontal lobe dysfunction and cognitive deficits concerning episodic memory and inhibitory control efficiency. The present study aims at replicating and extending these observations. We compared cognitive control performance of normal weight (BMI < 25) and overweight (BMI ≥ 25) university students on a task tapping either inhibitory control (Experiment 1) or response conflict management (Experiment 2). Experiment 1 replicated previous findings that found less efficient inhibitory control in overweight individuals. Experiment 2 complemented these findings by showing that cognitive control impairments associated with high BMI also extend to the ability to resolve stimulus-induced response conflict and to engage in conflict-driven control adaptation. The present results are consistent with and extend previous literature showing that high BMI in young, otherwise healthy individuals can compromise key cognitive control functions.

Email: Roberta Sellaro, r.sellaro@fsw.leidenuniv.nl

(2135)

Deconstructing Task Switching: A Detailed Theoretical Analysis of Lifespan Developmental Change. MELODY WISEHEART and ANNALISE DSOUZA, *York University* — The current study investigates lifespan changes in task switching, the ability to shift between cognitive tasks. Several control mechanisms have been identified to reconfigure mental resources for switching frequently among task sets, but changes in these control mechanisms across the lifespan have not yet been explored. The study used a large Internet-based sample (n=14,732) to model fine-grained age-related change in task switching performance. Segmented regression was used to identify the transition periods at which shifts in performance occur. Further, the authors separated task switching into each of the control mechanisms involved, to identify the varying trajectories for each mechanism from pre-adolescence to late middle age. Differential lifespan trajectories were observed for each mechanism, which support the role of both domain-general mechanisms (e.g., processing speed) and domain-specific mechanisms (e.g., cue processing and task alternation) in task switching.

Email: Melody Wiseheart, melodywiseheart@gmail.com

(2136)

A Horserace Model of Task Switching. JOONSUK PARK, JAY INJAE MYUNG and MARK A. PITT, *Ohio State University* — A new mathematical model of task-switching is proposed. Currently, to the best of the authors' knowledge, there does not exist an easy-to-interpret model of task-switching which is simple enough to be used as a cognitive psychometric measurement tool. Specifically, the new model, dubbed 'HORTAS,' assumes that task-switching can be described as horserace process among different types of cognitive processes. Based on this assumption, the model is specified in each experimental condition, and the likelihood functions are derived in closed forms. It is shown that the new model predicts various well-known experimental effects and qualitative patterns of the data. In addition, some preliminary results are reported. The results suggest that task-switching ability can be reliably measured by using the new model, which demonstrates its practical utility in the applied and measurement-theoretic settings.

Email: Joonsuk Park, park.1952@osu.edu

(2137)

The Value of Knowing When to Switch: Investigating the Interaction of Value and Control. DAVID A. BRAUN and CATHERINE M. ARRINGTON, *Lehigh University* — Real-world decisions often involve the strategic allocation of effort for executing and switching between two or more decision options. When multitasking, switch costs arise from switching between, and the resulting interference from, sequentially activated task sets. The present research examines how choice processes are influenced by assigning differential values to tasks in a voluntary task switching environment (Arrington & Logan, 2004) and how these values might be represented in the task set. Subjects performed task switching where task values were probabilistically diminished for the recently performed task and increased for the non-performed task. Results suggest an *increased* sensitivity to the value of the non-performed task associated with a task switch, rather than the recently performed task (Experiment 1) and that the influence of value on task selection is minimally impacted by task difficulty (Experiment 2). These results suggest that task value may be represented separately from task set.

Email: David Braun, dab414@lehigh.edu

(2138)

Conflicts and Disfluency as Aversive Signals: Context Specific Processing Adjustments are Modulated by Affective Location Associations. GESINE DREISBACH and ANNA-LENA REINDL, *University of Regensburg*, RICO FISCHER, *University of Greifswald* — Context-specific processing adjustments are one signature feature of flexible human action control. Here we argue that aversive signals produced by conflict- or disfluency-experience originally motivate such control adjustments. In two experiments, high vs. low proportions of aversive signals (Experiment 1: conflict trials; Experiment 2: disfluent trials) were presented above or below screen center. Given the broad evidence that verticality is associated with affective valence (*up* – positive, *down* – negative) we expected that aversive signals would lose their trigger function for control adaptation when presented in the negative context below. As predicted, location specific proportion effects were only present when the high proportion of aversive signals occurred above screen center but were reduced (Experiment 1) or even eliminated (Experiment 2) when the high proportion of aversive signals occurred below screen center. This interaction of processing adjustments with affective background contexts is taken as further hint for an affective origin of control adaptations.

Email: Gesine Dreisbach, gesine.dreisbach@psychologie.uni-regensburg.de

(2139)

Threat of Electric Shock Eliminates Control Over Affective Stimuli. HEEJUNG JEONG and YANG SEOK CHO, *Korea University* — The congruency sequence effect (CSE) was examined under a threatening context to investigate the influence of anxiety on cognitive control. Participants performed a facial Stroop task with emotional conflict between the target word and the distractor face. A pair of happy and sad faces/words and the other pair of surprise and angry faces/words were presented in an alternative order so that the impacts of stimulus-response repetition and contingency learning were removed. Half of participants were assigned to a threat context in which electric shocks were delivered randomly while the other half performed the task under no threat. The results showed that CSE obtained in the safe context disappeared in the threat context. Specifically, participants in the safe context exerted more control to deal with conflict experienced by surprise/angry distractors than by happy/sad ones while participants in the threat context could not exert control in both tasks due to anxiety caused by shock. The results imply that anxiety impairs cognitive control involving processing of affective stimuli.
Email: Heejung Jeong, heefromkorea@gmail.com

(2140)

Strategies for Selective Stopping in the Elderly. YU-CHI LIN and SHULAN HSIEH, *National Cheng Kung University* — The aims of this study were to distinguish if different age groups exhibited different strategies in performing a stop-signal task, and whether there remained age-related differences in the stopping performance even when they used the same performing strategy. 24 younger adults and 24 older adults participated in this study. Participants' strategies were classified using the Bayes factor to support or reject the null hypotheses at the individual level on the paired comparisons among mean no-signal RT, signal-respond RT, and ignore RT. This study observed that older adults utilized more various kinds of strategies than younger adults. Yet, the stopping performance differed more significantly between the subgroups of strategies in the younger group; hence, whether there is age-related inhibition deficit could be dependent on which type of the strategy being used. The implication of this study is that one should not overlook the factor of performing strategy in a stop-signal task.
Email: Shulan Hsieh, psyhsl@mail.ncku.edu.tw

LETTER AND WORD PROCESSING II

(2141)

Individual Differences in Spelling Ability Contribute to Phonological Processing. MICHAEL A. ESKENZAI, *Stetson University,* ANGELA C. JONES, *John Carroll University,* ASHLEY N. ABRAHAM and JOCELYN R. FOLK, *Kent State University* — Individual differences in spelling ability may lead to differential orthographic processing during reading (Andrews & Low, 2013), and may contribute to null effects when individual differences are not considered (Andrews & Hersch, 2010). The purpose of the current study was to investigate whether such differences in spelling ability may contribute to phonological processing. Using a masked priming procedure, participants made lexical decisions on words (e.g. FROG) that were briefly primed by a semantic associate (e.g. TOAD) or a homophone of the associate (e.g. TOWED). Overall, consistent with prior literature (Lukatela & Turvey, 1994), only the semantic associate primed the target word. However, individual differences results indicate spelling ability differentially influenced priming. Low spelling ability, regardless of reading ability, led to priming from both prime types. High spelling ability, regardless of reading ability, only led to priming from the semantic associate. Thus, spelling ability not only contributes to differences in orthographic processing, but also to differences in phonologically mediated semantic activation during reading.
Email: Michael Eskenazi, maeskenazi@gmail.com

(2142)

Time Courses of Lexicality and Beauty Identification of Chinese Characters. MAKAYLA SZU-YU CHEN, TZU-YUN WANG, SHANE SHIH-HSUAN LIN and DENISE HSIEN WU, *National Central University* — Humans' ability to appreciate beauty might have evolutionary value. Previous research has indeed showed that facial beauty is perceived unconsciously even before face identity is recognized. However, whether similar findings would be observed in other types of stimuli, such as cultural artifacts, has not been explored before. To address this issue, Chinese readers were asked to make lexicality or beauty judgment on calligraphic Chinese characters, which appeared between a forward and a backward mask. The results indicated that participants could identify the lexicality of calligraphic characters, which were mixed with Korean characters, when they were presented for 40 ms or longer. On the other hand, identification of beauty of exactly the same set of stimuli required 53 ms or longer. Such findings are in contrast with the rapid perception of beauty expressed in faces, and imply at least partly separate mechanisms underlying beauty appreciation in different domains.
Email: Makayla S. Chen, szuyu08131988@cycu.org.tw

(2143)

Serial Position Functions for Letters and Digits in Arabic Readers. YOUSRI MARZOUKI, *Qatar University and Aix-Marseille University*, TAREK BELLAJ, *Qatar University*, LAURIE BETH FELDMAN, *The University at Albany, State University of New York*, JONATHAN GRAINGER, *Aix-Marseille University & CNRS* — We examined letters and digits identification in a stimulus-in-string identification paradigm to detect morphological and script direction influences on the form of the serial position function. Participants identified letters (digits) at a post-cued location in briefly (60 msec) presented 5-unit strings (e.g., مكغحش). We compared performance to outer-, first-, and central-letter positions in Arabic (right-to-left) with those in Roman scripts in Marzouki and Grainger 2014. The outer-central difference was smaller with Arabic letter strings but the first- and central letter advantages were comparable; importantly, central-letter accuracy hinged on the morphological status of those letters. With digits, the results revealed a clear-cut W-shaped curve with a final digit advantage higher than the initial, an effect that might be driven by right to left reading habits in Arabic. Overall, these findings further

support and extend to Arabic the existence of a specialized but tuneable parallel processing mechanism within strings of letters or digits.
Email: Yousri Marzouki, yousri.marzouki@univ-amu.fr

(2144)

The Influence of Bigram Frequency on the Processing of Visually Presented Words. LOUISA M. SLOWIACZEK, *Bowdoin College*, TODD A. KAHAN and NED SCOTT, *Bates College* — Whether word processing is holistic or whether individual letters may be attended/ignored was addressed using a visual composite task adapted for words by Wong et al. (2011). The neighborhood density and overall frequency of four letter words (e.g., HINT) were controlled, while the frequency of the initial bigram (i.e., HI), middle bigram (i.e., IN) or final bigram (i.e., NT) were manipulated to be high or low. Participants saw a study word, a cue to attend to the right or left half of the word, and a test word. They indicated if the cued half of the words (e.g., left) were the same (e.g., HINT-HILL) or different (e.g., HINT-LAND). Response times indicated that words with high frequency bigrams in the initial, middle and final positions (i.e., HHH) are bound more tightly, resulting in interference of one half of the word on the other half. The accuracy data revealed that for words with low frequency bigrams (i.e., LLL) pieces of words are processed more independently. Higher accuracy was obtained for LLL words for which the response to both sides of the word were the same (congruent trials), but lower accuracy was obtained for LLL words for which responses to the two sides of the word were different (incongruent trials).
Email: Louisa M. Slowiaczek, lslowiac@bowdoin.edu

(2145)

Is There Lexical Competition in the Recognition of L2 Words for Different-Script Bilinguals? A Masked Priming Investigation With Japanese-English Bilinguals. MARIKO NAKAYAMA, *Rikkyo University*, STEPHEN J. LUPKER, *University of Western Ontario*, HINO YASUSHI, *Waseda University* — Japanese-English bilinguals made lexical decisions to (L2) English targets that were primed by either word or nonword neighbor primes or unrelated primes (67 ms prime duration). As with L1 stimuli, a significant facilitation effect was observed with nonword neighbor primes. Unlike with L1 stimuli, an equivalent size facilitation effect was observed with word neighbor primes, with the data pattern being essentially unaffected by L2 proficiency. The possibility that prime processing for our bilinguals was sufficiently weak that the primes did not allow lexical access was ruled out by the fact that these subjects did show significant L2-L1 translation priming. Only when the prime was clearly visible (a 175 ms prime duration) was there any evidence of lexical competition (i.e., inhibition from word neighbor primes). These results support the idea that, although lexical competition processes exist, their role is, in general, a minor one for all but the most skilled readers.
Email: Mariko Nakayama, mariko_nakayama@rikkyo.ac.jp

(2146)

Visual Word Processing Efficiency for Chinese Characters and English Words. CHENG-TA YANG and JAY CHEN, *National Cheng Kung University*, JOSEPH W. HOUPT, *Wright State University*, AMI EIDELS, *University of Newcastle*, DANIEL R. LITTLE, *The University of Melbourne* — Due to the differences in the writing system, it is reasonable to speculate that Chinese characters may involve a higher degree of holistic processing than English words. We examined visual word processing efficiency, a reaction-time measure of the degree of holistic processing, while matching Chinese characters and English words, respectively. The word type (word, pseudo-word, and non-word) were manipulated. Both AND-capacity and OR-capacity were calculated. Results showed that AND-capacity for English word and pseudo-word was larger than that for the English non-word, replicating previous findings of word and pseudo-word superiority effect. In contrast, OR-capacity for the English words showed opposite effect: Non-words result in larger capacity than words and pseudo-words. Interestingly, the AND-capacity and OR-capacity for the Chinese characters revealed a different effect. Our results suggest that Chinese characters and English words may involve different processing strategies and this visual word processing strategy may be modulated by the amount of information required for decision-making.
Email: Cheng-Ta Yang, yangct@mail.ncku.edu.tw

(2147)

Lexical Access and Cross-Language Activation in Deaf Readers: Evidence From the Visual World Paradigm. MARCEL R. GIEZEN, SAÚL VILLAMERIEL, PATRICIA DIAS and MANUEL CARREIRAS, *Basque Center on Cognition, Brain and Language* — The visual world paradigm is widely used to study the time course of spoken word recognition. In the current study, we presented printed target words instead of auditory target words together with an experimental display of objects to investigate the time course of visual word recognition in deaf readers. In an initial study with hearing readers (n=40), we validated this printed word adaptation by directly comparing the time course of lexical frequency effects and phonological and semantic competition effects for auditory versus printed word presentation. In a second study we used the printed word adaptation to investigate lexical access and cross-language activation in bilingual deaf readers (n=25). Preliminary results suggest that the visual world paradigm can be successfully used to study the dynamics of lexical competition during visual word recognition and provides a valuable tool to study lexical access in deaf readers.
Email: Marcel Giezen, m.giezen@bcbl.eu

(2148)

The Phonological Unit of Japanese Kanji Words. MASAHIRO YOSHIHARA, *Waseda University*, MARIKO NAKAYAMA, *Rikkyo University*, RINUS G. VERDONSCHOT and YASUSHI HINO, *Waseda University* — It has been proposed that the phonological unit for speech production is different across languages (e.g., O'Seaghdha, Chen, & Chen, 2010). That is, while phonemic segments are assumed to play a functional role

in English, morae are assumed to be critical in Japanese (e.g., Roelofs, 2015; Verdonschot et al., 2011). Nonetheless, because there is no previous research using only Japanese Kanji words, we attempted to re-examine whether the phonological unit of Japanese Kanji words is a mora using masked priming naming tasks. When an initial mora was shared by the prime and the target, a significant priming effect was observed only when the initial mora also corresponds to the initial character of the prime and the target. This result indicates that the phonological unit of Japanese Kanji words is the entire phonology possessed by each Kanji character, rather than a single mora. The nature of the phonological unit is discussed.
Email: Masahiro Yoshihara, m.yoshihara@kurenai.waseda.jp

(2149)

Zooming in on Interaction Between Planning and Articulation Through the Lens of Disruption. RHONDA MCCLAIN, EMILY CIBELLI and ERIN GUSTAFSON, *Northwestern University*, CORNELIA MOERS, *Max Planck Institute for Psycholinguistics*, MATT GOLDRICK, *Northwestern University* — Disruption of lexical access has provided inconsistent evidence regarding whether cascade extends from lexical access to articulation. It is possible that high degrees of disruption to lexical access are required to prevent discrete selection of a target representation; only under these circumstances will distortions arising in lexical access influence articulation. We tested this hypothesis by varying the degree of disruption induced by a paradigm that results in semantic substitution errors in picture naming. In Experiment 1, we examined young adult monolinguals. In Experiment 2, young adults completed the paradigm under time-pressure. In Experiment 3, we examined a group of older adults, for whom normal cognitive aging increases the demands of lexical access. Our hypothesis predicts there will be increased disruptions to articulation in Experiments 2 and 3 relative to the baseline of Experiment 1. We will discuss the implications of the results for dynamic accounts of interaction during speech production.
Email: Rhonda McClain, rhondam1@gmail.com

(2150)

Working Memory and Reading Comprehension in Arabic Language. MOHAMMED ELMIR, *University sidi Mohammed ben Abdellah, Fes Morocco.* — The present study examined the relationships between Working memory (WM) and reading comprehension in native Arabic 3rd graders. WM is responsible for storing and processing incoming information. The comprehender gradually constructs a mental model of the text. Thus, WM contributes to reading comprehension; because it helps to store medial products during the processing of the printed information. Previous studies have found correlations between WM and reading comprehension in other languages like English; however we have no reliable data about the effect of WM on reading comprehension in Arabic language. In this research, WM capacity is expected to explain performance in reading comprehension in Arabic, consequently high WM span readers perform better than low WM span readers in reading comprehension tasks. Participants were tested in different tasks aimed at evaluating WM span and reading comprehension ability. The results demonstrate that differences between good and poor comprehenders correlate highly with WM span scores. Consistent with previous data, the findings of this study indicate that comprehension ability in Arabic depends on WM capacity. We can conclude, then, that deficiencies in WM functioning affect also reading comprehension in Arabic language. Therefore, WM capacity measures can be a good predictor of reading comprehension ability in Arabic.
Email: Mohanned Elmir, elmirmohammed21@gmail.com

(2151)

Additive Effects of Predictability and Parafoveal Information: Evidence from Eye Movements. JANE ASHBY and PETER SHLANTA, *Central Michigan University*, ASCENSION PAGAN, *Oxford University*, STEPHEN J. AGAUAS and HOLLY GAGNON, *Central Michigan University* — Does predictability affect how readers process parafoveal information? Eye movements were monitored during sentence reading using a 2 (predictability) x 4 (preview) design. Each participant read targets (float) in predictable contexts (The raft was able to float with four people on it) or in unpredictable contexts (The door was able to float with four people on it). We manipulated orthographic information (all correct letters or not) and phonological information (correct number of syllables or not) to yield four preview conditions: flaot (vowel-TL); flota (TL); flote (PH); and flotu (SL). Analyses returned main effects of predictability and preview type, with no interaction (Fs<1). The fastest gaze durations occurred in the vowel-TL condition, followed by the PH condition, and the TL and SL conditions were comparable. Therefore, a mismatch in syllable number between the preview and target minimized TL facilitation, replicating a pattern reported at last year's meeting.
Email: Jane Ashby, jane.ashby@cmich.edu

(2152)

The Effects of Semantic Priming on Lexical Activation/inhibition. ALEX TAIKH, *University of Western Ontario*, STEPHEN J. LUPKER, *The University of Western Ontario* — Word recognition is influenced by pre-activated semantic and orthographic information. For example, in a lexical decision task, orthographically similar masked word primes inhibit responding while orthographically similar nonword primes facilitate responding (e.g., Davis & Lupker, 2006). Both effects presumably arise at the lexical level. Similarly, semantically related primes facilitate responding. However, there is controversy as to the locus of this effect (i.e., do related primes activate the target's lexical representation or are they used strategically after the target's lexical representation has been activated?). The present experiments examined the potential interaction between semantic and orthographic information in a multiple prime situation. Specifically, orthographically similar or dissimilar masked primes were preceded by visible primes that were semantically related or unrelated to the target in order to determine whether the two prime types would produce an interaction, a result that would suggest an influence of semantic primes arising at the lexical level.
Email: Alex Taikh, ataikh@uwo.ca

(2153)

Effects of Semantic Activation for Orthographic and Phonological Neighbors in the Reading of Japanese Kanji Words. YUU KUSUNOSE, YASUSHI HINO and KEISUKE IDA, *Waseda University*, STEPHEN J. LUPKER, *The University of Western Ontario* — In a relatedness judgment task (are the two words in a word pair semantically related?), a semantic relationship between the initial member of the pair and a neighbor of the second member of the pair leads to delayed responding (e.g., missile-pocket). The question addressed here was, are the activated neighbors that are responsible for the effect orthographic or phonological (or both) in nature? Because most Japanese kanji characters possess multiple pronunciations, it is possible to independently manipulate orthographic and phonological similarity for kanji word pairs. For high frequency second members, an effect was only observed for orthographic neighbors, paralleling the results found when the second member is written in katakana (Hino, Lupker & Taylor, 2012). For low frequency second members, however, an effect was observed for both orthographic and phonological neighbors of that word. These results shed light on the nature of semantic coding for Japanese kanji words.
Email: Yasushi Hino, hino@waseda.jp

(2154)

Hemispheric Lateralization of Early ERP Components in Deaf and Hearing Readers With Low and High Vocabulary Size. ZED SEVCIKOVA SEHYR, KAREN EMMOREY, KATHERINE MIDGLEY and PHILLIP HOLCOMB, *San Diego State University* — Deaf readers have distinct developmental experience with word acquisition than hearing readers. We examined whether N170 and P1 lateralization for words differs for deaf and hearing readers and whether lateralization is modulated by English vocabulary size. Twenty hearing and 20 deaf participants made same-different judgments to word pairs where the first word was presented centrally (750ms) and the second laterally. EEG was recorded to the central stimuli. The N170 was left-lateralized for both groups, but only the deaf readers showed a vocabulary effect: those with low vocabulary (median split) showed a left-lateralized N170 while those with high vocabulary displayed a bilateral N170. P1 amplitude was bilaterally distributed for hearing readers, however, deaf readers again exhibited a vocabulary effect: P1 was bilateral for the low vocabulary group but right-lateralized for the high vocabulary group. These unique asymmetries suggest that vocabulary size modulates early visual orthographic processing in deaf readers.
Email: Zed Sevcikova Sehyr, zsevcikova@mail.sdsu.edu

PSYCHOLINGUISTICS I

(2155)

Relation of Reading and Eye Fixation Duration to Sentence Comprehension Accuracy. DAVID CAPLAN, *Massachusetts General Hospital*, ADRIAN STAUB, *University of Massachusetts*, MARIA VARKANITSA, JENNIFER MICHAUD and SAMER EDDINE, *Massachusetts General Hospital* — Sentence reading time, first fixation duration, go-past time, regressions out and regressions in for segments in sentences with NP/complement ambiguities with subject and object relatives on the ambiguous NP, early/late closure sentences with long and short post-verbal NPs, and sentences with and without embedded passivized relative clauses were measured in 81 participants. The effects of sentence type on RT and accuracy and of sentence type and region on eye fixations largely replicated previous studies. There were very few significant relations between sentence reading time or of any of the eye fixation measures and accuracy. The implications of the null result of the relation of measures of processing duration and accuracy will be discussed.
were measured in 81 participants
Email: David Caplan, dcaplan@partners.org

(2156)

Keep Listening: Grammatical Context Reduces But Does Not Eliminate Activation For Unexpected Words. JULIA F. STRAND, VIOLET BROWN and HUNTER BROWN, *Carleton College* — While perceiving speech, listeners combine expectations derived from semantic and grammatical context with the bottom-up, auditory input. Studies on semantic context have generally supported continuous-integration models, in which listeners maintain sensitivity to the bottom-up signal irrespective of semantic fit (Dahan & Tanenhaus, 2004). In contrast, studies on grammatical context typically support restrictive-access models, in which context completely eliminates activation of grammatically inconsistent neighbors (similar-sounding words) (Dahan et al. 2000). In the current eye-tracking study, participants were presented with target words in grammatically constraining ("They thought about *the*…") or unconstraining (The word *is*…") contexts. Grammatical context reduced but did not eliminate activation of contextually inappropriate neighbors when the target contained co-articulatory information from the neighbor. The data are consistent with continuous-integration accounts and suggest that although grammatical context constrains lexical activation, listeners remain sensitive to the bottom-up input, just as they do with semantic context.
Email: Julia Strand, jstrand@carleton.edu

(2157)

Cognitive Control Engagement From a Nonlinguistic Source Can Ease Processing Along the Garden Path. NINA S. HSU, STEFANIE E. KUCHINSKY, ASHLEY THOMAS and JARED M. NOVICK, *University of Maryland - College Park* — How do listeners revise misinterpretations of language input? Recently, we showed that Stroop-conflict detection, which mobilizes cognitive control, subsequently facilitated listeners' real-time recovery from misinterpretation of temporarily ambiguous instructions. Cognitive control engagement is therefore causally linked to revision procedures. We test if *non-verbal, visual* conflict also triggers control processes that consequently facilitate revision, testing for domain-general effects of cognitive control on comprehension. Subjects completed spoken sentence-comprehension trials interleaved with Flanker trials. When ambiguous sentences followed conflict (<<>><<) vs. non-conflict (<<<<<) items, listeners' eye-movements to objects in a scene reflected more transient consideration of the false interpretation and earlier recovery of the correct one. We

replicated this pattern using visually-degraded vs. intact non-conflict Flankers, suggesting that even perceptual ambiguity deploys control functions that impact comprehension. A third study rendered basic attention mechanisms unlikely in explaining these results. Our findings suggest a cause-and-effect interplay between domain-general cognitive control and online language processing.
Email: Nina Hsu, ninahsu@umd.edu

(2158)

Empirical Examination of a Phonetically-Based Measure of Between-Language Similarity. ALISON TSENG, ERICA B. MICHAEL, JARED A. LINCK, SARAH PERRET and CHRISTOPHER GREEN, *University of Maryland Center for Advanced Study of Language* (Presented by Jared Linck) — Research has shown that between-language similarity affects multilingual language processing (e.g., cognate facilitation). However, there are no standard measures of similarity that can be applied to various language pairs, especially languages that differ in script. We describe a measure that compares the phonetic properties of word pairs, and can thus be used with any language pair. We examine our measure's ability to capture cognate effects in an empirical study of language processing. Naïve native English speakers first guessed the meaning of aurally-presented Dutch words, then rated the similarity of aurally-presented Dutch/English word pairs. Analyses will examine how well our measure correlates with guessability and similarity ratings, as well as whether specific phonetic properties predict which word pairs are identified as cognates (based on guessability). We discuss our measure and the implications of the results for understanding the mechanisms underlying similarity effects.
Email: Jared A. Linck, jlinck@umd.edu

(2159)

The Predictive Value of Varying Phonological Units in Productive and Receptive Tests of Phonological Awareness Across Four L1s. KATHERINE I. MARTIN, *Southern Illinois University Carbondale* — Phonological awareness (PhonA) is crucial for literacy but little work examines the impact of item characteristics on performance. Research suggests that the size and location of the target unit matter for task performance (McBride-Chang 1995) but it is unclear whether they also impact the predictive power of PhonA for other literacy skills or whether this varies by L1. This study thus examined the relationship between lexical skills and PhonA performance, specifically the predictive power of multiple phonological units in four L1s (French, Hebrew, Mandarin, English). Data were collected from 46 speakers in each L1. Participants completed a receptive (oddity) and a productive (deletion) PhonA task, lexical decision, naming, and decoding. Correlations varied among tasks, phonological units, and L1s. Phoneme awareness had no predictive value for L1 Chinese or Hebrew speakers; instead, larger units were better predictors. The reverse was true for L1 French and English speakers. The findings add to our understanding of the fine-grained development of PhonA and how it supports other literacy skills across L1s. They also have practical implications for task design and interpretation of results in cross-linguistic studies.
Email: Katherine I. Martin, martinki@siu.edu

(2160)

Second Language Learning in Child and Adult Classrooms: Neurocognitive Correlates of Syntactic Processing. FATEMEH ABDOLLAHI, *The Pennsylvania State University*, NATASHA TOKOWICZ, *University of Pittsburgh*, JANET VAN HELL, *The Pennsylvania State University* (Sponsored by James McQueen) — Second languages (L2) are taught in many classrooms worldwide, but we know relatively little about the neural correlates of syntactic processing in child and adult L2 learners. In this study, adult and child (~10yr) intermediate-level L2 learners read (un)grammatical L1 (English) and L2 (Spanish) sentences of varying syntactic categories, while ERPs were recorded. In L1, adults, but not children, showed sensitivity for all grammatical structures (P600). For L2, traditional group-level ERP analyses showed adult learners' sensitivity to syntactic violations corresponded to similarity with L1 structures, though grammaticality judgment accuracy was at chance. Group-level ERP-analyses showed that children were not sensitive to L2 syntactic violations. To examine individual variation in L2 processing, Response Dominance Indexes were calculated, dividing adult learners into N400- or P600-dominance. Clear individual differences, averaged out in traditional analyses, emerged. This variability may be critical in developing models of adult and child classroom learner L2 syntactic processing.
Email: Fatemeh Abdollahi, fxa143@psu.edu

(2161)

Imagining Counterfactual Worlds in Autism Spectrum Disorder. JO S. BLACK, HEATHER FERGUSON and DAVID WILLIAMS, *University of Kent* — Specific impairments in counterfactual processing, as well as difficulty with imaginative thinking, are common in people with Autism Spectrum Disorders (ASD), however only a handful of published studies have empirically tested counterfactual thinking in this group. We present two eye-tracking experiments that explore how imaginability influences counterfactual reasoning in individuals with ASD and typically developing (TD) participants in an anomaly detection reading task. Experiment 1 depicted everyday counterfactual events that incur a minimal change from reality. Experiment 2 described alternative versions of known historical events that require readers to suspend their knowledge of reality and imagine a novel version of the world. Results revealed both ASD and TD participants detected anomalous words within the same time course. However, the disruption caused by the anomaly was greater within factual than counterfactual contexts in Experiment 1, and participants with ASD showed increased difficulty integrating reality-altering counterfactuals in Experiment 2.
Email: Jo Black, j.s.black@kent.ac.uk

(2162)

Theory of Mind Reasoning Is at Play During Language Comprehension. OLESSIA JOURAVLEV and DIMA AYYASH, *Massachusetts Institute of Technology*, RACHAEL SCHWARTZ, *Wellesley College*, ZACHARY MINEROFF and EVELINA FEDORENKO, *Massachusetts Institute of Technology*, *Harvard Medical School, Massachusetts General Hospital* — Do we model others' minds during language comprehension? Participants read semantically implausible sentences (e.g., *His boat has wheels now*), preceded by a context that made them plausible (e.g., *Mike turned his boat into a car*) while their ERPs were recorded. Critically, the target sentences were implausible to a confederate, who did not receive the context. Participants performed a plausibility judgment task or read sentences passively. The presence of a confederate was also manipulated. Replicating prior work (Rueschemeyer et al., 2014), during the plausibility judgment task, we observed an N400 in response to critical sentences when a confederate was present (social N400), but not when the participant was alone. However, importantly, we generalized these results to a more naturalistic passive reading condition, suggesting that language comprehenders *automatically* engage in modeling the states of minds of those around us.
Email: Olessia Jouravlev, olessiaj@mit.edu

(2163)

Lexical Differentiation and the Discourse History. SI ON YOON and SARAH BROWN-SCHMIDT, *University of Illinois, Urbana-Champaign* — When designing definite referring expressions, speakers consider both the local context and the discourse history. In three experiments, we examine the phenomenon of Lexical Differentiation, wherein speakers differentiate two sequentially presented objects from the same category. Little is known about why speakers choose to differentiate. In a referential communication task, on critical trials a target referent (e.g., striped shirt) was from the same category as an earlier exemplar (e.g., dotted shirt) that had (differentiation condition) or had not (non-differentiation condition) previously been described. A robust differentiation effect was evidenced by increased use of modifiers at test in the differentiation vs. non-differentiation condition. We also find that speakers differentiate more often when they perceive the past as relevant to the current topic of discussion. This work emphasizes the importance of the perceived structure of the communicative interaction. The small magnitude of the context effect, however, indicates that further work is needed to fully understand how and when the discourse history matters.
Email: Si On Yoon, syoon10@illinois.edu

(2164)

Appear Happier: Text With Emojis. MONICA A. RIORDAN, *Chatham University* — The use of pictographs called emojis have expanded in text messaging in recent years, particularly in younger generations. Qualitative studies suggest that emoji effectively soften negative messages or increase the positivity of messages. The current study applies a quantitative methodology to measuring the effect of emojis on the affective content of a text message. Four positive and four negative text messages were created with either 0, 1, 2, or 3 emojis, generating 32 text messages. Each participant rated only one message for affective content. Results show that the addition of emoji to both positive and negative messages led to more positive affect ratings. Specifically, emojis lead to the perception of more joy in all messages. However, this boost in positivity was primarily between the presence and absence of emoji; the presence of two or three emojis did not always lead to additional increases in positive affect beyond one emoji alone.
Email: Monica Riordan, mriordan@chatham.edu

(2165)

Conceptual Representations of Misspoken Words Linger in Working Memory. HOSSEIN KARIMI and FERNANDA FERREIRA, *University of California, Davis* — An important theoretical question in spoken language comprehension research concerns the extent to which the syntactic and semantic properties of misspoken, repaired words (reparanda) linger in memory. To investigate this question, we conducted a spoken sentence continuation task to examine whether a reparandum affects form of reference to potential antecedents, including the repair word(s). Sentences were either fluent or disfluent; in the latter condition, the reparandum and repair were gender-marked nouns of the same gender. Thus, if the reparandum lingers, it should produce semantic interference and reduce pronominal references to the repair (Arnold & Griffin, 2007). The results revealed less pronoun use overall in the Disfluent condition but no semantic interference effect, indicating that the reparandum lingers in memory but does not retain its gender label. These results suggest that an abstract conceptual representation of the reparandum (and not its specific gender information) stays in memory and influences processing.
Email: karimi@ucdavis.edu, karimi@ucdavis.edu

(2166)

Information Integration in Online Modulation of Pragmatic Inferences During Language Comprehension. RACHEL A. RYSKIN, *University of Illinois at Urbana-Champaign*, CHIGUSA KURUMADA, *University of Rochester*, SARAH BROWN-SCHMIDT, *Vanderbilt University* — Recent studies show that listeners learn to suppress contrastive inferences based on size adjectives when the speaker is introduced to be incapable of informative language use (Grodner & Sedivy, 2011). In 5 eye-tracking experiments, we explore the nature of evidence necessary for such learning, focusing on 1) roles of bottom-up and top-down information about the speaker and 2) speaker-specificity of the process. Listeners were exposed to speakers who either use size adjectives felicitously (e.g., "the big dog" when a small and big dog present) or infelicitously (e.g., "the big dog" when only one dog present). Overall we found 1) bottom-up evidence is sufficient to trigger suppression of contrastive inferences while top-down instructions facilitate the learning; and 2) the learning is not speaker specific. We discuss how observed evidence may be evaluated against listeners' prior assumptions about pragmatic language use, determining the speed and degree of suppression of contrastive inferences.
Email: Rachel Ryskin, rryskin@gmail.com

(2167)

I Deny my Expectations. Even So, I Predict: Differential Electrophysiological Effects of Concession and Result Connectives in Discourse Comprehension. EDWARD J. ALEXANDER, *Tufts University*, EINAT SHETREET, *Tel Aviv University*, CONNIE CHOI, *Tufts University*, MING XIANG, *University of Chicago*, GINA R. KUPERBERG, *Tufts University* — We used event-related potentials (ERPs) to compare comprehenders' use of two types of discourse connectives to predict upcoming events: "Therefore", which tells comprehenders to expect a specific causal relationship (Result), and "Even so", which tells comprehenders to deny expectations about any type of real-world relationship (Concession). Participants read two-sentence contexts followed by a third sentence, presented word by word, beginning with "Therefore" or "Even so". ERPs were measured on critical words that rendered scenarios coherent or incoherent ("She took the test and aced/failed it… Therefore/ Even so, she CELEBRATED…"). The N400 was reduced on coherent (versus incoherent) critical words following "Even so", but not following "Therefore". A posteriorly distributed late positivity was enhanced on incoherent (versus coherent) critical words, regardless of the preceding connective. These findings suggest that, while both connectives influenced online neural processing, "Even so" led comprehenders to generate stronger predictions about upcoming events than "Therefore".
Email: Edward Alexander, edward.alexander@tufts.edu

(2168)

Speech Errors and Repair by Chinese Language Learners: Metalinguistic Knowledge in Chinese Learning. LIANG TAO, *Ohio University* — This study deals with speech error analyses of native English speakers in their production of Mandarin Chinese. Different from previous studies on this topic, the present study focuses on how speakers catch and correct their errors in the self-initiated self-repairs. Data came from spontaneous questions and answers by beginning Chinese language learners. The importance of metalinguistic knowledge in foreign language learning is exemplified. It demonstrates how such knowledge helps learners to enhance accurate L2 production. Repair constitutes an important part of the social organization of conversation for interactional needs of human communication. Self-repair by native speakers illustrates their metalinguistic awareness of communicative needs at the subconscious level; whereas self-repair by beginning Chinese language learners reflects their conscious effort and self-monitoring of their utterances for accurate Chinese production. This study suggests that developing metalinguistic knowledge should help learners to suppress L1 influence. However, such knowledge eventually should be suppressed for automatic language production.
Email: Liang Tao, Tao@ohio.edu

(2169)

Barney Rubble Has a Crowbar: Priming Initial Syllables Out of Sequence During Tip-of-the-Tongue States. JESSICA T. CAMPBELL and LISE ABRAMS, *University of Florida* — A tip-of-the-tongue state (TOT) occurs when an individual cannot retrieve a known word or name from memory. Previous research has shown that TOTs are particularly prevalent for proper names and that encountering another word with the same initial syllable helps to resolve TOTs. To examine the breadth of priming from the initial syllable, this experiment investigated whether primes containing a TOT's initial syllable in a different position would increase TOT resolution. Participants saw questions corresponding to target names (e.g., Barney Rubble) and indicated whether they were having a TOT. They then saw a list of words, which sometimes contained a prime with the initial syllable of the target's first name ('bar') as the middle syllable (embargo) or final syllable (crowbar). Percentage of target retrieval was compared for TOTs followed by primed vs. unrelated lists, and the results will be interpreted in terms of the Transmission Deficit model of TOTs.
Email: Jessica T. Campbell, jesscamp616@ufl.edu

BILINGUALISM II

(2170)

Cognitive Ability Profiles, Brain Training Gains, and Foreign Language Learning. JARED A. LINCK, *University of Maryland*, DAVID HARPER, *Rosetta Stone*, CONNY H. LIN, *University of British Columbia*, LAUREN AMER and ANITA R. BOWLES, *Rosetta Stone* — Research suggests that individual differences in language aptitude (including executive function) may predict success in foreign language (L2) learning (e.g., Linck & Weiss, 2015). Further, brain training exercises can lead to enhanced performance in some aspects of executive control (e.g., Klingberg, 2010). However, the relationships among brain training performance, language aptitude, and L2 learning have not yet been examined in conjunction. The current study provides a preliminary analysis of a large (N>30,000) corpus of online data generated by users engaged in both brain fitness training and L2 learning. Analyses will examine whether pre-training cognitive performance profiles predict brain training gains or L2 learning progress, and whether brain training gains predict subsequent L2 learning progress. This study will provide much needed large-scale evidence for the potential links between language aptitude, brain training, and L2 learning. (Several of the authors are employed by Rosetta Stone or Fit Brains, a Rosetta Stone company).
Email: Anita R. Bowles, abowles@rosettastone.com

(2171)

How Code-Switching Affects VOT Within Sentences: An Acoustic Study. DELANEY WILSON, MARIANNA NADEU and JANET G. VAN HELL, *Pennsylvania State University* — Studies examining voice onset time (VOT) in language-switching have found that Spanish-English bilinguals have longer VOTs when naming isolated pictures (Goldrick et al., 2014; Olson, 2013) indicating that switching impacts phonetic output. These studies all tested habitual code-switchers. To understand how this manifests in non-habitual code-switchers, we employed a sentence creation task focusing on word-initial /p/ and /t/ phonemes. Bilinguals produces sentences that switched from Spanish to English, from English to Spanish, or unilingual Spanish/English sentences. Critical target words appeared before or after the switch. English VOTs were longer

than Spanish VOTs, in unilingual and code-switched sentences. VOTs in code-switched sentences and unilingual sentences were not statistically different, indicating that bilinguals maintain phonetic distinctions in code-switched sentences. This differs from the Goldrick et al. and Olson studies, and from spontaneous speech analyses (Arvaniti et al., 2015; Fricke et al., 2015), suggesting that mechanisms of phonological convergence manifest differently in non-habitual code-switchers.
Email: Janet G. van Hell, jgv3@psu.edu

(2172)

Even in Different Scripts: Bilingual Cross-Language Semantic Influences During Visual Word Recognition. TAMAR DEGANI and ANAT PRIOR, *University of Haifa, Israel*, WALAA' HAJAJRA, *University of Haifa* — The current study examined automatic activation and semantic influences from the non-target language of different-script bilinguals during visual word processing. Thirty-four Arabic-Hebrew bilinguals and 34 native Hebrew controls performed a semantic relatedness task on visually presented Hebrew word pairs. In one type of critical trials, cognate primes between Arabic and Hebrew preceded related Hebrew target words. In a second type, false-cognate primes preceded Hebrew targets related to the Arabic meaning (but not the Hebrew meaning) of the false-cognate. Although Hebrew orthography is a fully reliable cue of language membership, facilitation on cognate trials and interference on false-cognate trials were observed for Arabic-Hebrew bilinguals. The activation of the non-target language was sufficient to influence participants' semantic decisions in the target language, demonstrating simultaneous activation of both languages even for different-script bilinguals in a single language context. To discuss the findings we adapt existing models of bilingual processing to accommodate different-script bilinguals.
Email: Tamar Degani, tdegani@research.haifa.ac.il

(2173)

Translation Ambiguity and Individual Differences Affect L2 Vocabulary Learning in Bilinguals and Monolinguals. GRIFFIN E. KOCH, NATASHA TOKOWICZ and TESSA WARREN, *University of Pittsburgh* — This study investigated whether bilinguals have an advantage in learning translation-unambiguous and translation-ambiguous vocabulary in an unfamiliar language. Participants learned German vocabulary words with 1, 2, or 3 English translations. Because words with more translations were trained more often, we included a translation-unambiguous control condition presented as often as 3-translation words. Two groups participated: a bilingual group (N=20), who identified English as a native language in addition to another native language taught at home since childhood, and a monolingual group (N=25), who identified as being native speakers of only English. Translation production and semantic judgment tests assessed vocabulary learning. Learning was best for the frequently presented unambiguous condition. For 3-translation words, the first translation produced was slowest, implying competition between multiple translations. Although there was no evidence of a bilingual advantage, participants with larger English vocabularies (assessed by the PPVT) were more accurate and faster on the translation production test.
Email: Natasha Tokowicz, tokowicz@pitt.edu

(2174)

The Role of the L1 in the Formation of Collocational Links in the L2 Lexicon: Exploring Facilitation and Interference Through ERPs. MANUEL PULIDO-AZPIROZ, *The Pennsylvannia State University*, PAOLA E. DUSSIAS, *The Pennsylvania State University* — Studies exploring the role of the first language (L1) during the processing of second language (L2) collocations (e.g., set the table), show faster RTs in collocational over unrelated word pairs, and more efficient processing of L1-L2 congruent collocations (word-by-word equivalents) relative to incongruent ones (Wolter & Gyllstad 2011). No studies to date have investigated L1 interference in the processing of collocations. Using ERPs, our goal is to explore this question by capitalizing on increased L1 activation induced by the presence of a cognate noun in 50% of collocations. Cognates are predicted to enhance the effects of L1 on L2, resulting in increased facilitation via congruency, and in increased interference due to conflict in incongruent collocations. Facilitation/Interference should elicit modulated N400s. We recorded ERPs while participants performed a lexical decision task containing 656 Verb+Noun sequences (82 congruent, 82 incongruent collocations). Preliminary results (N=11) reveal modulated N400s based on congruency.
Email: MANUEL PULIDO-AZPÍROZ, Pennsylvania State University., MPAZPIROZ@gmail.com

(2175)

Bilingual's Plausibility Judgments for Collocations With Literal or Non-Literal Meaning: An Effect of Language Brokering Experience. BELEM G. LÓPEZ, *University of Texas at Austin*, SÜMEYRA TOSUN, *Süleyman Şah University*, JYOTSNA VAID, *Texas A&M University* — The present investigation examined repercussions of differences in bilinguals' informal translation experience (language brokering) on a phrase plausibility task. Based on prior research suggesting a heightened activation of translation equivalents among brokers, it was hypothesized that semantic plausibility judgments, regardless of language or meaning type, would be facilitated by language brokering experience. Stimuli were constructed from 54 triads in which an adjective was presented with one of three nouns to form collocations that had a literal, figurative, or absurd meaning. Proficient Spanish-English bilingual adults differing in their extent of prior brokering experience judged phrase plausibility. Whereas collocations with a literal meaning were judged faster than those with a figurative meaning, this effect was reduced among brokers, who also showed equivalent responses across languages. Finally, brokers were faster and more accurate than non-brokers in judging phrase plausibility. The findings extend the scope of previous studies documenting an effect of interpretation expertise.
Email: Jyotsna Vaid, jvaid@tamu.edu

(2176)

Conceptual Representations in Mandarin-English Bilinguals: An ERP Study. XUAN PAN and DEBRA JARED, *The University of Western Ontario* — Dong et al. (2005) proposed that when an individual learns a word in L2, they link the features from the translation in L1 to that word, and as they become proficient in L2, bilinguals drop L1-specific features and add L2-specific features to their L2 conceptual representations. The present study tested this theory with Chinese-English bilinguals using an English semantic priming task with ERP. Primes were animal names (OWL), and targets were either related in L2 (WISE), in L1 (MISFORTUNE), or were unrelated. A priming effect was observed in the N400 for pairs related in L1, indicating that L2 words were associated with L1 features. No N400 priming effect was found for pairs related in L2, suggesting that the bilinguals did not yet have connections between L2 words and L2-specific features. However, there was a priming effect from 200-300 ms for pairs related in L2. This early priming effect may reflect associative relationships among L2 lexical items.
Email: Xuan Pan, xpan55@uwo.ca

(2177)

The Influence of Bilingualism on Ambiguity Resolution in Cross-Situational Learning. TIM POEPSEL and DANIEL WEISS, *The Pennsylvania State University* — Recent findings from the cross-situational statistical word learning (CSSL) literature indicate that bilinguals may more readily accommodate multiple mappings (Poepsel & Weiss, 2016). Here, we extend this work by comparing English monolinguals with English-Spanish bilinguals in a CSSL study presenting one-to-one mappings and two-to-one mappings that varied in mapping strength (i.e., seven of one mapping versus one of the other, six of one versus two of the other, etc.) within one familiarization phase. Overall mapping performance for both groups was equivalent across all mapping types and positively correlated with mapping strength for 2:1 mappings, suggesting all learners are sensitive to fine-grained statistical information within our task. Notably, reaction times for bilinguals were significantly slower across all two-to-one mapping strengths. We interpret this as evidence that bilingualism may result in greater implicit knowledge of weak or noisy evidence for multiple mappings, which may facilitate resolution of mapping ambiguity given additional exposure.
Email: Tim Poepsel, tjp19@psu.edu

(2178)

Effects of Working Memory Load on Bilingual Translation Route. JENNIFER M. BROWN, ANA I. SCHWARTZ and WENDY S. FRANCIS, *University of Texas at El Paso* — We examined whether working memory load causes bilinguals to translate words in a lexically-mediated route rather than a direct, conceptually-mediated route. To examine this highly-proficient Spanish-English bilinguals (N = 101) first translated words in the L1- L2 direction and L2-L1 direction either under a working memory load or under no load. At test participants named pictures in L1 and L2 that were either repeated or non-repeated. Repeated items were named faster at test than non-repeated, and this priming effect was stronger in L2 than L1. Working memory load did not affect the priming effect. These results suggest that conceptual access during translation is not affected by working memory load. Rather, consistent with previous research monolinguals, production priming was not affected by cognitive load.
Email: Jennifer Brown, jmbrown2@miners.utep.edu

(2179)

Is There or Isn't There a Cost of Bilingual Sequence Learning? DENISE N. STEPHAN and IRING KOCH, *RWTH Aachen University*, JONATHAN GRAINGER and MATHIEU DECLERCK, *Aix-Marseille Université and Centre National de la Recherche Scientifique* — Bilingualism describes the ability to effectively communicate in more than one language. However, this can come at a cost, since using two languages is known to decrease overall performance. In the current study we were interested in whether using two languages also impairs learning, which is an important question for education. Based on the classic serial reaction time task, which reveals enhanced performance with fixed compared to random sequences, we developed a bilingual version in which number words of two languages (French and English) were presented. In addition, bilingual performance was compared to performance with monolingual stimulus presentation. No additional bilingual cost was observed for sequence learning. Moreover, the effect of sequence learning was numerically almost twice as large with bilingual stimuli. We assume that the crucial mechanism behind the similar performance with bilingual and monolingual sequence learning lies in the fixed language switches that serve as chunking points.
Email: Denise N. Stephan, stephan@psych.rwth-aachen.de

(2180)

Learning a Second Language for Arabic Speakers: Can Word Pair Directionality Make a Difference? BUSHRA ALDOSARI, *Kent State University* — Text structure (e.g., left-to-right orientation) can bias later task performance by supporting scanning strategies on unrelated tasks (e.g., scanning left-to-right when learning word-pairs). How might the reading habits of native Arabic speakers affect the acquisition of English vocabulary in word lists? Arabic-speaking ESL students were asked to learn two word lists. The experimental materials are two lists of low-frequency English words with their Arabic translations. In the first session, 20 pairs of English-Arabic words were presented to the participants and presentation order and position of the words in the list was counter-balanced across students (e.g., Arabic-English). The participants were asked to complete the English-Arabic directional translation test. In the second session, the sample and the procedure were identical, with another list of 20 pairs of English-Arabic words presented to the same participants. The preliminary result shows that the presentation position of the words had no effect on acquisition of English vocabulary.
Email: Bushra Aldosari, baldosar@kent.edu

(2181)

Comparing Monolingual and Bilingual Learners' Performance on a Multi-Level Statistical Learning Task. FEDERICA BULGARELLI, *The Pennsylvania State University*, LAURA BOSCH, *Universitat de Barcelona*, DANIEL J. WEISS, *The Pennsylvania State University* — Statistical learning research comparing monolinguals and bilinguals has yielded inconsistent findings, perhaps due to the types of statistics used in the experimental tasks. Consequently we tested English monolingual and Spanish-Catalan bilingual adults on a nonlinguistic visual task involving two types of statistical learning: extraction of co-occurring objects (spatial segmentation) and integration (finding correlated features that define object categories). While the groups were equivalent in both the extraction and integration components when the task only required tracking one regularity within each component, bilinguals significantly outperformed monolinguals in identifying the correlated features when there were multiple correlated features to track. These results suggest that bilingual differences in statistical learning may be specific to tasks involving integration, specifically when the learner needs to track multiple regularities.

Email: Federica Bulgarelli, fub113@psu.edu

(2182)

The Positive Influence of Elementary School English-Language Activities on Attentional Abilities and Automatization of English Stroop and Reverse-Stroop Effects: A Three-Year Cross-Sequential Study. YASUYUKI SAKUMA, *Fukushima University* — The goal of this research was to investigate the influence of an English activity, intended to familiarize children with easy spoken English, on attentional abilities and selective attentional abilities (automatization) in working memory over a three-year project by using five easy color-related words and comparing performance on first language (Japanese) and foreign language (English) versions of the Stroop (ST) and Reverse-Stroop (R-ST) tests. The participants were composed of two groups, Group 1 (the fifth-grade of the first-year project) and Group 2 (the seventh-grade of the first-year project), both of whom participated in elementary school foreign language (English) activities. The principal findings were as follows. First, attentional abilities for both languages increased proportionately with both groups. Second, regarding automatization (selective attentional abilities such as ST and R-ST effects), we found different influences depending on school grade and test (ST and R-ST).

Email: Yasuyuki Sakuma, ysakuma@educ.fukushima-u.ac.jp

(2183)

Resolving Language Co-Activation in Bilingual Speech Comprehension: ERP Evidence From Korean-English Bilinguals. PEIYAO CHEN, *Northwestern University*, SUSAN C. BOBB, *Gordon College*, NORIKO HOSHINO, *Kobe City University of Foreign Studies*, VIORICA MARIAN, *Northwestern University* — Previous studies suggest that a bilingual's languages are co-activated and compete for selection even in a monolingual context. We examined neural signatures of language co-activation and control during speech comprehension. Korean-English bilinguals and English monolinguals heard English word pairs and judged their semantic relatedness. The critical comparison was between word pairs that were unrelated in English but related across languages (e.g., "*moon – lock*", where "*moon*" sounds like Korean "door") and word pairs that were unrelated in either language (e.g., "*moon – lobe*"). ERP results revealed that greater exposure to the native language in daily life increased the degree of language co-activation in bilinguals, as indexed by a reduced N400 effect. Further, word pairs related across languages elicited a smaller late positive component than unrelated word pairs, suggesting that cross-linguistic competition prevents elaborate semantic processing in bilinguals. Together, these findings indicate that language co-activation in bilinguals is sensitive to individual differences in language experience, and that resolving cross-linguistic competition requires additional cognitive resources.

Email: Peiyao Chen, peiyaochen@u.northwestern.edu

(2184)

Rapid Changes in Cortical Activity Associated With Semantic Processing in a Newly Learned Language. ANA ZAPPA and JEAN MARIE PERGANDI, *Aix-Marseille Université*, DANIEL MESTRE and CHERYL FRENCK-MESTRE, *Aix-Marseille Université and Centre National de Recherche Scientifique* — How quickly can L2 learners begin to understand auditory sentences in a new language? The majority of ERP studies showing that L2 learners process semantic violations in sentential context similarly to natives have been performed on advanced learners. In the current study we used computer games to teach completely novice French learners a new lexicon in Brazilian Portuguese during a longitudinal 6-day study. We then tested learners' abilities to process sentences in the first days of L2 acquisition. Both pre- and post-training, participants listened to (to be) learned, semantically acceptable and semantically anomalous sentences while ERPs were recorded from the scalp. Pre-training results showed similar N400 amplitudes for all conditions. Post-training results showed greater N400 amplitudes for sentences containing semantic violations compared to learned and semantically acceptable sentences. Behavioral data corroborated this pattern. Our results belie earlier work by showing that semantic processing in an L2 can occur within days.

Email: Cheryl Frenck-Mestre, cheryl.frenck-mestre@univ-amu.fr

(2185)

Second Language Proficiency Affects Subcortical Recruitment During Executive Control Processing. ANGELA M. GRANT and PING LI, *Pennsylvania State University* — Bilingualism has been linked to improved executive control, but the mechanism of this link remains unclear. To investigate the relationship between second language acquisition and executive control, native English learners of Spanish (19 low proficiency or LP, 16 high proficiency or HP) completed a Go-Nogo task and Stop Signal task while functional magnetic resonance images were collected. Preliminary results show significant differences in executive control processing between the groups. HP learners, as compared with LP, recruited subcortical regions

including the cingulate and thalamus during Nogo trials and used linguistic areas (e.g., fusiform gyrus) more during Stop trials. In contrast, LP learners showed greater recruitment of the caudate, insula, and parahippocampal gyrus during Nogo trials and recruitment of the caudate and cingulate gyrus during Stop trials. The differential recruitment of subcortical regions between the high and low proficiency learners during these tasks is compatible with recent literature suggesting that bilingualism affects non-linguistic processing (e.g. Garbin et al., 2010). Results will be discussed in the context of current models of bilingual language control (e.g., Green & Abutalebi, 2013).
Email: Angela Grant, amc497@psu.edu

NEURAL MECHANISMS OF COGNITION I

(2186)

Common and Unique Neural Mechanisms Supporting Temporal and Social Discounting. PAUL F. HILL, AMBER M. KOCH and RACHEL A. DIANA, *Virginia Tech* — Studies using temporal and social discounting as behavioral indices of self-control and altruism, respectively, have revealed functional similarities between farsighted and other-regarding decisions. However, no studies have directly compared the neural mechanisms supporting temporal and social discounting. In this study, 26 young adults chose between receiving a small, immediate monetary reward vs. a larger, time-delayed reward (temporal trials) or allocating a larger reward to a close friend or relative (social trials) during fMRI scanning. A conjunction analysis of fMRI data from the temporal and social discounting tasks revealed common patterns of neural activity in functional networks thought to support reward valuation, cognitive control, and prospective thinking. We also observed preferential engagement of self-appraisal and mentalizing subsystems associated with social discounting and left lateralized subcortical activity during temporal discounting. These results provide novel insights into the common and unique mechanisms driving behavioral preferences across temporal and social domains.
Email: Paul F. Hill, pfhill@vt.edu

(2187)

Interpreting Ease as Truth: Fluency and the Neural Mechanisms of Illusory Truth. NADIA M. BRASHIER, WEI-CHUN WANG, ERIK A. WING, ELIZABETH J. MARSH and ROBERTO E. CABEZA, *Duke University* (Sponsored by David Rubin) — People frequently encounter misinformation in advertisements, political campaigns, and rumors. Repeating such claims may introduce and reinforce common misconceptions, like the belief that vitamin C prevents the common cold: Repeated statements seem truer than new statements, the *illusory truth effect*. Behavioral data suggest that repeating a statement makes it easier to process, or *fluent*, an experience that is interpreted as evidence of truth. The present functional magnetic resonance imaging (fMRI) study offers converging neuroimaging evidence of this mechanism. Participants rated the truth of repeated and new statements in the scanner. The perirhinal cortex (PRC), an area previously linked to fluency, was the only brain region that exhibited an interaction between repetition and perceived truth. PRC activity increased with greater truth ratings for repeated, but not new, statements. These data strengthen the fluency account of illusory truth and generalize the role of the PRC in fluency effects.
Email: Nadia Brashier, nadia.brashier@duke.edu

(2188)

Did You Hear the Melody of That Voice? Probing the Effects of Emotion and Attention on Voice Processing With EEG. ANA P. PINHEIRO, *University of Lisbon*, SONJA A. KOTZ, *University of Maastricht* — Human social communication is a complex process that relies on the dynamic interaction between verbal and non-verbal cues. Even though, in the last decades, the study of social communication was revolutionized by neuroscience methods, the brain mechanisms underlying social communication are not yet well understood. In particular, the question of how vocal emotion influences attentional processes remains to clarify. We combined event-related potential (ERP) and time-frequency EEG to probe how emotional salience is detected at both preattentive and attentive levels of voice processing. A modulatory role of stimulus valence was found on both MMN and P300 amplitude, but depended on attention. Furthermore, stimulus valence had an impact on pre-stimulus induced oscillatory activity in the beta and alpha frequency bands. Importantly, pre-stimulus oscillatory power predicted the modulation of the MMN and P300 amplitude. Our findings confirmed that the brain is tuned to detect vocal changes and that deviance detection is modulated by stimulus salience and relevance when change occurs, even when attention is focused elsewhere. They additionally suggest that vocal stimuli may be differentially processed depending on the spotlight of attention.
Email: Ana Pinheiro, ana.pinheiro@psi.uminho.pt

(2189)

Animal Representations in Superior Temporal Sulcus Reflect Their Interactive Roles. NADEEM DABBAKEH, *Texas Tech University*, MICAH B. GOLDWATER, *University of Sydney*, NICHOLAS GAYLORD, *CrowdFlower*, TYLER DAVIS, *Texas Tech University* — Superior temporal sulcus (STS) represents aspects of biological categories and is involved in biological motion processing and social perception. One recent study found the STS may also represent the dangerousness of animals. However, social neuroscience suggests that the representation of danger may be part of a broader capacity to process the interactive roles that animals can play with humans and other animals. In the current study, we scanned participants while they viewed animals and rated their size, swimming ability, potential as a pet, and predacity. Consistent with STS's social role, it activated more for interactive roles (pet and predacity) than non-interactive features (size and swimming). Furthermore, the similarity relations between activation patterns elicited for different animals were more strongly associated with pet ratings than ratings for size or swimming. Our results suggest that the STS may represent not only animals' dangerousness, but also their interactive roles more broadly.
Email: Tyler Davis, thdavis5@gmail.com

(2190)

Gesture Observation Does Not Engage High-Level Language Processing Brain Regions. OLESSIA JOURAVLEV, *Massachusetts Institute of Technology*, DAVID ZHENG and ZUZANNA BALEWSKI, *University of Pennsylvania*, SUSAN GOLDIN-MEADOW, *University of Chicago*, EVELINA FEDORENKO, *Massachusetts Institute of Technology,, Harvard Medical School, Massachusetts General Hospital* — Observation of co-speech gestures has been argued to engage brain regions that support language comprehension (e.g., Dick et al., 2014). However, those studies used traditional fMRI group analyses that can underestimate functional selectivity (Nieto-Castañon & Fedorenko, 2012). In the current fMRI study, we identified language regions in each participant individually using a language comprehension task (Fedorenko et al., 2010). We then examined their responses to auditory language comprehension accompanied by co-speech gestures or non-gesture movements, the same materials with no audio, and the audio alone. Whenever the linguistic signal was present, language regions were active. In contrast, they did not respond during the processing of silent videos. Other brain regions differentiated between gestures and non-gestures, suggesting that the manipulation was effective. In summary, contra prior claims, language regions do not respond to co-speech gestures, suggesting that gesture processing takes place outside of the fronto-temporal language network.
Email: Olessia Jouravlev, olessiaj@mit.edu

(2191)

Delta (2-3 Hz) and Theta (4-5 Hz) Oscillations During Sentence Reading in Russian. ANASTASIA STOOPS, *Columbia University*, SUSAN GARNSEY and TANIA IONIN, *University of Illinois* — Fast oscillations in beta (13-30Hz) and gamma (>30Hz) neural activity are thought to be related to the integration of syntactic and lexico-semantic information (e.g. Baastiansen & Hagoort, 2015; Baastiansen, Magyari, & Hagoort, 2010; Lewis, Wang, & Bastiaansen, 2015, among others). However, the role of slow oscillatory dynamics in the delta/theta range (<7Hz) is not well understood. In the auditory domain, delta is believed to track the sentence's acoustic envelope (e.g. Giraud & Poeppel, 2012; Ghitza, 2011), but the role of delta/theta during reading is unknown. Electrophysiological responses were recorded during reading in a language with free word order and a rich inflectional paradigm (Russian), crossing grammaticality and canonicity (SV**O**[canonical baseline]/SV**S**/OV**S**/OV**O**) while controlling for sentence and word length. Analysis of intertrial coherence (ITC) phase-locked to target word onset revealed interaction between grammaticality and canonicity in delta(2-3HZ)/theta(4-5HZ), with increased delta($p<.001$) and theta($p<.01$) levels in response to ungrammaticality in canonical order only (SVS).
Email: Anastasia Stoops, astoops@nki.rfmh.org

(2192)

Visual Memory and Metamemory Improved Following Prefrontal Theta-Burst Stimulation. ANTHONY J. RYALS, JONATHAN T. O'NEIL, ROBERT T. PALUMBO and JOEL L. VOSS, *Northwestern University Feinberg School of Medicine* — Classic feeling-of-knowing (FOK) judgments involve prospective memory monitoring after retrieval failures in order to estimate the likelihood of correctly recognizing missed items later. Little is known about the neural mechanisms underlying FOKs. Prior research implicates anterior prefrontal cortex (aPFC), with lesion evidence for left-hemisphere specialization. We administered theta-burst stimulation (TBS) to12 individuals in either left or right aPFC or a sham location on three separate days. Next we administered a visual associative-memory task incorporating global-level performance judgments and FOK judgments for misses at retrieval. Memory performance was significantly improved after right TBS compared to sham, despite significantly increased global underconfidence for right TBS compared to both left and sham. Population gamma z-scores suggest a reliable increase in FOK-based monitoring accuracy for right TBS compared to left, and a reliable decrease for left TBS compared to right and sham. Preliminary results from a follow-up experiment with healthy older-adults will be presented.
Email: Anthony Ryals, Anthony.ryals@northwestern.edu

(2193)

True Memories and False Memories for Visual Information: A Meta-Analysis of Retrieval-Related Activity in Early and Late Visual Processing Regions. JESSICA M. KARANIAN and SCOTT D. SLOTNICK, *Boston College* (Sponsored by Linda Henkel) — Prior research has given rise to the predominant view that true memories, but not false memories, activate early sensory cortex. In the present meta-analysis, we conducted a literature review to determine whether true memory and false memory for visual information produced activity in early visual regions (BA17, BA18) and late visual regions (BA19, BA37). Counter to the predominant view, we found that false memories produced activity in early visual regions under particular stimulus and task conditions (e.g., false memory for detailed spatial location information). Additionally, true memory activity was only sometimes greater than false memory activity in early visual regions, which may have resulted from similar magnitudes of activity associated with true memory and false memory. The present findings suggest that false memories can activate early sensory cortex, which calls for a revision of the predominant view. More broadly, these results challenge the potential use of fMRI in the courtroom.
Email: Jessica Karanian, jessica.karanian@bc.edu

(2194)

Semantic-Episodic Interactions During Memory Retrieval. VENCISLAV POPOV and LYNNE M. REDER, *Carnegie Mellon University* — Semantic and episodic memory retrieval are supported by two largely overlapping neural networks. However, most studies have compared them separately to non-mnemonic tasks, which prevents us from inferring how parts of these networks contribute differentially to the retrieval of semantic vs episodic information. In an fMRI experiment participants made either semantic or episodic judgments on the same stimuli. In the first phase, participants responded whether facts about famous people were true or false. Subsequently, participants responded whether intact or

recombined facts from the first phase were tested or not in the first phase. The behavioral results suggested that semantic and episodic information interact during both retrieval conditions. Univariate analyses revealed greater activation of the angular and middle temporal gyri in the semantic task, and greater parahippocampal and hippocampal activation in the episodic task. Results are discussed with respect to the interaction between semantic and episodic information during memory retrieval.
Email: Vencislav Popov, vpopov@cmu.edu

REASONING AND PROBLEM SOLVING

(2195)

Balance Between Self and Setting: Interactions Between Individual Differences and Incubation Influence Insight Problem Solving. LYUBOMIR N. KOLEV II, MITCHELL J. TIRRELL, RACHEL HATCH, and TRINA C. KERSHAW, *University of Massachusetts Dartmouth* — Periods of rest (incubation) during cognitive strain, individual differences in working memory capacity (WMC), and the ability to focus attention can all influence insight problem solving in varying ways. To test opposing findings, the present study utilized an active incubation manipulation and individual trait measures to investigate which factors influence insight problem solving. Two incubation groups attempted three problems for 30 seconds each and were then randomly assigned to a 10 minute audio condition asking them to focus (mindfulness) or disperse (mind-wandering) attention. They then attempted the problems again for 3 minutes each. A control group worked on each problem for 3.5 minutes without any rest. Incubation effects emerged for time to solution but not solution rate across groups. WMC benefitted participants only during the pre-incubation period. Interactions arose within the mind-wandering group; solution rates increased for those with daydreaming tendencies who were asked to actively daydream during incubation.
Email: Trina Kershaw, tkershaw@umassd.edu

(2196)

Why Good Thought Block Better Ones - The Mechanism of the Einstellung (Mental Set) Effect. MERIM BILALIC, *Klagenfurt University* — The Einstellung (mental set) effect occurs when the first idea that comes to mind, triggered by familiar features of a problem, prevents a better solution being found. It has been shown to affect both people facing novel problems and experts within their field of expertise.I show that it works by influencing mechanisms that determine what information is attended to. Having found one solution, expert chess players reported that they were looking for a better one. But their eye movements showed that they continued to look at features of the problem related to the solution they had already thought of. The mechanism which allows the first schema activated by familiar aspects of a problem to control the subsequent direction of attention may contribute to a wide range of biases both in everyday and expert thought – from confirmation bias in hypothesis testing to the tendency of scientists to ignore results that do not fit their favoured theories.
Email: Merim Bilalic, merim.bilalic@aau.at

(2197)

Fast Cognitive Reflection? Examining the Time Course Assumption of Dual Process Theeory. BENCE BAGO, *Paris Descartes University*, WIM DE NEYS, *CNRS* — Influential dual process models of human thinking posit that reasoners typically produce a fast, intuitive heuristic (i.e., Type-1) response which might subsequently be overridden and corrected by slower, deliberative processing (i.e., Type-2). In four experiments, we directly tested this time course assumption with the infamous bat-and-ball problem. We used a two response paradigm in which participants have to give an immediate answer and afterwards are allowed extra time before giving a final response. To knock-out Type 2 processing and make sure that the initial response was intuitive in nature, we used concurrent load and a strict response deadline on the first response. Our key finding is that we frequently observe correct responses as the first, immediate response. Response confidence and latency analyses indicate that these initial correct responses are given fast, with high confidence, and in the face of conflicting heuristic responses. Follow-up studies that tested people's response justifications further confirm that the initial correct responding is intuitive in nature. We sketch a revised dual process model in which the relative strength of different types of intuitions determines reasoning performance.
Email: Bence Bago, bencebagok@gmail.com

(2198)

Implicit and Explicit Awareness of Conflict During a Base-Rate Task Is Moderated by Strategy Choice. IAN R. NEWMAN, *University of Saskatchewan*, SIMON HANDLEY, *University of Macquarrie*, VALERIE THOMPSON, *University of Saskatchewan* — Reasoning often involves evaluating multiple pieces of information that may be inconsistent. Detection of this inconsistency has been claimed to be flawless and implicit, indicated by implicit measures of conflict detection, such as decreased confidence and increased response time. We tested this claim, using both implicit and explicit measures of awareness of evidence inconsistency in a base-rate task, where personality descriptions and base-rate ratios could suggest similar or opposite responses. Our explicit measures indicate that reasoners seem to be aware of the response conflict and self-identified response strategies map sensibly onto implicit measures of conflict detection: probability estimates, confidence measures, and response times. The degree of sensitivity to inconsistency was related to the strategy employed by reasoners to solve the problems. These data suggest that implicit measures of conflict detection are moderated by individual differences in strategy choice, and may be less diagnostic of conflict detection than previously thought.
Email: Ian Newman, ian.newman@usask.ca

(2199)

Is the Belief Bias Effect a Response Bias Effect? RACHEL G. STEPHENS, *University of New South Wales*, JOHN C. DUNN, *University of Adelaide*, BRETT K. HAYES, *University of New South Wales* — When asked to assess the deductive validity of an argument, people are influenced by the believability of the conclusion. Two competing explanations for this *belief bias*

effect have been recently proposed, based on signal detection theory. Under a *response bias* explanation, people set more lenient decision criteria for believable than for unbelievable conclusions. Alternatively, believable and unbelievable arguments may differ in subjective argument strength. Existing results can be attributed to either account, depending on whether it is assumed that people can vary their decision criteria on a trial-by-trial basis. Two new experiments tested the accounts by asking participants to assess valid and invalid causal conditional arguments or syllogisms. Conclusion-believability was manipulated either within- or between-groups. The results showed that the belief bias effect is not simply response bias. This highlights the importance of carefully considering the assumptions underlying an application of signal detection theory.
Email: Rachel Stephens, rachel.stephens.au@gmail.com

(2200)

Mechanisms Affect Preference for Simple Explanations. JEFFREY C. ZEMLA and STEVEN SLOMAN, *Brown University* — We sometimes explain an event by identifying its most likely causes. For example, a doctor may explain that a patient's rash is a result of a skin allergy. However explanations that merely identify causes can be unsatisfying. Good explanations also describe the mechanisms by which a cause leads to an effect. Mechanisms provide a fuller description of the causal system, potentially allowing more accurate inferences. While some studies have revealed a preference for simple explanations that invoke the fewest number of causes, others have shown a preference for complex, multi-cause explanations. We hypothesize that including mechanisms in an explanation modulates this preference, causing people to focus on how the effect arises, and reducing attention to the likelihood of the causes. In three experiments, we found that the inclusion of mechanisms increases preference for complex explanations relative to simple ones, in one case leading to a preference reversal.
Email: Jeffrey Zemla, jzemla@brown.edu

(2201)

Beyond Markov: Accounting for Independence Violations in Causal Reasoning. BOB REHDER, *New York University* — Although many theories of causal cognition are based on causal graphical models, a key property of such models—the independence relations stipulated by the Markov condition—is routinely violated by human reasoners. Three accounts of why people violate independence are formalized and subjected to experimental test. Subjects' inferences were more consistent with a *beta-Q* model in which people favor network states in which variables are all present or all absent than a *leaky gate model* in which information is transmitted through network nodes when it should normatively be blocked. The article concludes with a call for theories of causal cognition that rest on foundations that are faithful to the kinds of causal inferences people actually draw.
Email: Bob Rehder, bob.rehder@nyu.edu

(2202)

Scientific Explanation Is Influenced by an Inherence Heuristic. ZACHARY HORNE, *University of Illinois* and ANDREI CIMPIAN, *New York University*— Although scientific reasoning is usually deliberate, it may also be influenced by the intuitive processes involved in everyday reasoning. Here, we investigated whether the inherence heuristic in explanation (that is, the tendency to oversample easily-accessible inherent facts about the entities involved; Cimpian & Salomon, 2014) influences scientific explanation. Across six studies, children and adults (N = 1258) explained outcomes of unfamiliar experiments in physics, biology, and chemistry predominantly in terms of inherent features. These inherence-biased explanations exhibited multiple signatures of heuristic reasoning (e.g., they decreased with age). Strikingly, we also found traces of this bias toward inherence in initial explanations of phenomena from the history of science (e.g., phlogiston explains combustion); these historical explanations were obtained via a comprehensive survey of historians of science and were coded by hypothesis-blind researchers. These findings suggest that scientific explanation may be influenced by the same inherence heuristic that biases everyday explanation.
Email: Zachary Horne, horne2@illinois.edu

(2203)

The Effects of Paranormal and Superstitious Beliefs on Problem Solving Strategies. GABRIELLE LEVIN, GREG FRIEDMAN and GARY KOSE, *Long Island University, Brooklyn Campus* — The present study examines the effects of paranormal and superstitious beliefs on problem solving strategies. Ninety eight participants filled out the Revised Paranormal Belief Scale (1988), containing a subscale measuring superstitious beliefs. Participants then worked on either solvable or unsolvable word puzzles, followed by a list of ten anagram problems. Anagram sets consisted of either "nonsense" prompts (i.e., jumbled letters from which a word must be formed) or "word" prompts (i.e., a word that must be unscrambled to form a different word); nonsense anagrams have been linked to insight-based strategy and word anagrams to incremental, deliberate strategies. Participants who worked on the unsolvable problem completed significantly fewer anagrams than participants given the solvable problem. Superstitious participants given the unsolvable problem completed significantly more anagrams than non-superstitious participants in the same condition. There was an interesting interaction between anagram type and belief level in the unsolvable condition. Believers and nonbelievers may favor different anagram-solving strategies and exposure to the unsolvable problem may alter their use of these strategies.
Email: Gabrielle Levin, gabrielle.levin@my.liu.edu

(2204)

Altering Features of Interspersed Items Influences Learning Strategy and Knowledge Representation. ERIN N. GRAHAM and JERI L. LITTLE, *Hillsdale College* — Research suggests that learners can approach a single category learning task with various distinct strategies (e.g., utilizing memorization versus abstracting an underlying rule); and these differences in strategy lead to differences in what they learn. In addition to individual

predispositions, strategy selection and resulting knowledge representation can be influenced by small modifications to the training task. In the present study, we influenced strategy selection and resulting knowledge representation by interspersing six items during training that were created to focus attention on specific stimulus features; these items were designed either to focus attention on superficial details or to focus attention on information necessary for rule-based classification. Self-reported strategies, classification of novel transfer items, and memory for details all revealed that the former interspersed items facilitated memorization; the latter facilitated rule-abstraction. This study may have implications for how interspersing examples during learning can induce particular strategies and representations in other learning contexts.
Email: Erin Graham, egraha17@kent.edu

(2205)

Effects of Commonality Search on Activated Knowledge for Idea Generation. MAYU YAMAKAWA and SACHIKO KIYOKAWA, *Nagoya University* (Sponsored by Kuninori Nakamura) — Activated knowledge determines idea generation. If one activates mundane and salient features of an object, the ideas he/she generates on object use cannot be original. We hypothesized that commonality search between apparently unrelated objects can help to activate some of their non-salient features. Forty-six undergraduates were assigned to one of two conditions: commonality search and word association. While participants in the commonality search condition listed the commonalities between the apparently unrelated objects (e.g., a strawberry and a television), those in the word association condition listed as many words as they could remember from each object. The results revealed that features listed by participants in the commonality search condition were less salient than those in the word association condition. We concluded that a commonality search between apparently unrelated objects can facilitate the activation of non-salient knowledge as a basis for original ideas.
Email: Yamakawa Mayu, yamakawa.mayu@g.mbox.nagoya-u.ac.jp

(2206)

Representational Primacy: The Effects of Early Classification Training on Rule-Contingent Learning. DANIEL CORRAL and MATT JONES, *University of Colorado Boulder* — Many everyday tasks are *rule-contingent*, in that different categories of problems require different solution strategies (e.g., mathematical problem solving). In such tasks, knowing the right categories can be important for acquiring the various rules without interference. Moreover, an incorrect initial category representation may be difficult to restructure later in learning. This leads to the prediction that learning can be improved if subjects are trained to classify problems before attempting to solve them. We report two experiments in which one group of subjects was trained to classify different types of scenarios first and then trained on the full rule-contingent task, whereas the other group was trained on the full task first and then learned to classify the scenarios. Experiments 1 and 2 used relational and feature-based stimuli, respectively. After training, all subjects were given a posttest on the full task. Posttest performance showed subjects in the classify-first condition performed better in Experiment 1, but the opposite pattern was observed in Experiment 2. These findings suggest that representational primacy is critical for relational concepts, but may not be as important for feature-based learning.
Email: Daniel Corral, daniel.corral@colorado.edu

(2207)

Are Incubation Periods Always Helpful for Problem Solving? ANNIE S. DITTA and BENJAMIN C. STORM, *University of California, Santa Cruz* — An incubation effect is observed when a person attempting to solve a problem is more likely to solve it when they have two attempts separated by a break than the same total amount of time working continuously. According to the forgetting-fixation hypothesis, an incubation period allows participants to forget fixating information that would otherwise hinder their ability to solve a problem (Smith & Blankenship, 1991). We tested a counterintuitive prediction of this hypothesis—namely, that an incubation period might not elicit a problem-solving benefit if, during a long initial problem-solving attempt, participants are able to somehow inhibit or set aside fixating information. Indeed, if an incubation period allows fixating information to return, then the incubation effect might even be reversed.
Email: Annie S. Ditta, aditta@ucsc.edu

(2208)

What is the Nature of Creativity? Understanding the Role of Executive and Associative Processes in Creative Thinking. KENNY L. HICKS, RANDALL W. ENGLE and FRANCIS T. DURSO, *Georgia Institute of Technology* — Though creativity has been studied for some time, underlying mechanisms responsible for creative responses and their psychometric properties remain poorly understood. Creative thinking involves at least two facets, the ability to generate the maximum number of solutions in a given problem space (divergent thinking (DT)) as well as the ability to identify and select the best decision from the divergent process (convergent thinking (CT)). The current study investigated the relationship between these facets of creativity as well as the component processes that govern them, constructs reflecting executive control (working memory capacity) as well as associative abilities (fluency). We also assessed how well DT and CT predicted fluid intelligence. A final aim of this work was to test the relationship between the quality versus the quantity of ideas the subject generated in a divergent thinking task using a novel scoring procedure and three trained raters.
Email: Kenny Hicks, khicks6@gatech.edu

(2209)

Conflict Detection in Working Memory During Insight. SERGEI Y. KOROVKIN, ANNA D. SAVINOVA and OLGA V. LEBED, *Yaroslavl State University* — Insight process can be investigated by monitoring of actual working memory load. We use probe-task technique (selection task) to monitor working memory process as a secondary task during main problem

solving. Our results show that there are differences of working memory load in insight and noninsight problems during probe-task performance at the final stages of problem solving. We propose that various types of problems require different executive functions. Our hypothesis is that processes of error and conflict detection play specific role in insight problem solving. We verified our hypothesis comparing the dynamics of working memory load in insight problem solving via conflict probe-task. There are significant dynamics of working memory load during conflict probe-task in insight problem solving, whereas there are no significant dynamics during non-conflict probe-task. These findings indicate that conflict detection can be considered as a specific executive function at some stages of insight problem solving in contrast to sequential execution. This project is supported by RSF 16-18-10030.
Email: Sergei Korovkin, korovkin_su@list.ru

(2210)

The Skillful Dynamics of Discovery: Learning to Solve a Soma Cube. ADAM SHEYA and ASHLEY DHAIM, *University of Connecticut* — Everyday we demonstrate a profound ability to organize our activity over time and to task: we find our way to locations, we carry on conversations and we compose papers. All these tasks have clear goals but not necessarily clear plans of action. Rather it is in participating in these activities that the path to the goal is discovered. This open online coordination appears to be a characteristic of goal-directed behavior at all levels from individual motor acts to navigating to problem solving to communication, and thus, the dynamics of discovery is a fundamental aspect of cognition. In the current research, we use a model task to explore the dynamics of discovery. The task involves solving a spatial puzzle, the Soma Cube. What is important is that there are many solutions to the puzzle but none of the solutions are obvious and every solution requires multiple steps to complete. Eye, hand and head movements were tracked as participants made multiple attempts to solve the puzzle. The time series of movements showed increased structure, as measured by Recurrent Quantification Analysis, only for participants who discovered multiple solutions. This result supports the hypothesis that the participant's activity might be itself driving re-organization of the perceiving-action system in such a way to make the discovery more likely.
Email: Adam Sheya, adam.sheya@uconn.edu

(2211)

Old Hat, Useless, or Impossible? The Importance of Separating Quality Into Impact and Feasibility When Studying Real-World Creative Ideation. JOEL CHAN, *Carnegie Mellon University*, CHRISTIAN D. SCHUNN, *University of Pittsburgh* — In many real-world domains, such as engineering design, creators find it important and useful to distinguish sub-dimensions of idea creativity, such as novelty, impact (how useful the idea is for solving the problem), and feasibility (how easy it is to realize the idea). However, psychological studies of creative cognition often conflate impact and feasibility into a single "quality" dimension. We argue that this misses opportunities for deeper insights into creative cognition. In this study, we recruited sets of 6 domain experts to rate the novelty, impact, and feasibility of 318 ideas for 5 real-world social innovation problems (e.g., improving accessibility in elections). We find that all three constructs are related but statistically separable. Further, we show that distinguishing impact and feasibility yields deeper insights into two sets of findings from prior analyses of the data using a compound (binary) creativity measure: 1) ideas that build on inspirations from other problem domains are likely to be less useful (not necessarily impossible), while 2) conceptually distant combinations are likely to be less feasible (not necessarily less useful). These results demonstrate both the feasibility and theoretical importance of separating quality into impact and feasibility when studying real-world creative ideation.
Email: Joel Chan, joelchuc@cs.cmu.edu

(2212)

A Meta-Creative Approach to the Study of Individual Differences in Creative Cognition. HOLLY WHITE and EILEEN HICKS, *Eckerd College* — The study of creativity is fascinating, and, at times, maddening. Indeed, a creative approach is essential to the study of creativity (Barron, 1995). Meta-creativity challenges researchers to question assumptions and shift perspectives (Runco, 2015). The present research adopted a meta-creative approach to evaluate individual differences in divergent thinking. Undergraduate students completed two semantic fluency tasks, which were chosen specifically for their potential to induce priming and crossover effects. A mixture of conventional methods (e.g., human ratings) and innovative techniques (e.g., latent semantic analysis) were used to evaluate aspects of divergent thinking ranging from 'classic' dimensions (e.g., fluency) to conceptual expansion. Results suggested that fluency and originality, while correlated, contribute unique variance to divergent thinking measures, and originality and flexibility are predictive of conceptual expansion. We also found that different measures of flexibility may tap different conceptual dimensions of divergent thinking. Findings are discussed in terms of implications for the measurement and interpretation of creative cognitive processes.
Email: Holly White, whiteha@eckerd.edu

DECISION MAKING II

(2213)

Understanding Automatic and Controlled Intertemporal Choice With a Two-Stage Sequential Sampling Model. JOYCE WENJIA ZHAO and SUDEEP BHATIA, *University of Pennsylvania*, ADELE DIEDERICH, *Jacobs University* — We study the interplay of automatic and controlled processes underlying intertemporal choices by analyzing choice probabilities and response times (RTs). On the aggregate level, decision makers are quicker to choose immediate rewards compared to delayed rewards. On the individual level, the direction and magnitude of this tendency varies, but is correlated with standard measures of deliberative control, such as performance on the cognitive reflection task. We also fit choice probabilities and RTs using a two-stage sequential sampling model, and find that this type of model is able to describe both aggregate data and subgroup data based on

individual differences in deliberative control. The best fitting model has a short automatic stage that appears to be insensitive to time delays, and a long controlled stage that takes into account both monetary payoffs and time delays. The biases in the automatic process vary across subgroups: the automatic response of the low deliberative control group is to choose the immediate rewards, whereas that of the high deliberative control group is to choose the delayed rewards.
Email: Joyce Wenjia Zhao, zhaowenj@sas.upenn.edu

(2214)

Linking Theoretical Decision-Making Mechanisms in the Simon Task With Electrophysiological Data. MATHIEU SERVANT, *Vanderbilt University*, COREY WHITE, *Syracuse University*, ANNA MONTAGNINI and BORIS BURLE, *Aix-Marseille Université* — A current challenge for decision-making research is in extending models of simple decisions to more ecological choice situations. Conflict tasks have been the focus of much interest, because they provide a decision-making context representative of everyday life experiences. Modeling efforts have led to an elaborated drift diffusion model for conflict tasks (DMC), which implements a superimposition of automatic and controlled decision activations. This study combined DMC predictions with electroencephalographic and electromyographic measurements to test linking propositions that specify the relationship between brain activity and theoretical decision-making mechanisms involved in the Simon task. Our results are consistent with the DMC's assumed representation of the decision variable in the primary motor cortices and response agonist muscles. These findings provide new insight into the neurophysiology of human decision-making under conflict, and show how neurophysiological data can be used to augment behavioral data for testing and constraining models of cognition.
Email: Mathieu Servant, mathieu.servant@vanderbilt.edu

(2215)

Examining Choices of the Risky Future: A Cognitive Modeling Approach. EMMANOUIL KONSTANTINIDIS, *University of New South Wales*, DON VAN RAVENZWAAIJ, *University of Groningen*, SULE GÜNEY, *University of Southern California*, BENJAMIN R. NEWELL, *University of New South Wales* — Research on risky and inter-temporal decision-making often focusses on descriptive models of choice. This class of models sometimes lack a psychological process account of how different cognitive processes give rise to choice behavior. Here, we attempt to decompose these processes using sequential accumulator modeling (i.e., the Linear Ballistic Accumulator model; LBA). By combining choice data and reaction times from experiments involving risky, delayed, and risky-delayed options, our work utilizes variants of the 'preference' LBA to explore different assumptions about how preferences are formed. Specifically, we examine the extent to which subjective evaluations of now/certain choice options change as a function of delayed/risky choice options. The work highlights the advantages of using cognitive/process models in risky and inter-temporal choice, and points towards a common framework for understanding how people trade-off time and probability.
Email: Emmanouil Konstantinidis, em.konstantinidis@gmail.com

(2216)

Why Does Social Influence Increase With Group Size? A Sequential-Sampling Model Analysis of Rapid Perceptual Decisions. STEFAN M. HERZOG, *Max Planck Institute for Human Development*, RAFAEL HUBER, *PricewaterhouseCoopers Switzerland*, SEBASTIAN S. HORN, *Max Planck Institute for Human Development*, VASILY KLUCHAREV, *National Research University Higher School of Economics*, JÖRG RIESKAMP, *University of Basel* — Informational social influence on perceptual decisions increases with group size. However, the mechanisms underlying these effects remain poorly understood. Do group-size effects reflect a change in decision criteria towards the choice favored by the group (i.e., increased response tendency), enhanced facilitation of information uptake consistent with the group's opinion (i.e., increased facilitation of stimulus evaluation), or both? Using a sequential sampling model, we decomposed participants' performance in a rapid decision task, where prior to stimulus presentation, either no social information or the opinion of a small or large group was provided. Modeling results showed that social influence shifted stimulus evaluation towards the group opinion and that this effect was larger when the social information came from a large rather than a small group. In contrast, we neither found evidence for a response tendency to comply with the group's choice nor for a group-size effect on this tendency.
Email: Stefan Herzog, herzog@mpib-berlin.mpg.de

(2217)

How Many Pounds Does a Big Mac Cost in Tokyo? The Interplay Between Characteristic Compatibility and Numerical Proximity in Anchoring and Adjustment. KIMIHIKO YAMAGISHI and KOUHEI OHNISHI, *Tokyo Institute of Technology* — Since Tversky and Kahneman's (1974), numerical anchoring has established itself as a research agenda. Mussweiler and Strack (1997) showed that, for a precursor number to work effectively, compatibility between the anchor and later judgment must hold. Participants receiving the "height" information of the Brandenburg Gate later showed anchor influence when they estimated the height, yet not in the estimation of width. Wong and Kwong (2000) showed that numerical proximity between the anchor value and intended estimation value played a role in anchoring effectiveness. The current study incorporates these two factors, namely the characteristic compatibility and numerical proximity, in numerical estimation. Japanese participants first assessed if a Big Mac costs more or less than 2.7 Pounds (anchor) and then assessed how much Yen it costs. The experimental variations were familiarity with the currency, numerical proximity. Results showed that the anchor appearing in the familiar characteristic (currency) to the participants most effectively influenced

the judgment, followed by numerical proximity. We shall effectiveness desiderata for anchor information to effectively guide subsequent judgments.
Email: Kimihiko Yamagishi, yamagishi.k.aa@m.titech.ac.jp

(2218)

Nonconscious Goal Conflict Attenuates the Confirmatory Bias. AKITOSHI TOMITA, *University of Tsukuba*, SOYOGU MATSUSHITA, AKIRA YOSHIMITSU and SEIKI AKAI, *Osaka University* — We examined whether priming of goal-conflicting words improved performance on Wason's 2-4-6 task. In the priming phase, participants were exposed to words and pseudowords, and performed a lexical decision task wherein they judged whether the presented word had a meaning. The word list in the conflicting condition contained words related to an academic goal (e.g., university, grade) and a social goal (e.g., party, going out), whereas that in the control condition contained words with neutral meanings. In the test phase, participants performed Wason's 2-4-6 task. The results indicated that more participants in the conflicting condition achieved the correct answer than did those in the control condition. Additionally, participants in the conflicting condition used disconfirming evidence (eliminative induction) more frequently than did those in the control condition. Our findings demonstrated that nonconscious goal conflicts can attenuate enumerative induction in Wason's 2-4-6 task.
Email: Akitoshi Tomita, tomita.akitoshi.ge@u.tsukuba.ac.jp

(2219)

Sequentially Increasing or Decreasing Data and Relative Judgments: Assessing the Knowledge and Interests of the Judgmental Target. MASAYO NODA, *Kinjo Gakuin University* — The present study examined the influence of sequentially increasing (or decreasing) data on relative judgments, and inquired about participants' knowledge and interests of the judgmental target. In the study (N = 247), one of two tables was presented to participants. One table showed a monthly sequence of grain prices increasing, while another showed prices decreasing, with both tables meeting at the same value in the final month. The participants were asked to evaluate this value for either the increasing or decreasing table. The results showed a significant difference ($t(247) = 15.05$, $p < .001$), the price was evaluated as more expensive under the increasing condition compared to the decreasing condition. This indicated that in the increasing condition, people felt a loss because the reference point was lower than the target price. However, people felt a gain in the decreasing condition because the reference point was above the target price.
Email: Masayo Noda, masanoda@kinjo-u.ac.jp

(2220)

The Causal Mechanisms of Overconfidence - The Role of Perceived Difficulty. STEPHEN X. ZHANG, TOMAS REYES and VICTOR PEREZ-COTAPOS, *Catholic University of Chile* — Overconfidence varies by task difficulty. However individuals do not have direct access to task difficulty when performing the task; instead they *perceive* the difficulty of the task. Because individuals' perceptions influence decision-making, the role of perceived difficulty becomes particularly important on explaining the mechanisms of overconfidence. We reason and tested that perceived difficulty depends not only on the task but also on the context and individual. We find perceived difficulty partially mediates the influence of task difficulty on overconfidence, and even when task difficulty does not change, perceived difficulty influences overconfidence. This research contributes to delineate the theoretical mechanisms of overconfidence and to expand the nomological network around overconfidence.
Email: Stephen Zhang, stephen.x.zhang@gmail.com

(2221)

Cognitive Correlates of Cognitive Reflectivity. BLAIR R. K. SHEVLIN, *Towson University* (Sponsored by Kerri Goodwin) — The Cognitive Reflection Test (CRT; Frederick, 2005) was devised to evaluate cognitive reflectivity, the extent to which an individual can inhibit intuitive, Type-1 processing in favor of analytical, Type-2 thinking. Bockenholt's (2012) Cognitive Miser Response (CMR) model posits that correct responses are generated by first inhibitory processing must suppress an intuitive-incorrect response, and then performing the proper calculations. Failure at the inhibitory level generates intuitive errors, whereas improper calculations result in novel errors. The current study evaluated whether cognitive abilities differ along the lines of the CMR model. Analyses of each CRT problem showed a significant main effect, verifying that cognitive abilities varied among correct, intuitive, and novel responses. The results showed that crystalized intelligence, fluid intelligence, and numeracy most strongly differentiated the correct answer group. Reaction times and working memory capacity mostly discriminated the intuitive-response group from the novel-response group, but did not follow predicted pathways.
Email: Blair Shevlin, BlairShevlin@gmail.com

(2222)

Discounting of Delayed Gains, Delayed Losses, and Probabilistic Losses: Evidence for Subgroups With Qualitatively Different Choice Patterns. YU-HUA YEH, LEONARD GREEN and JOEL MYERSON, *Washington University in St. Louis* — 407 participants, recruited and tested online, completed Kirby's questionnaire, which involves choices between immediate and delayed monetary gains, an analogous questionnaire we developed concerning delayed losses, as well as a new questionnaire that we recently developed concerning probabilistic losses. Consistent amount effects were observed for delayed gains, but not for delayed or for probabilistic losses, replicating previous findings and providing validation of both of our questionnaires. Results also replicated our finding of qualitative differences among three subgroups of participants in regard to delayed losses, and for the first time provided evidence of three analogous subgroups that differed qualitatively in their discounting of probabilistic losses. These findings are consistent with the hypothesis that the discounting of losses is different from the discounting of gains with respect to both the processes and the traits involved.
Email: Yu-Hua Yeh, yeh.yu-hua@wustl.edu

(2223)

The Influence of Priors During Criminal Investigation on Posterior Likelihood of Guilt and Verdict. RICHARD S. JOHN, *University of Southern California*, NICHOLAS SCURICH, *University of California - Irvine*, KENNETH NGUYEN, *University of Southern California* — The American formulation of the *presumption of innocence* explicitly admonishes jurors to ignore official suspicion or indictment as evidence of guilt. A 4 x 2 mixed design experiment tested whether mock jurors (N = 355) follow this prescription by assessing their likelihood of an individual's guilt at different stages of investigation prior to trial and again after all evidence was presented. Compared to when an individual had been merely *named*, jurors thought the individual was more likely to be guilty after a detective *referred* the case to the district attorney, or when the individual was formally *charged* and thus a criminal defendant. A judicial instruction to presume innocence reduced jurors' beliefs about the defendant's guilt. However, at the conclusion of trial there were no differences in belief about the defendant's guilt among the four groups of jurors, suggesting that judicial instruction on the presumption of innocence merely removes the anticipation of evidence from jurors' beliefs until such evidence is presented. An ideographic analysis indicates that jurors with stronger *prior* beliefs about guilt had stronger *posterior* beliefs about guilt and were more likely to vote to *convict* at the conclusion of trial.
Email: Richard S. John, richardj@usc.edu

(2224)

I Want to Media Multitask Now: Individual Differences in Media Multitasking Predict Delay of Gratification and System 1 Thinking. KAREN M. ARNELL, DAN SCHUTTEN, GABRIELA SALGADO and KIRK A. STOKES, *Brock University* — Media multitasking, the concurrent use of multiple media forms, is related to greater self-reported impulsivity and reduced self-control. These measures are hallmarks of the need for immediate gratification which has been associated with fast, intuitive 'system 1' decision making. We used the Cognitive Reflection Task (CRT) to examine whether heavy media multitaskers (HMMs) differ from light media multitaskers (LMMs) in their degree of system 1 versus system 2 thinking. We also used a delay discounting measure in a hypothetical monetary choice task to examine whether HMMs and LMMs differ in delay of gratification, and looked for differences in self-reported procrastination. We found that HMMs were more likely than LMMs to endorse intuitive, but wrong decisions on the CRT, indicating a greater reliance on 'system 1' thinking, and were willing to settle for less money now relative to LMMs who were more willing to wait for the larger delayed reward. HMMs also reported a greater tendency to procrastinate, greater impulsivity, and reduced self-control. These results suggest that HMMs have a reactive decision making style that promotes current desires (money, ease of processing) at the expense of accuracy and future rewards.
Email: Karen Arnell, karnell@brocku.ca

(2225)

Integrating Time and Risk in Decision Making. DANIEL WALL, PERNILLE HEMMER and GRETECHE CHAPMAN, *Rutgers University* — Time and risk are intertwined. Recent work suggests that both risk and time fit into a psychological distance function. Further, this distance function is subadditive – e.g. the distance of risk and time evaluated together is less than the sum of the risk distance and time distance evaluated independently. This model, however, only accounts for outcome risk – e.g. a 50% chance of receiving $10. We seek to extend this model to situations with amount risk – e.g. a random amount between $5 and $10 – and the combination of amount and outcome risk. Initial evidence shows that the combination of risks has a subadditive effect on temporal discounting. These results point to a new cognitive model which integrates the types of risk as well as time. Understanding the nuanced ways in which time and risk are intertwined is important for understanding real world scenarios, such as investing.
Email: Daniel Wall, dgw42@rutgers.scarletmail.edu

ANIMAL LEARNING AND COGNITION

(2226)

From Reflexive to Volitional Processes. WILLIAM SABAN (Graduate Travel Award Recipient) and SHAI GABAY, *University of Haifa*, RAYMOND KLEIN, *Dalhousie University* — The literature has long emphasized cerebral cortex' role in endogenous attentional orienting. In this work we apply two different strategies to determine whether subcortical regions also have a functional role in endogenous orienting. With this purpose a central spatially informative cue and its ensuing target were either presented: (i) To the same eye or (ii) each to a different eye. Results demonstrated that the onset of endogenous orienting was apparent earlier at the same eye condition, indicating that subcortical regions in humans have a functional role in endogenous orienting. We also examine the endogenous orienting ability of an evolutionary older species (Archer Fish), which lacks a fully developed cortex. Unexpectedly, the fish demonstrated a human-like endogenous pattern. The fish also presented an inhibition of return, which commonly emerges in reflexive orienting tasks. These results provide a converging evidence for the evolutionary development of an endogenous attentional orienting. More broadly, these results suggest a parsimonious explanation with respect to "volitional abilities": The origin of volitional mechanisms relies on the scaffolding as well as on the reuse of older and more primitive neural structures.
Email: William Saban, williamsaban@gmail.com

(2227)

Rational Fools: Capuchins but Not Rhesus Monkeys Violate Transitivity to Maximize Their Gains in Stochastic Environments. JULIA WATZEK and SARAH F. BROSNAN, *Georgia State University* (Sponsored by Barbara Church) — Human and animal decision-making is known to violate rational expectations in a variety of contexts. Statistical structures of real-world environments may account for such seemingly irrational behavior. In a computer experiment, 16 capuchins and 7 rhesus

monkeys chose between up to three food options that delivered different amounts of pellets. We varied how frequently the options disappeared and became available again across two conditions. All subjects chose transitively ($A>B$, $B>C$ and $A>C$) in the control condition, where doing so maximized overall gain. However, all rhesus monkeys and most capuchins also adhered to transitivity in the test condition, where it was suboptimal. Only a third of the capuchins were able to maximize long-term gain by violating transitivity. Notably, choosing transitively in the test condition led to negligible losses compared to the optimal strategy. Thus, successful decision rules readily emerge in stochastic environments. Acting in line with rational choice principles may facilitate the formation of near-optimal decision rules when short-term and long-term goals align. The species difference suggests that transitivity may have evolved as a cognitive shortcut to preserve mental resources.
Email: Julia Watzek, j.watzek@gmail.com

(2228)

More Than Man's Best Friend: Effects of Dog Presence on Cognition. MACKENZIE P. SMITH and CONNIE SHEARS, *Chapman University* (Sponsored by Natalie A. Kocinik) — Research demonstrates that dog presence is associated with reduced stress levels in humans (Friedman et al, 2013; Polheber et al, 2014). Further, stress prevents humans from reaching full cognitive potential (Meijer, 2001; Northern, 2011. We investigate whether this "good feeling" from being with dogs will empirically translate to better cognition. We hypothesize that if stress reduces cognition, then cognitive scores will be lower when stress is induced. We next hypothesize that if dog presence reduces stress, then cognitive scores will be higher when a dog is present. Results show main effect on heart rate from the stress or neutral condition. Heart rate increased after stress and decreased after the neutral condition. A trend presented in pre-post cognitive scores for the dog/no dog condition. That is, cognitive scores increased more when a dog was present than when a dog was absent. Further supporting our predictions, dog presence reduced heart rate. After the stress condition, participants' heart rate decreased more when the dog was present than when dog was absent. Clearly reduced heart rate and a trend toward higher cognitive scores suggest the benefits of dog-human relations.
Email: Mackenzie Smith, smith549@mail.chapman.edu

(2229)

Evidence of Similar Reciprocity and Prosocial Behavior in Cotton Top Tamarins and Adult Humans. JULIE J. NEIWORTH and LYDIA HENDERSON, *Carleton College* — Tamarins and adult human subjects were tested in two different forced choice conditions within which they could choose to be selfish and obtain rewards only for themselves, or to share or act in an altruistic fashion and give rewards to a familiar partner at either a cost to themselves (altruism) or at no cost to themselves (sharing). This task was compounded in one phase by whether the two subjects (tamarin or human pairs) were taking alternating turns and thus had the opportunity to reciprocate immediately prosocial acts if they tracked them. Humans and tamarins behaved similarly in the tasks, choosing to be selfish more often in the altruism condition and less often in the sharing condition. Both groups matched the sharing choices of their partners, but tamarins tracked selfish behavior more and humans tracked sharing more.
Email: Julie Neiworth, jneiwort@carleton.edu

(2230)

Gambling Monkeys: The Influence of Reward Cues on Risky Decision-Making. TRAVIS R. SMITH and MICHAEL J. BERAN, *Georgia State University* — The present research involves a nonhuman primate model of gambling that captures the effects of reward cues in promoting risky-choice. Seven rhesus macaques chose between two clip-art icons, one delivering 2 pellets with 1.0 probability (safe option), the alternative delivering 8 pellets with x probability (risky option, x varying between 0.125, 0.2, 0.25, & 0.5 across phases) – with a 12 s delay between the choice and the outcome. Two conditions varied the presence or absence of reward cues. In the signaled condition, after making a risky choice, if the upcoming consequence was a win (8 pellets) then the background (cue) would flash red during the 12 s delay; if a loss (0 pellets), then a yellow cue would flash. For the unsignaled condition, the background flashed black regardless of the outcome. Overall, monkeys favored the risky option more when a reward cue accompanied the choice than when it did not.
Email: Travis R. Smith, smith.travis.r@gmail.com

(2231)

The Effects of Affective State on Capuchin Monkey (Cebus Apella) Behavior and Cognition. MACKENZIE F. SMITH and SARAH F. BROSNAN, *Georgia State University* (Sponsored by Michael Beran) — Animal models can provide important insights into the evolution of emotional processing in humans. The current study used a novel affect induction methodology to generate positive and negative affective states in 12 capuchin monkeys. Affect induction, or a control condition, was followed by a delayed matching-to-sample (DMTS) task to assess working memory. Although there was no overall significant effect of condition, contrasts revealed that DMTS scores after negative affect induction were significantly lower than the control, $F(1,11)=6.35$, $p=0.03$, $r=0.60$. There was also an overall main effect of delay $F(3,33)=9.94$, $p<0.001$, with contrasts revealing that delays of 5 seconds significantly reduced DMTS accuracy as compared to shorter periods. Finally, fewer trials were performed after positive affect induction compared to either negative affect, $F(1,11)=4.83$, $p=0.05$, $r=0.55$ or the control, $F(1,11)=6.97$, $p=0.023$, $r=0.62$. Overall, preliminary results indicate that affective state may be impacting capuchin monkey working memory and behavior.
Email: Mackenzie Smith, mfsmith018@gmail.com

(2232)

Statistical Regularities and Quantity to Humans and Rhesus Macaques. WILL WHITHAM, MICHAEL J. BERAN, CHRISTOPHER M. CONWAY and BRIELLE T. JAMES, *Georgia State University*, AUDREY E. PARRISH, *The Citadel,* DAVID A. WASHBURN, *Georgia State University* — A recent study showed that human participants systematically

underestimated the number of dots in arrays when the dots consistently co-occurred with one another (Zhao & Yu, 2016). This effect is hypothesized to have occurred because the consistently co-occurring pairs of dots were learned, chunked together, and perceived as single units. In the present study, we first aimed to replicate the findings of Zhao and Yu (2016) in a relative, rather than absolute, quantity discrimination task. Twenty-two human participants were asked to make 300 speeded judgments of the larger of two dot arrays. On each trial, one of the two dot arrays contained statistically regular pairs, while the other did not. Participants were found to have underestimated the numerosity of arrays with regularities in the final 100 trials. We are currently exploring whether statistical learning similarly affects numerosity judgments in rhesus macaques (*Macaca mulatta*).
Email: Will Whitham, will.t.whitham@gmail.com

(2233)

Traveling in Virtual Space: Comparing the Navigational Decision-Making Strategies of Chimpanzees, Bonobos and Humans. FRANCINE L. DOLINS, *University of Michigan-Dearborn*, CHRISTOPHER KLIMOWICZ, *University of Michigan-Ann Arbor*, CHARLES R. MENZEL, *Georgia State University* — Foraging primates localize resources in space across ecologically complex landscapes and exploit feeding sites to balance navigational efficiency with nutrient intake, seasonal availability, competition and group size. Efficient routes between resource sites are essential in reducing energy costs. Using virtual reality (VR), the present study tested three primate species' navigational strategies comparing responses by environment, species, age, attention to landmarks and travel efficiency. We compared 4 chimpanzees, 1 bonobo, with 20 humans (varying ages) in parallel virtual environments varied in scale and complexity. We predicted no differences in navigational strategies between species, but with age, differences would be exhibited in spatial strategy, travel efficiency and attention to landmarks. Results indicate that participants of all age groups applied topological strategies. The younger children and two chimpanzees in particular exhibited decreased performance with increased environment complexity. No participants demonstrated shifts in spatial strategy in relation to scale, complexity or landmark distribution.
Email: Francine Dolins, fdolins@umich.edu

(2234)

Social Influence on Rat Spatial Choice: Information vs. Affiliation. MICHAEL F. BROWN, KELSEY A. HESLIN and MARIE E. SAXON, *Villanova University* — Previous experiments show that both the outcome of a rat's own spatial choices ("personal information") and the choices made by an informed model rat ("social information") control choices in a spatial search task. In the present experiments, the location of food was cued by personal information but baited locations differed in the hedonic value of the hidden food. Information about the hedonic value of the food hidden in each baited location was available only socially. Because some model rats provided the information about hedonic value and others did not, we were able to investigate whether control of choices by the social information depended on its validity; i.e., did rats only follow other rats when their choices provided information about the location or value of hidden food. The results indicate that social influences on spatial choices are a matter of social information but there are limits on the resolution of that information.
Email: Michael Brown, michael.brown@villanova.edu

(2235)

Statistical Learning of Nonadjacent Associations: A Comparative Study With Baboons and Humans. RAPHAËLLE MALASSIS, ARNAUD REY and JOËL FAGOT, *Laboratoire de Psychologie Cognitive - CNRS & Aix-Marseille University* — When presented with complex sequences involving both adjacent and non-adjacent associations, animals and humans rely preferentially on adjacent associations (e.g., Wilson et al., 2015). In the present study, we tested nonadjacent association learning (i.e., the ability to learn the association between A and B elements over a variable intervening element X), when the predictive relationships between nonadjacent elements were stronger than those between adjacent elements. Humans and baboons were tested in a serial response time task. They were presented with sequences of 3 spatial locations. Location 1 predicted Location 3 while Location 2 varied. Results showed that the leaning patterns of the two species were similar: they extracted the nonadjacent associations after the same (small) amount of exposure. In an additional experiment, baboons generalized their performance over novel intervening locations. These results suggest that baboons, like humans, were able to extract nonadjacent associations when adjacent associations were unreliable.
Email: Raphaëlle Malassis, raphaelle.malassis@gmail.com

(2236)

Flexible Use of Social Information and Learning in Zebrafish. NOAM MILLER and RAMY AYOUB, *Wilfrid Laurier University* — Animals that live in groups, including humans, spend much of their time in close proximity to conspecifics. There are many reasons for this, including enhanced safety from predation and the possibility of taking advantage of social information. These two differing motivations for grouping have not previously been experimentally distinguished. We trained individual zebrafish (Danio rerio) to either approach or avoid a group of conspecifics for a food reward and show that fish learn either task equally quickly. A control group learned to locate food based on environmental cues more quickly, and was better at test, than either social group. These results demonstrate that grouping behavior can be modified by learning and that some of the drivers of grouping can be placed in conflict with each other and thus differentiated. There are many reasons to congregate and they are likely subserved by several different mechanisms.
Email: Noam Miller, nmiller@wlu.ca

(2237)

Metacognitive Illusions in Monkeys: The Effects of Perceptual Fluency on Confidence Judgments. STEPHEN FERRIGNO, *University of Rochester*, NATE KORNELL, *Williams College*, JESSICA F. CANTLON, *University of Rochester* — Humans have

the remarkable ability to judge the accuracy of their own thoughts in that they can report how likely they are to successfully solve a problem. Humans often use cues like perceptual fluency (how easy something is to see) when makings these metacognitive decisions. Like humans, monkeys can make accurate confidence judgments about their own performance using computerized memory tasks. Some have suggested that animals use associative learning during those tasks, while others have suggested animals have direct access to their memory and use internal estimates of their own uncertainty. Here we introduce a third, non-exclusive, possibility: perceptual fluency. We tested monkeys with a perceptual manipulation (image contrast) in a match-to-sample gambling task to test whether like humans, monkeys use perceptual fluency to make confidence decisions. We show that monkeys' gambling performance is affected by perceptual fluency and cannot be accounted for by associative learning models or direct access accounts.
Email: Stephen Ferrigno, sferrigno@rcbi.rochester.edu

(2238)

Tool Use and Metacognition in Chimpanzees. BONNIE M. PERDUE, *Agnes Scott College*, THEODORE A. EVANS and MICHAEL J. BERAN, *Georgia State University* — Metacognition refers to thinking about one's thinking and research suggests that this ability may be shared with nonhuman animals. Here we tested chimpanzees using a combination of an information-seeking task and a tool use task. We found that when effort was required, subjects typically used the tool to gain relevant information (that could be used at a later time to obtain the food) only when they did not have access to that information. We also found that one chimpanzee could make inferences about the location of food – even when it was never shown – and make appropriate responses with the tool. All chimpanzees responded appropriately when more than one food type was hidden and they had to use different information to obtain the best food type. This indicated that their behavior was not the result of a simplistic, rule-based decisional approach, but required the integration of knowledge in a variety of parameters.
Email: Bonnie Perdue, bonnie.m.perdue@gmail.com

(2239)

Discrimination of Conspecific Behaviors by Pigeons (Columba Livia). ASHLYNN M. KELLER, MUHAMMAD A.J. QADRI, JOANNA L. KORNSTEIN and ROBERT G. COOK, *Tufts University* — As a highly social species, pigeons need to differentiate and categorize a variety of conspecific behaviors to facilitate an appropriate response. Using video-recorded stimuli, three pigeons were trained to discriminate between videos and static frames of two behaviors (courtship versus walking) in a go/no-go paradigm. Reinforcement was contingent on both behavior and display condition (dynamic videos versus randomly-selected static frames). During acquisition a dynamic superiority effect was found similar to previous studies using digitally rendered actors. After extensive training, however, five feature manipulations suggested the birds were primarily relying on static feature processing in both display conditions. The implications for biological models of action recognition and discrimination will be discussed.
Email: Ashlynn Keller, Ashlynn.Keller@tufts.edu

(2240)

Establishing a Link Between Personality Traits and Social Rank in a Group of Bottlenose Dolphins (Tursiops Truncatus). ERIN E. FRICK, *University of Southern Mississippi*, HOLLI C. ESKELINEN, *Dolphins Plus*, STAN A. KUCZAJ, *University of Southern Mississippi* — The present study investigated the relationship between personality and social rank within a group of captive bottlenose dolphins (*Tursiops truncatus*) housed at the Roatan Institute for Marine Science (RIMS). Social rank was established utilizing questionnaires distributed to experienced RIMS personnel. Personality traits were derived from ethological behavioral coding using context-specific correlational matrices (i.e., interaction with other dolphins (DID), environment (DIO), human (DIH)). Traits were correlated to each dolphin's social rank position using Spearman rank order correlation coefficient. Traits that emerged revealed sex-related differences. Sexual (DID), contact seeking (DIO), and camaraderie (DID) significantly impacted social rank for males, while playful (DIO) and evasive (DIH) traits significantly related to social rank for females. Results suggest that a relationship between personality and social status is complex. Factors such as age, sex, maternal style, strength of associations, and interactions between hierarchies influence how rank related traits are expressed in different behavioral contexts.
Email: Erin Frick, erin.frick@usm.edu

(2241)

The Nonhuman Rights Project: Lack of Public Support? MITCHELL METZGER and DENDARA OAKLEAF, *Ashland University* — The Nonhuman Rights Project (NHRP) is an organization seeking legal rights for nonhuman species such as chimps, great apes, elephants, and certain marine species, with the goal of freeing these creatures from captivity. While a New York court recently ruled against the NHRP, a court in Argentina has ruled in favor of a zoo-held orangutan. The NHRP has vowed to continue domestic litigation until they achieve their goal of freeing these species from captivity, which could significantly change the interaction between humans and animals. Therefore, the public's perception of this issue will become increasingly valuable, especially if these lawsuits are eventually successful. This study surveyed 200 participants from across the country to determine public attitudes toward the NHRP mission. One-sample t-tests indicated that this sample did not agree with the NHRP, and is more concerned with protecting human rights as opposed to legal rights for some animal species.
Email: Mitchell Metzger, mmetzger@ashland.edu

FUNDING FROM US DEPARTMENT OF EDUCATION

(2242)

Funding Opportunities for Cognitive Psychologists Through the Institute of Education Sciences. ERIN HIGGINS, *Institute of Education Sciences* — The Institute of Education Sciences provides funding support for researchers to apply theories and recent findings from psychological science to education practice through the National Center for Education Research and the National Center for Special Education Research. For example, through the Cognition and Student Learning topic within the Education Research Grants program, the Institute supports research that capitalizes on our understanding of how the mind works to inform and improve education practice in reading, writing, mathematics, science, and study skills. Erin Higgins, the program officer for the Cognition and Student Learning topic, will be available to answer questions and talk to attendees about their proposed work at the Friday night and Saturday at noon poster sessions.
Email: Erin Higgins, Erin.Higgins@ed.gov

DIGITAL CONTENT EDITOR POSTER

(2243)

The Psychonomic Society and Social Media: Putting the Public Into Science and Making Science Public. STEPHAN LEWANDOWSKY, University of Bristol (Digital Content Editor), and the PSYCHONOMICS DIGITAL TEAM — The Psychonomic Society has been extending its digital presence for the last two years, and our blog posts at www.psychonomic.org have gathered a growing readership. Two "digital events" carried the scientific discussion from special issues of the Psychonomic Bulletin & Review into the public domain, and some of the Society's research has elicited increasing media interest. At a time when science and scientists are increasingly subjected to scrutiny by the public, politicians, and other stakeholders, the Society is committed to provide the public with information about its research and to solicit public commentary. Join the digital team at our poster to contribute to the discussion and to learn more about the Society's engagement on digital and social media.
Email: Stephan Lewandowsky, Stephan.Lewandowsky@bristol.ac.uk

POSTER SESSION III

Friday Evening
Hynes Convention Center, Grand Ballroom A-C
Viewing 4:00-7:30, Author Present 6:00-7:30

VISION

(3001)

Characteristics of Variance Perception in Multi-Dimensional Stimuli. SACHIYO UEDA, *Ochanomizu University*, REIKO YAKUSHIJIN, *Aoyamagakuin University*, AKIRA ISHIGUCHI, *Ochanomizu University* — Human observers extract the statistical information of environment to interpret them effectively. In particular, the variances are very important information because they reflect the diversity (or variety) of objects or people in the environment, which can be used to decide the observer's succeeded behavior. In recent years, it has been explored the ability to perceive variances in a single stimulus property. In real life, however, many objects consist of several properties. It is needed to examine the characteristics of variance perception of multidimensional stimuli. In this study, we conducted an experiment using stimuli defined in two properties (e.g. gabor patch which changes both orientation and size) to examine whether the variance of ignored property could effect on perceiving the variance of the other (target) property. PSE and precision of variance discrimination task showed the interaction between two properties in variance perception of multi-dimensional stimuli.
Email: Sachiyo Ueda, ueda.sachiyo@ocha.ac.jp

(3002)

Losing Focus: Binocular Gaze Divergence Reveals Mind Wandering. TAD T. BRUNYE and AMANDA HOLMES, *Tufts University* — Darwin (1872) proposed that being "lost in thought" involved divergence of the eyes, as if one were fixated on a point beyond the binocular horopter. The present study used eye tracking to test whether binocular divergence beyond the computer monitor's horopter would correlate with subjective reports of mind wandering to task-unrelated thoughts. Experiment 1 used a visual vigilance task involving the odd/even categorization of digit targets; three task versions contained 12%, 50%, or 88% target density. At task completion, we probed for retrospective mind wandering. Experiment 2 used the same task, but asked participants to spontaneously report mind wandering during the task. In both experiments, an eye tracker was used to monitor lateral divergence of binocular gaze. Results demonstrated more frequent mind wandering with lower target density, the eye tracker's sensitivity to binocular divergence, and potential value of this measure for objectively revealing perceptual decoupling and mind wandering.
Email: Tad Brunye, tbruny01@tufts.edu

(3003)

A Visual Path to the Universe. LAUREL THOMPSON, *Metropolitan State University of Denver* — Visual space research is limited to three-dimensional space because that is what humans normally perceive. But physical space research reveals that we live in the universe which contains all of time and space, plus numerous objects and phenomena that do not resemble anything we experience here on Earth. It is thought that the only way to glimpse this larger reality is through telescopes. However, by paying close attention to things on the surface of Earth as anchor points, and by linking them up with a cognitive map of the universe, a door opens. This door reveals the presence of the universe here on Earth. It also gives observers a new awareness that they are being regarded. Things are complex visual/physical entities. Visual space researchers should use them to expand their research to include more than just three-dimensions.
Email: Laurel Thompson, laurelcleugh@icloud.com

(3004)

Emotional Face Processing in Hearing and Deaf Bilinguals. MATTHEW W. DYE, *Rochester Institute of Technology/National Technical Institute for the Deaf*, JUNPENG LAO, *University of Fribourg*, CHLOÉ STOLL and OLIVIER PASCALIS, *Université de Grenoble Alpes*, ROBERTO CALDARA, *University of Fribourg* — Emotional face processing was compared in 30 hearing bilingual adults and 36 deaf bilingual adults with early access to natural language – spoken or signed. In separate blocks, observers categorized (a) emotional faces drawn from morphed continua, and (b) faces with varying degrees of uniform white noise added. Psychometric functions were derived from identification accuracies and used to compute 75% intensity thresholds and signal thresholds respectively. A multivariate ANOVA revealed a significant main effect of emotional category and two-way interaction between emotional category and deafness. Mean inspection suggested a trend for deaf observers to have higher intensity and signal thresholds for both anger and disgust faces, with the opposite trend for other emotional face types. However, independent t-tests revealed no significant effects of deafness on intensity or signal thresholds obtained using emotional expressions of anger or disgust.
Email: Matthew Dye, mwddls@rit.edu

(3005)

Males Perceive Females as More Attractive When in a Group Rather Than Alone. YURI HATTORI, AKIKO MATSUO and ATSUNOBU SUZUKI, *Nagoya University* — The cheerleader effect refers to the phenomena that a person (face) in a group seems more attractive than the one in isolation. The present study aimed to distinguish the cheerleader effect from other well-known context effects on attractiveness judgment, i.e., assimilation and contrast effects. Participants rated physical attractiveness of female faces. On each trial, a target face was presented alone (isolation condition) or with two other faces (group condition). The two conditions were manipulated as a within-subject factor (Experiment 1) or as a between-subject factor (Experiment 2). Critically, the faces in each triplet in group condition were made as similar as possible in terms of physical attractiveness (based on ratings from a pilot study) to minimize

assimilation and contrast effects. In both Experiments 1 and 2, the cheerleader effect was significant only in male participants. The results suggest gender differences in the cheerleader effect.
Email: Atsunobu Suzuki, atsuzuki@nagoya-u.jp

(3006)

Accuracy of Ensemble Summary of Facial Expressions. YOSHIYUKI UEDA, *Kyoto University* — People can extract some kind of statistical summary from multiple faces. Face recognition is instantly achieved although facial features are complicated. Previous studies suggest that high-level ensemble representations (e.g., facial expression) are independent from low-level ensemble representations (e.g., color), that this effect is achieved based on presented stimulus distribution. This study investigates how precisely people can perceive average facial expressions. Participants were presented 12 faces expressing happy/angry and neutral simultaneously, and asked to judge which expression was in the majority. The more emotional faces were presented, the more often participants judged that more of them had appeared than had neutral faces. However, participants did not accurately judge that emotional faces were in the majority as soon as the number of them became more than half, suggesting that precise average expressions were not perceived. Additional experiments suggest that perceived average expression was based on subsampling rather than on whole presented faces.
Email: Yoshiyuki Ueda, ueda.yoshiyuki.3e@kyoto-u.ac.jp

(3007)

Scaling in 2D Distance Assessment. STEPHEN DOPKINS and DARIN HOYER, *The George Washington University* — We report three instances of scaling in the assessment of 2D distances: 1) Discrimination is better when participants judge distance along the vertical than the horizontal meridian. The threshold is lower for vertical than for horizontal judgments when the judgments are made separately but not when they are made together. 2) Discrimination is better for judgments along the vertical or horizontal meridian when 13 as opposed to 5 levels of distance are tested. 3) Judgements of vertical or horizontal distance to pairs of locations that vary on the vertical and horizontal dimension reflect both the vertical and horizontal distance between the locations, with the effects of *relevant* distance being greater under some circumstances (e.g. more processing time, greater dispersion of test locations on the irrelevant dimension) than the effects of *irrelevant* distance. We suggest that the distance between two locations reflects the number of *attentional receptive fields* (Tsal & Shalev, 1996) between their representations and that our results reflect the configuration of these receptive fields. We offer some specific models of the distance assessment process.
Email: Stephen Dopkins, dopkins@gwu.edu

(3008)

The Temporal Resolution of Visual Perception for Aversive Stimuli. KEVIN H. ROBERTS, ALAN KINGSTONE and REBECCA M. TODD, *University of British Columbia* (Sponsored by Jim Enns) — The perceived duration of a visual stimulus is known to be modulated by the affective salience of the stimulus. Given that affective stimuli influence duration judgements, one might expect a similar affective modulation of the temporal resolution of visual perception. In this experiment, we conditioned participants to respond aversively to shape stimuli. Next, we used a two-alternative forced choice (2AFC) paradigm which presented aversively conditioned and unconditioned shape stimuli that were either flashed once (variable duration 90-130ms) or twice (variable 10-50ms "off" state between 40ms "on" states). After each trial, participants judged whether there was one or two flashes displayed. Psychometric curves were fit to participant response data for two-flash trials separately for aversive and neutral shape stimuli. The magnitude of the effect of aversive stimuli on the temporal resolution of visual perception is discussed in terms of the influence on psychometric curve parameters.
Email: Kevin H. Roberts, kevin.roberts@psych.ubc.ca

(3009)

Using Reaction Time Modeling of Forced-Choice and Same-Different Perceptual Decisions to Test a Race Model of Priming. KEVIN W. POTTER, *University of Massachusetts Amherst*, *CHRIS DONKIN, *University of New South Wales*, DAVID E. HUBER, *University of Massachusetts Amherst* — With immediate repetition priming of forced choice perceptual identification, short prime durations produce higher accuracy when the target is primed, but lower accuracy when the foil is primed. Long prime durations reverse this pattern. The nROUSE model of Huber and O'Reilly (2003) captures the time course of this transition from positive to negative priming via neural habituation. In the model, choices are made based on a race process and specific predictions are made regarding how rapidly the target and foil choices are identified. To examine the model's assumptions regarding the race process, we collected both forced-choice and same-different responses in the same priming paradigm. We fit a diffusion-race model, and the drift rate parameters implied by the single-item same-different task provided an adequate account of the relative comparison data from the forced-choice task. Furthermore, these drift rates were inversely proportional to the identification latencies of the nROUSE model even though the nROUSE and diffusion-race models were applied independently to the data. The consistency across tasks and across models lends support for the core assumptions made by the nROUSE model of perceptual priming.
Email: Kevin Potter, kevin.w.potter@gmail.com

(3010)

Analyzing Preattentive Visual Mechanisms via the Superthreshold Contrast Paradigm. KIER GROULX and CHARLES CHUBB, *University of California, Irvine* — Many studies have sought to probe preattentive mechanisms in human vision by measuring texture differences that support threshold discrimination. However, threshold equisalience contours offer little insight into mechanisms because they are determined primarily by the distribution of the noise limiting performance. We sidestep this problem by measuring superthreshold equisalience contours. Textures were grayscale scrambles whose histograms differed in mean and variance. On each

trial the participant judged (without feedback) which of two texture patches differed with greater salience from uniformly distributed grayscale scramble. The resulting equisalience contours implicate three mechanisms: a *light-only* mechanism activated only by positive Weber contrasts, an analogous *dark-only* mechanism, and a *gray-tuned* mechanism selective for elements of low absolute Weber contrast. These findings are supported by previous research and suggest this paradigm can may be useful for uncovering other visual mechanisms.
Email: Kier Groulx, kgroulx@uci.edu

(3011)

Confidence Influences Perceived Distance to Goal-Related Stimuli. BENJAMIN R. KUNZ, LUCAS A. KEEFER, SIERRA F. CORBIN and EMILY WRIGHT, *University of Dayton* — Individuals commonly describe goal-oriented behaviors metaphorically as forward movement. Research demonstrates that these metaphors influence spatial cognition and action (e.g. success-themed words facilitate forward motion). We tested the possibility that thinking of abstract goals with spatial metaphors influences visual perception. Participants were asked to rank goals and to consider their most important goal using a spatial metaphor or not. They then rated their confidence in ability to achieve that goal and estimated the distances to goal-relevant and goal-irrelevant target words. Although there was no effect of the spatial metaphor on judged distance to goal-relevant words, participants who felt more confident that they could achieve their top goal saw related target words as closer, but this effect did not extend to words related to other candidate goals. Confidence is associated with seeing goal-specific stimuli as closer, adding to a growing literature on the non-visual factors shaping spatial perception and cognition.
Email: Benjamin R. Kunz, bkunz1@udayton.edu

(3012)

Perceived Rate of Visual Pulsation Is Strongly Affected by Concurrent Task-Irrelevant Vibrotactile Pulsation. MAXIM A. BUSHMAKIN and ROBERT SEKULER, *Volen Center for Complex Systems, Brandeis University* — Selectively attending to input from one modality while ignoring input from another modality is crucial in many everyday situations. To examine this ability, we asked subjects to categorize the rate of visual pulsation while ignoring accompanying, non-informative task-irrelevant vibrotactlie pulses. A hand-held tablet presented a simple visual stimulus whose size fluctuated at either 4 or 6 Hz. Visual stimuli were paired with vibrations generated within the tablet, also at either 4 or 6 Hz. Categorizing visual rate as "fast" or "slow" was more accurate with matched rates of visual and vibrotactile stimuli than with mismatched rates. Accuracy and reaction times were modeled using Linear Ballistic Accumulator for differential rates and boundaries during accumulation of perceptual information. Finally, the tablet's built-in accelerometer allowed us to evaluate pre-response uncertainty in subjects' judgments.
Email: Maxim Bushmakin, mbushmak@brandeis.edu

(3013)

Measuring Temporal Integration in Visual Detection Using a Single-Photon Source. REBECCA HOLMES, MICHELLE VICTORA, FRANCES WANG and PAUL G. KWIAT, *University of Illinois at Urbana-Champaign* — We measured the duration of temporal integration near the visual detection threshold, using a novel light source developed in the field of quantum optics for generating small numbers of photons with precise timing characteristics, including the ability to produce no more than one photon at a time. Dark-adapted participants judged whether a light was presented to the left or right of their fixation in each trial. The stimuli contained a stream of single photons delivered at a constant rate while the duration was systematically varied. Accuracy should increase with duration as long as the later photons can be integrated with the proceeding ones into a single signal. The temporal integration window was estimated as the point after which performance no longer improved. The efficiency of the integration was also explored.
Email: Rebecca Holmes, rholmes4@illinois.edu

(3014)

The Ups and Downs of Holistic Body Processing: Differences in Orientation Specificity for Short- and Long-Term Memory Tasks. JOHN E. MCGOLDRICK, *University of Denver*, CATHERINE L. REED, *Claremont McKenna College*, CINDY M. BUKACH, *University of Richmond* — The perception of body posture requires the interaction of perceptual inputs with the long-term spatial body image. Here we investigated how holistic processing of body postures may differ for tasks with differential working memory and long-term memory requirements. In Experiment 1, we emphasized perceptual inputs by examining upright and inverted posture recognition using a sequential body-posture matching task with whole vs. scrambled body masks. Scrambled body masks disrupted upright but not inverted body recognition, suggesting that holistic processing of bodies during perception is orientation-specific and may involve orientation-specific posture simulation. In Experiment 2, we emphasized long-term posture representations in a part-whole task for upright and inverted body postures. Regardless of orientation, body parts were recognized better within the context of a whole body than in isolation, suggesting long-term holistic body representations are less orientation dependent. Together these experiments suggest differential roles for the body image in STM and LTM.
Email: Cindy Bukach, cbukach@richmond.edu

(3015)

The Cockeyed Thatcher Effect: The Relationship of Global and Local Feature Orientations Affects Face Processing. ANTHONY S. BARNHART, *Carthage College*, STEPHEN D. GOLDINGER, *Arizona State University*, ALEKSANDRA M. STEINERT, *Carthage College* — We present a novel variation on Thompson's (1980) Margaret Thatcher Effect, inspired by a finding from word perception. When handwritten words are rotated 90° in the same direction as their natural tilt, they are far more difficult to read, relative to when they are rotated 90° in the opposite direction, suggesting that the orientation of

internal features influences holistic processing. In the Cockeyed Thatcher Effect, instead of rotating individual facial features 180°, we tilted them at oblique angles (27°). When these images are rotated in a direction consistent with their featural tilt, it becomes more difficult to appreciate that the images have been manipulated, relative to rotation in the opposite direction. We verified this phenomenological impression in a perceptual categorization experiment. Taken together with findings from word perception, our results suggest that the Thatcher Effect reflects a domain-general strategy for processing complex stimuli with canonical orientations, not a face-specific tendency.
Email: Anthony Barnhart, abarnhart@carthage.edu

ACTION AND PERCEPTION II

(3016)

Chewing Gum Diminishes the Incidence of Contagious Yawning. KALEIGH ENGERT and ANDREW C. GALLUP, *State University of New York at Oneonta* — Chewing gum and yawning are often considered inappropriate behaviors in social settings, yet both seem to provide cognitive benefits to the actor. Previous research shows that chewing gum enhances cognitive performance on certain tasks, and yawns appear to promote cortical arousal and state change via brain cooling. These outcomes are likely a consequence of both actions producing mandibular contractions that enhance cerebral blood flow. Given these connections, we hypothesized that chewing gum would inhibit the expression of contagious yawning. A total of 66 participants were randomly assigned to a control, mint or gum chewing condition and then asked to view a yawning stimulus while they were recorded. Consistent with our predictions, chewing gum, but not sucking on mints, significantly reduced the incidence of yawning compared to the control condition ($p < 0.001$). Despite the negative public perception, growing evidence suggests that yawning, much like gum chewing, may improve cognitive performance.
Email: Andrew C. Gallup, a.c.gallup@gmail.com

(3017)

Alignment Effects in Beer Mugs: Automatic Action Activation or Response Competition? SANDER A. ROEST, DIANE PECHER, LILIAN NAEIJE and RENÉ ZEELENBERG, *Erasmus University Rotterdam* — Responses to objects with a graspable handle are faster when the response hand and handle orientation are aligned (e.g., a key press with the right hand is required and the object handle is oriented to the right) than when they are not aligned. This effect could be explained by automatic activation of specific motor programs when an object is viewed. Alternatively, the effect could be explained by competition at the response level. Participants performed a reach and grasp or reach and button press action with their left or right hand in response to the color of a beer mug. The alignment effect did not vary as a function of the type of action. In addition, the alignment effect disappeared in a go/no-go version of the task. The same results were obtained when participants made upright/inverted decisions, so that object shape was task-relevant. Our results indicate that alignment effects are not due to automatic motor activation of the left or right limb.
Email: Sander. A. Roest, roest@fsw.eur.nl

(3018)

Caloric Vestibular Stimulation Facilitates Spatial, but not Visual, Perspective-Taking. GALINA DONEVSKA and VICTORIA BRUNSDON, *University of Kent*, ANDREW SURTEES, *University of Birmingham*, HEATHER J. FERGUSON, *University of Kent* — Several vestibular areas overlap with those involved in perspective-taking (Deroualle & Lopez, 2014). This study investigated whether caloric vestibular stimulation (CVS) would enhance perspective-taking, specifically level-2 perspective-taking due to the hypothesised involvement of mental rotation in these processes (Surtees et al., 2013). Thirty participants completed a two-part study. In both sessions, participants wore a thermoneuromodulation device. In one session, the device delivered active CVS. In the other session (counterbalanced), the device delivered sham CVS. During both sessions, participants completed a mental rotation task, an inhibition task, and a perspective-taking task with four conditions (visual/spatial X level-1/level-2). Overall, findings replicated Surtees et al.'s results. Additionally, active CVS facilitated mental rotation processes in spatial perspective-taking (not visual). However, there was no effect of CVS for the mental rotation or inhibition task. Therefore, vestibular stimulation seems to facilitate the speed at which someone can mentally rotate to another person's perspective.
Email: Heather Ferguson, h.ferguson@kent.ac.uk

(3019)

Visual Attention to Self-Caused Distractors: Further Tests of the Sensory Preactivation Theory. DAVOOD GOZLI and BERNHARD HOMMEL, *Leiden University*, JAY PRATT, *University of Toronto* — Once an action-effect contingency is learned, performing the action alone activates the internal response to the learned sensory effect. Two seemingly paradoxical predictions are derived from this assumption; (1) a stimulus that matches the preactivated response is at a temporal advantage, and (2) the preactivation reduces the contribution of stimulus-driven response. In a series of visual attention experiments, we associated distractor features to participants' own actions. We found that when target-distractor competition depends primarily on the temporal advantage of distractors over target, then distractors that match the learned action-effect influence performance more than mismatching distractors. By contrast, when target-distractor competition depends on sensory salience of the stimuli, then distractors that match the learned action-effect influence performance less than mismatching distractors. These results support the preactivation theory and provide a basis for more precise predictions about the different treatment of self-caused and externally caused events.
Email: Davood Gozli, d.ghara.gozli@fsw.leidenuniv.nl

(3020)

Contrast Sensitivity Function Near the Hand. JONGSOO BAEK, *Yonsei Institute of Convergence Technology, Yonsei University*, DO-JOON YI, *Yonsei University* — Recent studies have reported enhanced visual representation near the hands. These studies measured observers' performance to stimuli with a fixed spatial frequency. In the present study, we measured the full contrast sensitivity function (CSF), perceptual sensitivity as a function of spatial frequency of stimuli, either near or far from the hand. Observers performed an orientation discrimination task for Gabor patches using a keypad either near the monitor ('near-hand condition') or far from the monitor ('far-hand condition'). As results, observers' CSFs tended to be shifted towards higher spatial frequency with narrower bandwidth in the near-hand condition, relative to the far-hand condition. This finding indicates that contrast sensitivity was enhanced in higher spatial frequency near the hands and suggests that the visual system is tuned to high spatial frequency for objects near hands in order to extract detailed visual information from them.

Email: Jongsoo Baek, Jongsoo.Baek@gmail.com

(3021)

Learning Movements From a Virtual Instructor: Effects of Perspective, Immersion, and Expertise. JASPER LAFORTUNE and KRISTEN L. MACUGA, *Oregon State University* — To investigate the format of action representations, we examined the effects of perspective (first person versus third person) and immersion (immersive virtual reality versus a nonimmersive display monitor) on motor performance and learning. We also evaluated whether these effects were modulated by experience. Experienced dancers and novices practiced dances by imitating a virtual instructor and then, following a delay, had to perform the dances from memory without the instructor present. Accuracy for both practice and test trials was video coded and analyzed. In line with theoretical models of motor learning, mean accuracy increased across successive trials in accordance with the power law of practice. First person perspective formats led to better accuracy, but immersive formats did not. Experienced dancers were more accurate than novices, but the effects of perspective and immersion were not modulated by experience. These results suggest that during learning, individuals across experience levels represent complex actions in first person perspective, and that virtual movement instruction does not require immersion to be effective.

Email: Kristen Macuga, Kristen.Macuga@oregonstate.edu

(3022)

Changes in Observer Location Eliminate Tool-Based Compression of Distance. ANDREW S. CLEMENT and JAMES R. BROCKMOLE, *University of Notre Dame* — Acting upon distant objects with a reach-extending tool leads observers to underestimate the perceived distance to those objects. By having observers move through an environment after interacting with an object (but before estimating the distance to the object), we examined whether tool-based perceptual distortions persist across changes in location and viewpoint. Individual objects were projected onto a table, and participants either pointed to each object or touched the object with a reach-extending tool. Observers then estimated the distance to each object from either the same location or a new location across the table. When observers remained at the same location for all trials, using the tool led them to estimate shorter distances to the objects. However, when observers moved to a new location (either on all trials or on a random subset of trials), tool-based compression did not occur. These results suggest that tool-based compression of perceived distance is location-dependent.

Email: Andrew S. Clement, aclemen3@nd.edu

(3023)

Behavioral and Electrophysiological Bases of Interpersonal Synchrony During Joint Music Performance. ANNA ZAMM and CAROLINE PALMER, *McGill University*, ANNA-KATHERINA R. BAUER and MARTIN G. BLEICHNER, *University of Oldenburg*, ALEXANDER P. DEMOS, *University of Illinois at Chicago*, STEFAN DEBENER, *University of Oldenburg* — Interpersonal synchrony, the temporal coordination of actions between individuals, is facilitated by similarity of partners' individual spontaneous production rates (SPRs). We investigated the neural correlates of interpersonal synchrony in an electrophysiological (EEG) study of synchronization between performing musicians. Pairs of pianists performed while EEG was recorded wirelessly: First, pianists performed simple melodies alone (Solo) at their SPR. Second, pianists performed the same melodies with a partner (Duet) while one pianist set the tempo, the partner set the tempo, or the tempo was set to the mean of the pianists' tempi. Duet tone onset asynchronies were smaller in pairs with similar SPRs, confirming that similarity of partners' SPRs facilitates synchrony. Cortical oscillations in Duet performance were enhanced at the frequency of the Duet pairs' rates; the magnitude of this enhancement was correlated with the difference in the partners' SPRs. These findings indicate that similarity of spontaneous production rates facilitates interpersonal synchrony.

Email: Anna Zamm, anna.zamm@mail.mcgill.ca

(3024)

Actions to Invisible Objects Bias Subsequent Vision. JIHYUN SUH and RICHARD ABRAMS, *Washington University in St. Louis* — Recent studies have shown that making a simple action towards an object facilitates subsequent perception of that object's features. Given that the mechanism underlying this action effect is still largely unknown, we used the continuous flash suppression technique to examine the role of conscious awareness in the action effect. Participants viewed a colored circle (the prime) in one eye that was suppressed from conscious perception by a flickering checkerboard in the other eye. Simultaneously on some trials participants made a keypress action. Consistent with previous findings, during a subsequent visual search task participants were faster to find the target when it was in the previously acted-on color despite the fact that the color was not consciously perceived. The results show that

conscious awareness is not necessary for the action effect and imply that actions may strengthen the traces of sensory signals early in the visual system.
Email: Jihyun Suh, jihyun.suh@wustl.edu

(3025)

Illusory Weight Change in the Size-Weight Illusion Can Produce Changes in Heart Rate and Possibly Mental Fatigue and Blood Pressure. VILAYANUR S. RAMACHANDRAN and CHAIPAT CHUNHARAS, *University of California, San Diego* – When two objects with identical absolute weights but different sizes are compared, the larger object feels much lighter – "the size-weight illusion". Because the observer expects the larger object to feel heavier, he/she is surprised that it isn't. Astonishingly, we found that heart rate changes partially in respond to perceived illusory weight rather than absolute physical weight and this may be true for fatigue as well. This is consistent with our earlier finding that illusory weight can also increase pain perception in arthritis. In addition to its obvious theoretical implication for mind-body interaction, this effect can be exploited in a clinical setting and manufacturing dumbbell and luggage.
Email: Vilayanur S. Ramachandran, vramacha@ucsd.edu

(3026)

A Response-Confidence Embedded Method for Threshold Estimation. YUNG-FONG HSU, *National Taiwan University* — We propose a response-confidence embedded method for threshold estimation in psychophysics. The method can be incorporated into the family of non-parametric, fixed-step-size up-down algorithms (e.g., Derman, 1957; Durham & Flournoy, 1995; Kaernbach, 1991) for the estimate of threshold quantiles (induced by the up-down algorithm of interest) with certain levels of response confidence (set by the predetermined criteria). We investigate via simulation the convergence patterns of the method with respect to the sample size under different settings of starting values, step sizes, and response criteria.
Email: Yung-Fong Hsu, yfhsu@ntu.edu.tw

(3027)

Uncertainty in Perceptual Decision Making: The Time Course of False Pop-Out. SASEN S. CAIN, *University of California, San Diego* (Sponsored by Matthew Cain) — We used 3D hand-tracking to capture participants' uncertainty in an orientation singleton task. Participants were to reach toward the uniquely tilted shape on a rear-projected screen. However, trajectories were more curved than in previous color or shape singleton tasks (Moher & Song, 2013), implying that participants frequently changed their minds after movement initiation. Despite receiving feedback, they could not effectively suppress these partial errors. These observations are consistent with the phenomenon of false pop-out (Orsten-Hooge & Pomerantz, 2015), in which perceptual organization biases the representation of each item. We found that the slowest movements had much higher curvature than the quickest, confirming that these perceptual decisions unfold during movement, sometimes with several change-of-mind events. We tested both pointing and grasping hand configurations, but the different motor intentions did not lead to different performance, implying that the need for local processing did not override the bias induced by global processing.
Email: Sasen Cain, scain@ucsd.edu

(3028)

Representational Momentum for Human Action: Walking Versus Running. MARGARET P. MUNGER and CLAIRE E. WEITNAUER, *Davidson College* — Representational momentum (RM) is the forward displacement of a viewer's representation of a moving object. RM typically increases with faster velocities, and has been observed for human action. To see if actions that implied faster velocities led to larger RM, participants viewed animations of a human cartoon either walking or running. There was a main effect of action, but with larger RM for the walk. RM was also observed following a single posture for the walk, but not for the run. RM for human action is sensitive to awkwardness, with less RM for more awkward actions, but the running cartoon is not awkward. We suggest that the decreased RM results from perceived complexity of the running figure (or single running posture). Sensitivity to the type of action (walk vs. run) only occurred when the figure was upright; all inverted conditions led to equivalent RM.
Email: Margaret P. Munger, mamunger@davidson.edu

SPATIAL COGNITION II

(3029)

Psychology or Engineering Major, Man or Woman; It Doesn't Matter! Spatial Representation Matters for Mental Rotation Performance. A. REYYAN BILGE, *Istanbul Sehir University* — While processing spatial information mental representations of an environment are created. Some people rely on a more survey-centered representation, whereas others use a more landmark-based knowledge. Previous research reported spatial representations influencing MR performance. Participants having survey- and landmark-representations performed differently, especially at greater degrees of rotation. To follow up on the previous work, current research investigated mental representations and MR performance of 95 students at Istanbul Sehir University. Student population consisted of psychology and engineering majors. Since having superior spatial ability is correlated with a tendency towards STEM fields, would there be a difference in MR performance for engineering students? Student major, gender, or representation was not the main effects leading to differential rotation performance. However, there was an interaction between their majors and representation style. The findings propose a link between spatial skills, its relation to habitual spatial thinking, and vital role it carries in STEM fields.
Email: Reyyan Bilge, reyyanbilge@sehir.edu.tr

(3030)

Do Biases in Quantity Judgments Reveal Optimal Cognitive Processing? HILARY C. BARTH, *Wesleyan University* — The idea that cognitive systems may combine information sources in a Bayesian and/or optimal manner (or some approximation), tracking source variability and using this to guide the weighting

of the sources, is currently prominent in many areas of cognitive science. If broadly true, this is an important principle of cognitive (and perhaps neural) processing. Bayesian cue combination theories feature prominently in literature on the role of categories in cognition, where they are invoked to explain estimation biases in numerous and diverse tasks over development. However, some findings commonly taken as evidence of these processes may be better explained in different terms. Data from both children and adults suggest that estimation biases in spatial tasks are not necessarily evidence of the Bayesian combination of information sources: instead, they may be explained in terms of simpler models of relative quantity judgment.
Email: Hilary Barth, hbarth@wesleyan.edu

(3031)

Item Type, Confidence, and Gender Differences in Mental Rotation Performance. RANDI DOYLE and DANIEL VOYER, *University of New Brunswick* — Doyle and Voyer (2013) found that for women, but not men, the effect of occlusion was decreased when mentally rotating human figures compared to block figures, reflecting gender difference in mental rotation strategy. In the current study, 169 participants (88 males, 81 females, mean age = 19.67) completed Doyle and Voyer's block and human figure MRTs, and rated their confidence in accuracy on each item. It was hypothesized that a significant gender by occlusion by test type interaction on confidence ratings would reflect lower confidence among women on the occluded blocks than the occluded human figures. Cooke-Simpson and Voyer's (2004) findings were replicated and extended; confidence ratings positively correlate with accuracy and response time on both the block and human figure MRT. Men reported higher overall confidence than women. However, there was no significant gender by occlusion by test type interaction on confidence ratings. Gender differences in spatial strategy and cognitive processing are discussed.
Email: Randi Doyle, rdoyle@minerva.kgi.edu

(3032)

Individual Differences in Spatial Navigation: Behavior and Brain Structure. ELIZABETH R. CHRASTIL, KATHERINE R. SHERRILL and CHANTAL E. STERN, *Boston University* — Spatial navigation allows us to find resources and avoid danger. Large individual differences in navigation abilities exist, in part because navigation may not be a singular skill. In some environments, navigation can be done using landmarks. In landmark-free environments, fundamental self-motion and updating processes such as path integration, the continuous updating of position and orientation, are critical. We developed two navigational paradigms that required updating of position and orientation in landmark-free environments: 1) a basic path integration paradigm examining location, translation, and orientation tracking, and 2) a goal-directed task that required egocentric motion while maintaining and updating the allocentric spatial layout. For both, we examined volumetric differences in key brain areas, and related them to behavioral performance on the tasks. Our findings demonstrate that the hippocampus, retrosplenial cortex, entorhinal cortex, and thalamus—brain structures predicted to be important for path integration—are key to individual differences in human navigation.
Email: Elizabeth Chrastil, chrastil@ucsb.edu

(3033)

Spatial Abilities and Environmental Experiences of Hunters and Non-Hunters. BRANDI A. KLEIN and RACHEL STANCIL-BACON, *Missouri University of Science and Technology* — Hunters and non-hunters were examined in order to determine environmental factors and experiences that were unique to each group, which could potentially account for differences in spatial abilities. Each group was put through a battery of spatial ability tests, including a real-world way-finding task, and answered a questionnaire about the details of their hunting and gun-related experiences as well as other spatial-ability related factors such as video game experience. Results indicate that hunters are superior to non-hunters on several measures of spatial ability, and that there are several environmental factors that could lead to the hunters' increased spatial abilities, separate from video game experience. These findings support other research suggesting that experiences that individuals have as children can contribute to the development of spatial ability. These factors and their implications are discussed.
Email: Brandi Klein, kleinb@mst.edu

(3034)

Exploring the Role of Effort and Sex in Non-Visual Location Memory. DANIELE NARDI, JACOB R. JOHNSTON and BENJAMIN A. GUENTHER, *Eastern Illinois University* — The action-specific view of perception suggests that the way we perceive the world is affected by the physical effort exerted when interacting with it. However, the issue of whether physical effort affects also memory is neglected in the literature. In an object location memory task, participants had to remember a target on a circular search space by using two non-visual cues that provided directional information: the slope of the floor or a stable sound source. Effort was manipulated through the use of backpack weights, and – following previous research – it was expected that participants' reliance upon the two cues would be influenced. Results did not support this hypothesis; however, a sex difference in performance was revealed. Previous studies have repeatedly shown a female difficulty in localizing a target with slope information alone. The present finding suggests that this disadvantage should be viewed not as specific to using slope, but in the context of a more general difficulty with directional information.
Email: Daniele Nardi, dnardi@eiu.edu

(3035)

Misremembering Emotion: Inductive Category Effects for Complex Emotional Stimuli. JONATHAN C. CORBIN, LAURA E. CRAWFORD, DYLAN VAVRA, JUSTIN KELLER, JAVIER HOFILENA and KYLE LEE, *University of Richmond* — Memories of objects are biased toward what is typical of the category to which they belong. This bias has been attributed to a Bayesian combination of an imprecise memory for a

particular object with prior information about its category (e.g., Huttenlocher, et al., 2000, Hemmer & Steyvers, 2009; Feldman, et al., 2009). To extend this work to emotional faces, we morphed facial expressions on a continuum from sad to happy. Different ranges of emotion were used in 5 experiments in which participants viewed individual faces and, after a variable delay, reproduced each face by adjusting the morph to select its match. Estimates were biased toward the center of the presented stimulus range**,** and the bias increased at longer memory delays, consistent with the Bayesian prediction that as trace memory becomes less precise, category knowledge is given more weight in memory. Bias was greater in the second half of trials, suggesting greater reliance on the category as familiarity with it increased. The results show that memory for emotional expressions is affected by presented distributions of faces.
Email: Jonathan Corbin, jcorbin@richmond.edu

(3036)

An Electrophysiological Study of Neural Noise for Spatial Memory in Aging. PETER R. MALLIK and PHILIP A. ALLEN, *The University of Akron*, ME-CHING LIEN, *Oregon State University* — Allen, Kaufman, Smith, and Propper's (1998) behavioural study showed age differences in neural noise for spatial memory. We extended this finding using electrophysiological measures. A target-probe task was used, where a target appeared in one of nine locations followed by a probe. The probe was in the same location as the target for 50% of the trials and was transposed 1, 2 or 3 places to the left or right of the target location for the other 50% of the trials. Participants determined if the probe was in the same location as the target. Replicating Allen et al.'s finding, we observed transposition distance effects for response time and accuracy for older and younger adults. However, the P3 component, an index of stimulus discrimination difficulty, revealed greater distance effects for older adults than younger adults (replicating the earlier behavioural results). These findings suggest that neural noise increased with age.
Email: Phil Allen, paallen@uakron.edu

(3037)

Factors Influencing Performance Differences in Spatial Microgenesis. MIKAYLA KELLER, *The University of Western Ontario*, JENNIFER SUTTON, *Brescia University College* — The ability to build a survey representation, or cognitive map, of a new environment varies across individuals, yet the factors that contribute to these differences are not well specified. In the current study, the role of memory for target and non-target objects in a new environment was investigated as a potential source of varying performance on typical cognitive map assessments. For 10 to 20 minutes, participants freely controlled their own movement through a virtual environment (VE), Silcton, with the goal of learning the locations of 8 target buildings. Immediately after the learning period, participants completed a recognition task consisting of items from Silcton (target buildings, non-target buildings, and objects) and foils (new buildings and objects). In addition, participants completed direction estimation and map-building tasks based on memory for Silcton. Participants who correctly identified target and non-target Silcton buildings and other Silcton objects (e.g., fire hydrant, truck) created more accurate maps of Silcton. These data suggest that memory for items in a VE affect assessments of cognitive map accuracy, highlighting the interaction of spatial and non-spatial forms of memory in spatial microgenesis.
Email: Mikayla Keller, mkeller4@uwo.ca

(3038)

Individual Differences in Spatial Ability: Testing the Role of the Ratio of Visuospatial to Verbal Working Memory Capacity. MEREDITH MINEAR, THERESA HOLMES, PRESTON HUNT, MAGGIE KOUGL, KENNETH MCCLURE, WILLIAM MILLER and AMANDA STILL, *University of Wyoming* — Spatial ability refers to the ability to visualize and manipulate spatial information. Working memory capacity (WMC) predicts individual differences in spatial performance. Wang & Carr (2014) proposed the relative capacity of visuospatial to verbal WMC contributes to differences in spatial performance. We examined the relationship between span-based measures of verbal and visuospatial WMC, paper and pencil measures of spatial visualization (Surface Development, Paper Folding) and mental rotation (Cube Comparisons) and accuracy and reaction time performance on a 3D mental rotation task. Visuospatial WMC predicted performance on all three paper and pencil tasks, but verbal WMC was not a significant predictor when controlling for visuospatial WM. Visuospatial WMC predicted RT, but not accuracy on the 3D task while the spatial ability measures strongly predicted accuracy but not RT. We found no evidence to support the hypothesis that the ratio of visuospatial to verbal WMC predicted individual differences in spatial performance.
Email: Meredith Minear, meredithminear@gmail.com

(3039)

Symmetry Effect on Spatial Span Increases With Delay. DEVIN M. KELLIS, ERIC HENDERSON, KENTRELL COOPER and JESSE Q. SARGENT, *Francis Marion University* — The capacity of spatial working memory (spatial span) is often measured as how many sequentially presented locations on a computer screen can be immediately recalled. The symmetry effect refers to the finding that spatial span increases if the path connecting all the locations in a sequence forms a symmetrical pattern. Participants viewed a 5x5 grid of squares. Three to seven of the squares changed color, sequentially, for 1 s. each and then the sequence was recalled via mouse clicks, immediately or after a 10 s. delay. The symmetry effect was observed both with and without delay, but it was larger in the delay condition. Results suggest that the symmetry effect is not solely the result of more predictable locations facilitating sequence encoding. We propose that configural regularity facilitates perceptual-type grouping and maintenance due to greater imageability of symmetrical patterns as static visual stimuli.
Email: Jesse Sargent, jsargent@fmarion.edu

RECALL II

(3040)

Memory Self-Efficacy: The Effects of Type of Task and Method of Measurement. KERI L. KYTOLA and CELINDA REESE-MELANCON, *Oklahoma State University* (Sponsored by Kristi Multhaup) — To examine memory self-efficacy (MSE) across tasks with varying retrieval demands and to determine the usefulness of different types of MSE measures, participants made single-item (Experiment 1) or multi-item (Experiment 2) predictions about their future performance on two retrospective memory (RM) tasks (free and cued recall) and either a focal or nonfocal prospective memory (PM) task. In both experiments, participants more accurately predicted their performance on the PM task and the cued recall RM task than performance on the free recall RM task. Further, they were more accurate in predicting their performance on a focal PM task than on a nonfocal PM task. Participants were generally overconfident in their memory abilities, but this pattern was more pronounced when multi-item predictions were employed. Overall, these findings suggest individuals are more metacognitively aware of the demands of some memory tasks than others, and the way MSE is measured is an important consideration.
Email: Keri L. Kytola, keri.kytola@okstate.edu

(3041)

Scarcity Impairs Retrospective and Prospective Memory. BRANDON M. TOMM and JIAYING ZHAO, *University of British Columbia* — Operating under limited resources poses significant demands on the cognitive system. Scarcity induces an attentional focus on the task at hand, but importantly causes a neglect of other information which also deserves attention. In two experiments, we demonstrate that participants with a smaller financial budget were less accurate at recalling their consumption of snacks than participants with a larger financial budget, suggesting that scarcity caused greater retrospective memory errors. Moreover, participants under time scarcity were more likely to forget instructions to execute future actions, suggesting that scarcity caused greater prospective memory errors. Ironically, participants under time scarcity failed to remember previous instructions which, if followed, would have saved them time. The retrospective and prospective memory errors are particularly problematic because they may further perpetuate scarcity. The current findings provide a new perspective on the counter-productive behaviors of the poor, and important implications for welfare services and programs for low-income individuals.
Email: Brandon Tomm, brandon.tomm@psych.ubc.ca

(3042)

Wearable Technology and Retrieval Practice in a Real-World Environment. TANYA R. JONKER, *University of California, Davis*, MAUREEN RITCHEY, *Boston College*, CHARAN RANGANATH, *University of California, Davis* — Retrieval practice has a robust beneficial effect on long-term retention, positioning it as an ideal method for memory enhancement in the real world. We explored the efficacy of wearable technology in combination with retrieval to enhance long-term memory for a dynamic real-life event. Participants visited the California Raptor Center where they learned about and met birds of prey while wearing cameras that automatically captured photos of the event. The following morning, participants performed either retrieval or a control task in response to a subset of photos from their camera. The effect of retrieval practice on memory for both retrieved and nonpracticed facts from the Raptor Center visit was assessed one week later. Retrieval practice resulted in superior long-term retention of the facts learned at the Raptor Center. The results demonstrate that wearable technology, combined with retrieval practice, enhances long-term memory for real-world events.
Email: Tanya R. Jonker, tanyarjonker@gmail.com

(3043)

Encoding in (Cognitive) Context: The Role of Context Variability. KATARZYNA ZAWADZKA, *Nottingham Trent University*, MACIEJ HANCZAKOWSKI, *Cardiff University*, EDWARD L. WILDING, *University of Nottingham* — It has been argued that varying contexts at study can improve recall of an item as compared to studying the item repeatedly in the same context. In our study, we investigated the effects of encoding variability using a cognitive context manipulation (e.g., Diana, Yonelinas, & Ranganath, 2013): at study, for each item participants were required to answer an orienting question such as "Does it make a sound?" Recall performance was then compared for items studied repeatedly with the same versus different cognitive contexts. Across experiments, we manipulated the number of study trials for each item, type of recall test, and the item-to-context ratio. Overall, the results suggest that the effects of encoding variability when cognitive contexts are used are at best elusive.
Email: Katarzyna Zawadzka, k.n.zawadzka@gmail.com

(3044)

Isolation Effect in the Enactment Paradigm. MELISA AKAN and LILI SAHAKYAN, *University of Illinois at Urbana-Champaign* — When an item differs from surrounding items on a certain dimension shared by them, it is better remembered, known as the isolation effect. This study examined the isolation effect in the context of enactment paradigm. Participants studied action phrases either through verbal encoding, by performing them during learning, or by observing an experimenter perform the actions. Gıven that enactment enhances item-specific processing, and the latter reduces the isolation effect (Hunt & Lamb, 2001), we examined whether isolation effect would emerge in enactment, and if so, how it would compare against the verbal encoding and observation conditions. With an exception of two critical items, all items on the isolate list were thematically related to the birthday party theme while also involving similar motor movements when performed (without repeatedly using the same verb to denote the action). One critical isolate was unrelated to the birthday theme but engaged the same motor movement as the rest of the items when performed (thematic-isolate). The second isolate involved a different body movement while being related to the birthday theme (motor-isolate). Recall of these two isolates was compared against the heterogeneous control list, which

contained action phrases that were neither related thematically nor by similarity of movements when enacted. The results have implications for theoretical mechanisms of enactment and isolation effect.
Email: Lili Sahakyan, lsahaky@illinois.edu, lsahaky@illinois.edu

(3045)

The Effects of Animacy in Survival Processing. MICHAEL J. CONLEY, QUENTIN KING-SHEPARD and ALTHEA N. BAUERNSCHMIDT, *St. Bonaventure University* — Two separate, but related, lines of research have shown that animacy and survival processing improve memory for words (VanArsdall, Nairne, Pandeirada, & Blunt, 2013; Nairne & Pandeirada, 2016). The present study examined whether animacy affects survival processing. Participants were shown one of three scenarios, varying in animacy and survival relevance, and then asked to rate how useful words were to that scenario. Finally, they recalled those words. We found significant differences in usefulness ratings, however; there were no significant differences in recall between scenarios.
Email: Quentin King-Shepard, kingshqw12@bonaventure.edu

(3046)

Evaluating the Fate of Within and Across List Order Memory Following Retrieval Practice. WILLIAM R. AUE and JEFFREY D. KARPICKE, *Purdue University* — Retrieval practice is a robust phenomena, present in a variety of materials and scenarios. While recalling studied items improves performance on subsequent recall attempts, it is less clear whether other aspects of memory for the items, such as within-list order or list membership, also benefit from being recalled. This information is important because it has the potential to constrain explanations of the retrieval practice effect. In a series of experiments participants studied five lists containing five words each. Lists were separated either by a retrieval task or a distractor task. Following the fifth list, participants completed the criterial test. We examined a variety of tasks for the criterial test including free recall of all lists, probed recall of individual lists, and probed order reconstructions of lists. Across experiment, an intricate picture of retrieval practice benefits emerged. Implications for explanations of the retrieval practice effect and models of memory are discussed.
Email: William Aue, william.aue@gmail.com

(3047)

What Does Doodling Do? Evidence for Free Recall Impairments. MELISSA E. MEADE, JEFFREY D. WAMMES and MYRA A. FERNANDES, *University of Waterloo* — Previous work suggests that drawing to-be-remembered information leads to better recall than many other reliable encoding strategies. The purpose of the present study was to determine whether doodling, compared to task-related drawing, might produce a reliable enhancement to later memory performance. Participants were presented, auditorily, with either categorized lists of words (Experiment 1), or pre-recorded blocked narratives for which they monitored for target words (Experiment 2). Participants were asked to either draw or write each target word, or to doodle while listening to the target words. Following a delay, in both experiments participants showed poorer free recall of words encoded whilst doodling, compared to words that were drawn or written out during encoding. These findings suggest that unlike task-relevant drawing, doodling during study does not enhance memory performance.
Email: Melissa E. Meade, mmeade@uwaterloo.ca

(3048)

Self-Paced Study of Repeated Words. GEOFFREY L. MCKINLEY and AARON S. BENJAMIN, *University of Illinois Urbana-Champaign* (Sponsored by Brian Ross) — Having control over the pacing of one's own learning generally leads to better memory. In the current study, we examined whether the benefits of self-pacing generalize to a paradigm in which the to-be-learned materials were repeated and to evaluate at what point during study having control is most valuable. Subjects were given control over the study duration of either the first presentation, the second presentation, both, or neither. Quartets of subjects were yoked to minimize the effects of total study time over the list. Under both massed and spaced repetition conditions, more control over study led to higher performance: control over the study time of both presentations was superior to control over one, which was superior to no control. There were no apparent differences in performance between control of the first versus second study presentations. Taken together, these results suggest that self-pacing of repeated materials is beneficial for memory, but the results here provide little additional guidance on possible interactions between the point of self-control and spacing.
Email: Geoff McKinley, mckinle2@illinois.edu

(3049)

Comparing the Instability of Event Memory and Knowledge. ALLISON D. CANTOR and ELIZABETH J. MARSH, *Duke University* — Memories of events are often described as more fragile than one's knowledge, with event memories being more malleable and vulnerable to forgetting. In contrast, human knowledge is often characterized as impressive, with remarkable stability of scores on general-knowledge tests over decades (Bahrick, Baker, & Hall, 2013). However, knowledge is not invulnerable to misinformation or shifting access (e.g., TOT states). To better understand the similarities and differences between event memories and knowledge, participants either repeatedly generated category exemplars (knowledge) or studied exemplars and took repeated tests (event memories); the materials were pre-tested to ensure very similar items across conditions. We examined two variables that are well-known to affect the stability of event memories: testing (which increases stability) and delay (which decreases stability). Overall, knowledge was unstable, in that some items were lost and other items were gained, but it was relatively less affected by time and testing than were event memories.
Email: Allison Cantor, allison.cantor@duke.edu

(3050)

Is Location Information Automatically Encoded in Memory? STEVEN P. MEWALDT, LAURA R. MELVIN and MIKE A. MICHAEL, *Marshall University* — In Exp. 1, 64 college students (tested in 4 groups of 16) were seated in a square and given fictitious background information which they used to introduce themselves. They were to remember all introductions. In addition, two of the groups were asked to remember where each person sat. Subjects then moved to a new room and sat in a different order, where they attempted to recall the introductory information, match it to the person, and indicate the location where each person had been seated. Recall of location approached 80% regardless of the subject's instructions. Recall of the other information, while poorer, was also unaffected by instructions. Exp. 2 followed the same procedure except subjects could not see each other during recall. Instead they recalled the fictitious information and the location from which it was presented. Results suggest that location is automatically encoded.

Email: Steven Mewaldt, mewaldt@marshall.edu

(3051)

The Effect of Valence on Retrieval-Related Memory Vividness and Re-Experiencing of Affective Videos. SARAH M. KARK and ELIZABETH A. KENSINGER, *Boston College* — In the current study, we examined the effect of valence on the phenomenological characteristics of memory for short (20s) emotional and neutral videos clips. Seventeen participants viewed 60 short videos (20 negative, 20 positive, 20 neutral) with neutral words displayed above them. Participants then completed a cued recall task in which the word labels were presented individually. For each word, participants were asked to elaborate on the corresponding video in as much detail as possible. After each elaboration, participants rated visual and internal vividness and re-experiencing. Results revealed re-experiencing and internal vividness was significantly stronger for negative videos compared to positive and neutral videos, which were similar in re-experiencing and internal vividness. Recall of negative and neutral videos was associated with higher levels of external vividness, compared to positive videos. These results suggest valence-specific effects of re-experiencing and memory vividness during retrieval, despite being matched on arousal at encoding.

Email: Sarah Kark, kark@bc.edu

RECOGNITION II

(3052)

Recognition Errors are Worse Than Guesses: A Test of Threshold Models. QIULI MA and JEFFREY J. STARNS, *University of Massachusetts Amherst* — We conducted a word recognition experiment to distinguish the double high-threshold model (2HT) and a continuous signal detection model (SDT) of recognition memory. Participants studied a list of words. During the test phase, they were first given the probability of the upcoming test word being old (studied) or new (not studied). Participants made their first old or new responses based on the probability information before they saw the word (the "guess" response). After this first response, the test word appeared and participants made a second response (the "memory" response). The 2HT model implies that recognition errors come only from guessing, so it predicts that memory performance cannot be lower than guessing performance in any condition. The SDT model assumes that errors can be a result of misleading memory evidence, so participants should sometimes make incorrect memory responses even when they would have made a correct response if they had to guess. Results showed that participants made more memory errors than guessing errors on trials with valid probability cues, providing evidence against the 2HT model.

Email: Jeffrey Starns, jstarns@psych.umass.edu

(3053)

The Response Dynamics of Recognition for Emotional Items. GREGORY J. KOOP, *Eastern Mennonite University*, AMY H. CRISS, *Syracuse University* — In recognition memory experiments, hits tend to be higher for emotional items than neutral items, leading some to conclude that emotion enhances the quality of memory. An alternative explanation is that this change in responding is due to a liberal response bias for emotional items. Interpretations of existing data have been mixed due to the flexibility of standard signal detection measures (e.g., Dougal & Rotello, 2007; Grider & Malmberg, 2008). By focusing on the response process itself rather than solely the outcome of that process, continuous mouse tracking—or response dynamics—provides model independent data that are sufficiently high resolution to inform this debate. Specifically, the initial degree of departure provides a measure of response bias, whereas uncertainty across the entire response provides an indication of sensitivity (Koop & Criss, 2016). In two experiments we manipulated emotional valence and arousal between and within lists. Results and implications will be discussed.

Email: Gregory J. Koop, gregory.koop@emu.edu

(3054)

Understanding Effects of Categorical Membership on Memory Bias and Discriminability as a Function of Output Interference. JENNIFER F. SLOANE, RYAN CURL and COREY N. WHITE, *Syracuse University* — Output interference (OI) is the finding in recognition memory that discriminability decreases as more items are encountered at test. A standard recognition paradigm was used where one condition consisted of all neutral (unrelated) items and the other condition consisted of half categorized (emotional stimuli or animal names) and half neutral items. It was predicted that 1) there would be a larger memory bias for the categorized words and 2) that OI would be stronger for categorized words. As predicted, there was a memory bias for emotional stimuli. Interestingly, this memory bias did not manifest for animal names. Analyses for discriminability showed opposite trends for emotional stimuli and animal names, such that neutral words were more influenced by OI than emotional words, but animal names were more influenced than neutral words. These findings challenge certain theories that suggest categorical membership is the mechanism driving interference based on tested items. Further

analysis is required to elucidate this unexpected finding and to better understand effects on OI, categorical membership, and discriminability.
Email: Jennifer Sloane, jfsloane@syr.edu

(3055)

Explicit Prediction Eliminates Sequential Dependencies in Recognition Judgments. MARINA P. GROSS and IAN G. DOBBINS, *Washington University in St. Louis* — In randomized recognition tests, current judgments are sometimes influenced by prior judgments. We examined whether this positive sequential dependency reflects an explicit, anticipatory strategy by collecting subjects' predictions for each upcoming memory probe; either with or without prediction confidence. In both experiments, requiring predictions eliminated the positive sequential dependency across recognition judgments. Generally, predictions were positively dependent on the immediately preceding recognition conclusion; a relationship that was moderated by the confidence of those conclusions. Unlike predictions without confidence ratings, those with ratings induced a small positive dependency between predictions and subsequent recognition judgments. This suggests that subjects may seek consistency with predictions when overtly expressing increased confidence. Because serial dependencies among recognition judgments were generally absent and predictions themselves were largely driven by prior memory conclusions, these data do not support the idea that explicit anticipatory strategies are the basis of typical serial dependencies in recognition memory.
Email: Marina P Gross, mpgross@wustl.edu

(3056)

Interactive Effects of Semantic Ambiguity, Acoustic Challenge, and Aging on Recognition Memory for Spoken Sentences. CHAD S. ROGERS, MARGARET KOERITZER, KRISTIN VAN ENGEN and JONATHAN PEELLE, *Washington University in St. Louis* — Prior work has shown that memory for speech is negatively impacted by difficult listening conditions (e.g., Van Engen, et al, 2012). Such findings have led to an "effortfulness hypothesis" which holds that processing of a degraded speech signal expends cognitive resources that would otherwise be used to encode that signal into memory (Rabbitt, 1968). In the current study, we tested the effortfulness hypothesis by examining young and older adult listeners' recognition memory for spoken sentences. Sentences varied along three levels of acoustic degradation (i.e., clear speech, and two levels of speech-in-noise), and two levels of semantic ambiguity. Participants listened to list of spoken sentences, and then completed a visually presented recognition test. Results revealed that older adults' recognition judgments and response times were more adversely affected by semantic ambiguity and acoustic challenge than young adults'. Individual differences in cognitive and hearing abilities in older adults predicted the impact of acoustic challenge and semantic ambiguity on recognition memory.
Email: Chad S. Rogers, Chad.S.Rogers@gmail.com

(3057)

Multidimensional Source Memory: Encoding of Source Dimensions Across Different Temporal Delays. SAMANTHA N. SPITLER and JASON L. HICKS, *Louisiana State University* — In two experiments, we explored whether stochastic dependence between two source dimensions could be created over a temporal lag in the presentation of each dimension. In a Simultaneous condition, participants saw a word in one of two locations and heard the same word in a male or female voice. In a Separate condition, participants saw a word then heard the same word after two intervening trials. At test, participants were asked to make an old-new decision, a Remember-Know decision, and then retrieve the location and gender of the word. We found stochastic dependence only for recollected items in the Simultaneous condition. In a second experiment we created a new Separate condition with only one intervening trial to shorten the lag. We again found no evidence for stochastic dependence in the Separate condition, despite the shorter lag. These results suggest that binding source dimensions across intervening encoding trials is difficult.
Email: Jason L. Hicks, jhicks@lsu.edu

(3058)

The Precision of Memory-Based Prediction Biases Memory Pruning. HYOJEONG KIM, MARGARET L. SCHLICHTING, ALISON R. PRESTON and JARROD A. LEWIS-PEACOCK, *University of Texas at Austin* — When changes in the statistics of the environment occur, memory updating can alter existing representations to weaken, or prune, unreliable information (Kim et al., 2014). In this work, our goal is to determine how the precision of memory predictions (i.e., item-specific vs. category-level) impacts pruning. We hypothesize that memories that trigger specific predictions (e.g., "apple") will be pruned when the prediction is violated, while memories that trigger generic predictions (e.g., "some fruit") will not. We tested this hypothesis by showing observers a sequence of objects that included "cue" items that appeared three times. Some cues were followed by different categories of items (e.g., bell-lemon, bell-tiger, bell-hammer); other cues were followed by items from the same category (e.g., cup-apple, cup-banana, cup-orange). We found that items in the different category condition (e.g., tiger) for which predictions were violated (e.g., by hammer) were forgotten more often than items in the same category condition.
Email: Jarrod LewisPeacock, jalewpea@utexas.edu

(3059)

Orthographic Neighborhood Size Modulates the Word-Frequency Mirror Effect in Recognition. TYLER M. ENSOR, HANNAH V. WILLOUGHBY, AIMEE M. SURPRENANT and IAN NEATH, *Memorial University of Newfoundland* — One of the hallmarks of recognition memory is the word-frequency mirror effect—that is, more hits and fewer false alarms to low-frequency words compared to high-frequency words (Glanzer & Adams,1985). Glanc and Greene (2007) documented a similar finding with orthographic neighborhood size, such that small-neighborhood words had a recognition advantage over large-neighborhood words. Here, we factorially manipulated word frequency and neighborhood size in a recognition

experiment and observed a significant interaction between word frequency and neighborhood size. In hits, although the standard low-frequency advantage emerged in the large neighborhood, this advantage was only marginally significant in the small neighborhood. In false alarms, although there were more false alarms to high- than low-frequency distractors in both neighborhood sizes, the magnitude of the effect was larger in the small neighborhood. The results suggest a potential boundary condition on the word-frequency mirror effect.
Email: Tyler Ensor, tyler.ensor@mun.ca

(3060)

Fewer Constraints Enhances the Generation Effect for Context Memory: Benefits for Source and Color. MATTHEW P. MCCURDY, RYAN C. LEACH and ERIC D. LESHIKAR, *University of Illinois at Chicago* — The generation effect is known as the memory benefit for generated materials over non-generated materials. This finding is robust for item memory, but less consistent for context memory details such as source memory and memory for color. However, in the majority of prior work examining the generation effect there are experimental constraints placed on what can be generated, possibly limiting the memory benefits from self-generation. In this study, word pairs presented in one of two font colors (e.g., red or green) were encoded in a lower-constraint generation task, where participants responded freely to a cue word, a higher-constraint task used in prior work (e.g., anagram), and a read control. We compared each task on item and context memory (as measured by source and font color recognition) and found that words generated in the lower-constraint task provided improved context memory benefits compared to the higher-constraint task for both source and font color details. These findings suggest that the level of constraint can influence the magnitude of the memory benefits from self-generation, and further support the idea that self-generation is a powerful mnemonic that can improve both item and context memory.
Email: Matthew McCurdy, mmccur3@uic.edu

(3061)

Recognition Sensitivity, Confidence, and Bias in Continuous Versus Study-Test Recognition Procedures. HELEN L. WILLIAMS, *Keele University*, D. STEPHEN LINDSAY, *University of Victoria* — Memory experiments typically use a study-test format where encoding and retrieval are performed separately. However, in everyday life we continuously process incoming information and compare it against the contents of memory – if it matches information in memory it is recognised, if it is deemed new it may be encoded in case useful later. We compared Study-Test (ST) and Continuous Recognition (CR) paradigms for semantically matched words (Exp. 1), low-frequency words (Exp. 2a), low-frequency words with a Remember-Know test (Exp. 2b), and faces with a Remember-Know test (Exp. 3). Each experiment contained two ST or CR blocks and lag between initial presentation of an item (for encoding) and re-presentation (for recognition) was matched across test types (as far as possible). Recognition performance, sensitivity, confidence, bias, and Remember-Know judgments showed some differences across ST and CR procedures but the direction of these differences were not consistent across experiments.
Email: Helen Williams, h.l.williams@keele.ac.uk

(3062)

The Development of Recognition Decision Biases. DIANA SELMECZY and SIMONA GHETTI, *University of California, Davis* — While developmental research has investigated the negative influence of misleading suggestions on children's recognition memory, the adaptive influence of reliable information has not been explored. The current study investigates whether children ages 5, 7, 9 years and adults (Current N=81, Projected N=96) are sensitive to reliable environmental cues that indicate the likely status of a recognition probe. Results reveal that children as young as 5 adaptively shift their decision biases in response to the cues, and do not simply outsource their judgments to this external information. Furthermore, children's metacognitive ability during uncued/baseline recognition improves with age and predicts accuracy gains following the cues. These results suggest that adaptive shifts in decision biases are present by early childhood and children's metacognitive insight plays a role in the ability to incorporate these memory cues.
Email: Diana Selmeczy, dselmecz@ucdavis.edu

(3063)

Investigating the Contributions of Recollection and Familiarity to Face and Picture Retrieval in Recognition Memory for Familiar Faces: Evidence From Event-Related Potentials and the Remember/Know Procedure. GRAHAM MACKENZIE, GEORGIA ALEXANDROU, PETER J.B. HANCOCK and DAVID I. DONALDSON, *University of Stirling* — In recognition memory tests for faces if the same picture is used at study and test then picture retrieval can support task performance. However, if different pictures are used at test then faces must be retrieved. We contrasted recognition for pictures of famous faces that were either the same as, or different to, studied pictures. We asked how faces and pictures are retrieved. We used Event-Related Potentials (ERPs) and the Remember/Know procedure in separate experiments to assess the contributions of recollection and familiarity to the tasks. Recollection supports reinstatement of episodic context; familiarity involves assessing memory strength. We predicted that while same pictures could be recognized through familiarity, different pictures would be recollected. Participants studied 200 faces and then, at test, discriminated between 100 same, 100 different and 200 new pictures. Memory was better for same than different pictures. This memory advantage was associated with a larger parietal old/new effect and more Remember responses, both of which implicate differences in recollection rather than familiarity. Together, these behavioural and ERP findings suggest that both faces and pictures of famous people are recollected.
Email: Graham MacKenzie, graham.mackenzie@stir.ac.uk

(3064)

The Nature of Item-Context Binding in Memory. MANOJ K. DOSS, JAMILA K. PICART and DAVID A. GALLO, *University of Chicago* — Context reinstatement is known to facilitate object recognition memory. However, the nature of object-context binding processes has not been well described. In two experiments, we explored whether these binding processes are perceptually specific or involve more abstract conceptual or semantic information. Participants learned object-scene associations over two days, and their memory was tested on recent and delayed objects either on the same or different scenes from their original presentation. In Experiment 1, memory was tested on the same objects, similar objects, or completely new objects. Context reinstatement increased false alarms to similar objects. In Experiment 2, same and similar objects were presented in a forced choice test. Context reinstatement did not improve accuracy, but it did increase ratings of conceptual familiarity. A receiver operating characteristic analysis found this effect to be thresholded only for recent items, suggesting that context reinstatement evokes the retrieval of conceptual/semantic object information.
Email: Manoj Doss, mkdoss@uchicago.edu

(3065)

The Detrimental Effect of Recognition Memory Testing: Estimating Contributions From Item Interference, Context Change, and Response Bias and Boundaries. ADAM F. OSTH, *University of Melbourne*, ANNA JANSSON and SIMON DENNIS, *University of Newcastle*, ANDREW HEATHCOTE, *University of Tasmania* — A robust finding in recognition memory is the observation that performance declines monotonically across test trials (Peixotto, 1947; Criss, Malmberg, & Shiffrin, 2011). Despite the prevalence of this result, there is a lack of consensus on the mechanism responsible for the decline. Three hypotheses have been put forward: 1.) interference is caused by the addition of test items into memory (Criss et al., 2011), 2.) the test items cause a shift in the context representation used to cue memory (Osth & Dennis, 2015) and 3.) participants change their bias and response caution through testing (Ratcliff, 1978). To investigate these hypotheses, we collected data from an experiment where list length and study-test delay were manipulated. The data demonstrated a decline in performance through testing in the long list conditions. We applied a global matching model to the data with a back-end diffusion process to allow for the model to account for both choice and response time simultaneously. The model allows for separate estimation of item interference (jointly constrained by list length and test position), match to context (jointly constrained by study-test delay and test position), along with response bias and boundaries.
Email: Adam Osth, adamosth@gmail.com

(3066)

The Effect of Survival Processing on Location Memory. RACHEL L. VONDERHAAR and DAWN M. MCBRIDE, *Illinois State University* — In the survival processing effect, individuals remember items better after processing them with a survival scenario than with other scenarios (Nairne, Thompson, & Pandeirada, 2007). Location memory was tested in the current study to further investigate if it is enhanced through survival processing, as predicted by an evolutionary perspective (Narine, VanArsdall, Pandeirada, & Blunt, 2012). Picture and word food items were presented in various locations on the screen and then rated for difficulty in collecting the items for survival or a scavenger hunt. The expected picture superiority effect in location memory was found. However, contrary to previous studies, our results indicated no survival processing effect in location memory and no interaction of item type and study scenario. Thus, we failed to replicate the the survival effect in location memory previously found for pictures.
Email: Dawn M. McBride, dmcbride@ilstu.edu

(3067)

Enhancing Memory for Positively Valenced Pictures. EMILY A. FARRIS, *University of Texas of the Permian Basin*, MICHAEL P. TOGLIA, *University of North Florida* — Emotional memory enhancements are not observed as frequently for positive items as they are for negative, as demonstrated in prior work from others and us. Two experiments investigated how manipulating a participant's focus at study impacts recognition memory performance. Participants studied negative, positive, and neutral pictures before completing a recognition memory test 48 hours later. During study participants were instructed to focus on positive, negative, both types of emotional items, or to make a judgment about whether they would encounter the item in a typical month (i.e., neutral encoding goal structure). Negative pictures were recognized more frequently than neutral across all encoding goal structure conditions. After controlling for the neutral encoding goal structure, positive items were recognized more frequently than negative. Such results suggest that if participants seek out positive aspects of items they may be better able to remember them, a finding that may be useful in forensic settings.
Email: Emily Farris, farris_e@utpb.edu

(3068)

Feedback Lowers Discriminability on a 2AFC Recognition Test. BRYAN FRANKS and JASON HICKS, *Louisiana State University* — According to the noisy decision theory of signal-detection (ND-TSD; Benjamin, Diaz, & Wee, 2009), manipulations that create criterion variability or noise will lower recognition discriminability. In unpublished work, we found that discriminability in single-item recognition was typically lower in test feedback versus no-feedback conditions which we interpreted as being consistent with ND-TSD. On the assumption that 2AFC conditions minimize the role of recognition criterion setting and therefore criterion noise, we employed a within-subjects manipulation of test accuracy feedback in a 2AFC recognition memory task. In Experiment 1, accuracy was lower on the tests with feedback. Experiments 2 & 3 employed strength manipulations at encoding. Feedback significantly lowered accuracy only for weak items in Experiment 2 and for both strong and weak items in Experiment 3. The results will be discussed relative to the process of decision making and the role of criterion noise in 2AFC environments.
Email: Bryan Franks, bfranks145@gmail.com

FALSE MEMORY II

(3069)

The Devil's in the Detail: High Perceptual Load Memories Are More Susceptible to Retroactive Interference and False Memory Intrusions. CIARA M. GREENE and CATHERINE WELLS, *University College Dublin* — Retroactive interference occurs when old memories are reactivated and contaminated by new information. We have recently shown that increased perceptual load impairs episodic memory. Here we investigate whether perceptual load also enhances retroactive interference. 61 participants memorised high perceptual load images (colour photographs of everyday objects against complex backgrounds) or low perceptual load images (line drawings of the same objects). On Day 1 and Day 2, participants memorised two different sets of images. Prior to the Day 2 session, half of the participants received a subtle reminder of the items presented on Day 1. On Day 3, participants recalled as many of the Day 1 items as possible. Under low load, the reminder had no effect on memory. Under high load the presence of a reminder reduced accuracy and increased false memory intrusions by the Day 2 items. Detailed memories may therefore be more malleable and susceptible to retroactive interference.
Email: Ciara Greene, ciara.greene@ucd.ie

(3070)

Processing Political Misinformation—Comprehending the Trump Phenomenon. BRIONY SWIRE, *University of Western Australia*, ADAM J. BERINSKY, *Massachusetts Institute of Technology*, STEPHAN LEWANDOWSKY, *University of Bristol*, ULLRICH K.H. ECKER, *University of Western Australia* — In today's highly polarized political environment, individuals may use their trust in political figures as a heuristic to evaluate whether information is true or false. This study investigates the impact of political polarization on (1) the initial assessment of information veracity when it comes from a polarizing source, and (2) the effectiveness of retracting misinformation and affirming factual information. To this end, we used statements from Donald Trump's presidential campaign. Participants rated their belief in misinformation and factual statements, which were either explicitly attributed to Trump or presented without attribution. The misinformation was subsequently retracted and facts affirmed, and participants re-rated their belief immediately or after a delay. Results indicate bipartisan polarization: If misinformation was attributed to Trump, Republicans believed it more than if it was presented without attribution, whereas the opposite occurred for Democrats. After the retractions and affirmations, both Republicans and Democrats were less accurate after a delay if the information was attributed to Trump. Additionally, Trump supporters reduced their belief in misinformation but did not change their voting preferences.
Email: Briony Swire, swire@mit.edu

(3071)

Bilingual Witnesses Are More Susceptible to the Misinformation Effect in Their Less Proficient Language. DUSTIN P. CALVILLO, NICOLE V. MILLS, SARAH TAYLOR, KATHERINE GOSSETT and ANDREA FLORES, *California State University San Marcos* — The misinformation effect occurs when a witness views an event, is exposed to misleading post-event information, and remembers some misleading details as having occurred in the original event. The present study examined the effect of different languages on English-Spanish bilingual participants' susceptibility to the misinformation effect. English-Spanish bilingual participants (N = 234; 78% claimed English was their dominant language) watched a video, read a post-event narrative in English or in Spanish, and then were tested on details of the video in English or in Spanish. Regardless of the language in which participants read the post-event narrative, participants who were tested in English correctly recognized more true details and falsely recognized fewer misinformation details than those tested in Spanish. These results suggest that bilingual participants are more susceptible to the misinformation effect in their less proficient language, a finding that has important implications for interviewing bilingual witnesses.
Email: Dustin Calvillo, dcalvill@csusm.edu

(3072)

Does Working Memory Capacity Predict Susceptibility to the Misinformation Effect? New Data and a Meta-Analysis. WHITNEY C. HAWKINS and DUSTIN P. CALVILLO, *California State University San Marcos* — A few studies have reported that working memory capacity is negatively correlated with susceptibility to the misinformation effect. Two experiments attempted to determine if mind wandering mediates this relationship. Participants completed a working memory measure and a misinformation task. Participants' mind wandering was assessed with thought probes during (Experiment 1) or retrospectively after (Experiment 2) the witnessed event. Contrary to previous findings, working memory capacity was not related to the misinformation effect in either experiment. A meta-analysis on the relationship between working memory capacity and the misinformation effect was conducted. Across all samples, there was a small but significant negative relationship that was moderated by the average age of the studies' samples. There were only 13 data sets and most of them used small, college age samples. More research with well-powered samples across the lifespan is needed to better understand the relationship between working memory capacity and the misinformation effect.
Email: Dustin Calvillo, dcalvill@csusm.edu

(3073)

Age-Related Differences in the Effect of Mood on Emotional False Memories. WEIWEI ZHANG, JULIEN GROSS and HARLENE HAYNE, *University of Otago* (Sponsored by Jeff Miller) — We used the Deese/Roediger-McDermott (DRM) paradigm to investigate age-related differences in the effect of mood on emotional false memories. To do this, children (7-8-year-olds), adolescents (11-12-year-olds), and young adults (18-22-year-olds) were assigned to one of three induced-mood conditions (positive, negative, or neutral) and were presented with word lists comprised of positive, negative, or neutral words. Overall, adults had greater true memories than did children or adolescents, regardless of mood or word valence.

For false memories, however, there were mood-dependent age-related differences. In the positive-mood condition, there were no age-related differences in false memories. In contrast, in the negative-mood condition, adolescents and adults falsely recalled more negative information than did children. In the neutral-mood condition, adults also falsely recalled more negative information than did children and adolescents. Our findings provide the first direct evidence to support association theories regarding the mechanism of age-related increases in false memory.
Email: Weiwei Zhang, weiwei.zhang.swu@gmail.com

(3074)

Retrieval Processes in Mood-Related False Memory. SARAH H. BOOKBINDER and CHARLES J. BRAINERD, *Cornell University* (Sponsored by Valerie Reyna) — Prior mood-induction research has demonstrated mood effects on the DRM illusion, specifically that negative moods reduce false memory and positive moods increase it. However, that research has usually failed to separate the valence and arousal components of mood, and it has yet to identify the retrieval processes that are responsible for mood effects. We used a video mood induction that varied valence while controlling arousal, and found that DRM false recognition was reduced by negative moods. Furthermore, mood effects persisted over time and retrieval processes, identified using the conjoint recognition model, differed as a function of mood valence. Fuzzy-trace theory explains these results as consequences of negative moods' ability to enhance verbatim processing.
Email: Sarah Bookbinder, sb978@cornell.edu

(3075)

Semantic Processing in Bilinguals: The Role of Implicit and Explicit Manipulations on False Memories. EUGENIA MARIN-GARCIA and PEDRO M. PAZ-ALONSO, *Basque Center on Cognition, Brain and Language* — Consequences of bilingualism in the memory domain remain not well understood. Bilinguals often perform poorly in semantic tasks as category fluency tasks. Studies using the Deese-Roediger-McDermott paradigm revealed that encoding semantic relations between items in word lists enhances true and false memories. Here, we used this paradigm to investigate semantic processing based on implicit and explicit manipulations on veridical and false memories in monolinguals and high proficient early bilinguals. Our implicit manipulation involved using lists that were low and high on semantic associative strength. After studying lists under standard and explicit relational processing instructions, participants performed an old/new recognition test that included studied items (targets), non-studied items that were semantically associated to the theme of the lists (critical lures), and non-studied non-semantically related items (unrelated lures). Results revealed that both groups were sensitive to the implicit manipulation, showing more false memories for lists with high versus low associative strength. Only bilinguals exhibited more false memories for lists studied under standard versus relational processing encoding instructions.
Email: Eugenia Marin-Garcia, e.marin@bcbl.eu

(3076)

Increased Correct Recall and Decreased False Memory Susceptibility After Mindfulness Meditation. MICHAEL F.S. BARANSKI and CHRISTOPHER A. WAS, *Kent State University* — Wilson et al. (2015) demonstrated that mindfulness meditation (MM) increased false memories using the Deese-Roediger-McDermott (DRM) paradigm. This purportedly resulted from MM's non-judgmental observation of experience contributing to failure to distinguish internally generated from externally presented information. We sought to replicate Wilson et al.'s results and extend them by warning half of the participants that the DRM task would elicit false memories (Watson et al., 2005). We hypothesized we would see a lower incidence of false memories in the MM/warning group consistent with previous findings regarding individual differences in working memory. Results from our first study were inconsistent with Wilson et al. and our hypothesis, as groups did not differ in false memories. Instead, we found that MM groups had a higher rate of correct recalls. A second study also found no significant differences in false memories, and the MM group significantly decreased false memories after mindfulness induction.
Email: Michael Baranski, mbaransk@kent.edu

(3077)

The Processes Behind Memory Fallacies: An Investigation in Memory Disjunction and Conjunction Illusions. KOYUKI NAKAMURA and CHARLES J. BRAINERD, *Cornell University* — Fallacies in probability judgment, namely disjunction and conjunction fallacies, also appear in episodic memory. Although memory disjunction and conjunction illusions have both been studied, they have only been studied in separate experiments. The aim of the present research was, for the first time, to investigate both illusions simultaneously, in a single experiment. We used the same source memory paradigm as in prior experiments, with a modified design that included both disjunctive and conjunctive probes for the same lists. Both illusions were present, as in prior experiments. Disjunction illusions were strongly affected by proactive interference, whereas conjunction illusions were affected by gist processing. We introduce a new model for the two illusions.
Email: Koyuki Nakamura, kn252@cornell.edu

(3078)

Does Repeated Lying Increase False Memories for Lies? ERIC J. RINDAL and MARIA S. ZARAGOZA, *Kent State University* — Liars must be consistent in order to appear credible. The present study assessed the memorial consequences of repeatedly lying about a witnessed event. Whereas prior research in our lab shows that lying can lead to false memories, whether repeatedly lying increases or decreases false memory is unclear (cf., Viera & Lane, 2013). Participants viewed an eyewitness event and were subsequently asked questions that they were instructed to answer either truthfully or by lying. In the lie condition, participants lied about some things once and lied about other things on three occasions, with the instruction that repeated lies should be consistent. After a 4-week retention interval memory was assessed with both free recall and yes/no recognition. Whether repeated lying reduced false memories or increased

false memories was dependent on how memory was assessed. Although the magnitude of the effect varied, lying led to reliable false memory effects in every condition.
Email: Eric Rindal, erindal@kent.edu

(3079)

Does Emotional Picture Content Affect Boundary Extension? STEVEN BEIGHLEY, GARRET R. SACCO, LAURA BAUER, ADELE M. HAYES and HELENE INTRAUB, *University of Delaware* — There is controversy as to whether the emotional content of a picture affects boundary extension (BE). However, prior research did not control layout/background across valence. In our study, photographs depicting sadness, isolation, and grief were each paired with a version in which faces were, instead, smiling. To examine potential effects of cognitive style on processing of emotional pictures, participants were selected who were either high or low on rumination (a common symptom of depression). In a 2 (picture type) x 2 (rumination) factor design, high and low ruminators viewed 16 sad or happy pictures for 15 s each. To assess BE, at test, the same photographs were rated as "the same", "closer-up", or "farther-away" (5-point scale). Significant levels of mood-induction were obtained for both sad and happy pictures. Yet, *neither* valence nor rumination affected BE. We discuss the benefits of a stable anticipatory spatial representation across changes in emotional states.
Email: Steven Beighley, smbeighley@gmail.com

(3080)

Understanding How Trait Mindfulness Relates to Bilingual's False Memory. LI-HAO YEH and YI-CHUN ANGELA LU, *Chung Yuan Christian University* — Mindfulness intervention has been shown to increase false memory; however, this result is challenged by the findings showing that high trait mindfulness is associated with external encoding style which is in turn associated with low false memory. The study aimed to utilize bilingual context to disentangle these contrasting findings. Sixty Chinese-English bilinguals took DRM false recognition task and Mindfulness Attention Awareness Scale. The results showed a negative correlation between trait mindfulness and false recognition in Chinese-Chinese condition as well as a positive correlation between trait mindfulness and the false recognition in Chinese-English condition. The opposite directions of correlation suggested that when both verbatim and gist information were available (i.e. same language condition) higher trait mindfulness bilinguals applied verbatim information more efficiently to reduce memory errors. Nevertheless, when only gist information was available (i.e. different language condition) high trait mindfulness made more memory errors due to higher activation of gist information.
Email: Li-Hao Yeh, lhyeh@cycu.edu.tw

(3081)

Measuring the Impact of Implicit Associations on False Recognition. ALEXIS E. PAYNE and DEBORAH K. EAKIN, *Mississippi State University* — The Deese-Roediger-McDermott (1995) paradigm has proven to reliably produce false memories, although the lists vary in the likelihood of a false memory being produced for the critical target. This finding was attributed to differences in the associative properties between the list words and their target (Stadler, Roediger, & McDermott, 1999). McEvoy, Nelson, & Komatsu (1999) further found that the degree of inter-list-item association predicted the likelihood of false cued recall, but not false recognition. Using a novel paradigm to investigate false recognition (Payne & Eakin, 2015), we directly tested the degree to which associative properties between word pairs, rather than among list members, predicted false recognition. Recognition was compared between studied cue-target pairs (e.g., FROG-LEG), cue-false target pairs (e.g., FROG-GREEN), and new pairs. Two experiments are presented demonstrating that the false target must be associated with both the studied cue and target to produce false recognition of cue-false target pairs.
Email: Alexis Payne, aej85@msstate.edu

(3082)

The Influence of Encoding Details on the Illusory Truth Effect. STEPHANIE M. VICARI, CHRISTOPHER B. PIZZICA, ANNA B. DRUMMEY and IRENE P. KAN, *Villanova University* — In a typical illusory truth paradigm, subjects evaluate the truthfulness of ambiguous statements for which they hold no prior knowledge (e.g., "Polish coins are triangular"). When asked to rate these same statements at a later time, subjects tend to provide truth ratings that are higher than those provided initially. The primary explanation is that repetition leads to an increased sense of fluency, which subjects may interpret as an index of a statement's veracity. We hypothesized that increased contextual details at encoding would reduce the reliance on fluency for truth judgments. During session 1, subjects rated statements under contextually-rich (statements with corresponding photographs) and contextually-poor (statements alone) conditions. During session 2, subjects rated the perceived truth of novel and repeated statements. Surprisingly, although we replicated the classic illusory truth effect, contextual details at encoding did not attenuate the effect. Results are discussed in light of the dual-process model of recognition.
Email: Irene P. Kan, irene.kan@villanova.edu, irene.kan@villanova.edu

(3083)

Integrative Item-Context Encoding Increases Font Match Effects for True and False Memories. JASON ARNDT, DOROSI VALLE FLORES, TERUMI SMITH RANDLE and INGRID XU, *Middlebury College* — We examined the bases of DRM lure false memories by presenting lists in different encoding contexts (fonts). For half of the lists, participants completed an integrative encoding task designed to enhance binding of words and contexts. For the other half of the lists, they rated words for pleasantness. At test, participants judged the old/new status of studied items, DRM lure items, and unrelated new items. Studied items and lure items were tested in fonts that either matched or mismatched the font used to show their associated themes during encoding. Results indicated that integrative encoding produced larger study-test match effects (match > mismatch for p(old) judgments) for both studied

items and lure items compared to pleasantness encoding. These results suggest that while integrative encoding improves binding of items and fonts for studied items, a positive memory outcome, it also makes people more prone to false memories, a negative memory outcome.
Email: Jason Arndt, jarndt@middlebury.edu

METAMEMORY/METACOGNITION II

(3084)

Memory for Important Information: Test Expectancy and Variable Practice. CATHERINE D. MIDDLEBROOKS and TYSON K. KERR, *University of California, Los Angeles*, KOU MURAYAMA, *University of Reading*, ALAN D. CASTEL, *University of California, Los Angeles* — When studying for an exam, there is often more information than one could possibly remember—efficient study requires prioritizing the most important information, even if the less important information is forgotten. Recent research suggests that such selectivity can be diminished by experience with recognition testing compared to free recall testing. The current study investigates whether selectivity is similarly influenced by varied testing experience. Participants studied a series of word lists, with words ranging in value from 110 points, and received either: all recall testing; interleaved testing (each list alternating between recall and recognition testing); or interleaved-dyad testing (test format alternating every two lists). Participants recalled fewer high value words and were significantly less selective than the "all recall" condition only in the interleaved-dyad condition that began with recall tests. Thus, experience with recognition testing, compared to free recall testing, may impair value-directed remembering and selectivity in some situations.
Email: Catherine D. Middlebrooks, cmiddlebrooks@ucla.edu

(3085)

Estimating Others' Knowledge: Judgment Conditions Affect the Accuracy and Bases of Estimates of Difficulty for Others. JONATHAN G. TULLIS, *University of Arizona* — Predicting others' knowledge is vital to countless social and educational interactions. In two experiments, I examined how the conditions under which estimates of others' knowledge are made affect the accuracy of those judgments. Subjects estimated the difficulty of trivia questions for others. Half of the subjects were required to answer the questions before estimating others' knowledge and half were provided with the correct answer. The accuracy and bases of metacognitive judgments for others depended upon the conditions under which judgments were elicited. Providing subjects with the correct answer consistently improved the accuracy of their judgments of others' knowledge, but requiring subjects to answer the questions improved the accuracy of judgments only when subjects were either provided with feedback or the questions were not misleading. Predictions of others' knowledge were dynamically generated by grounding estimates of others' knowledge in outcomes of metacognitive processes directed towards oneself.
Email: Jonathan Tullis, jonathantullis@gmail.com

(3086)

Effects of Feedback and Test Experience on Delayed Metacomprehension Judgments. ELIZABETH A. GREEN and MICHAEL J. SERRA, *Texas Tech University* — Low-performing students overestimate their academic performance more than high-performing students (the "unskilled and unaware effect"). We previously found that low-performing students can accurately adjust their judgments within a single session given effective cues such as test experience and explicit feedback. In the present experiments, we examined such effects over a two-day delay using a five-group design. Participants studied eight texts and made metacomprehension judgments for each text on Day 1. A control group was not tested on Day 1; the remaining four groups completed a test over four of the texts on Day 1, and received feedback according to a 2 (feedback Day 1: yes/no) x 2 (feedback Day 2: yes/no) design. All participants returned 48 hours later to re-judge their learning and complete a test over the remaining texts. Test experience was both necessary and sufficient for low-performing students to effectively adjust their judgments, regardless of feedback schedule.
Email: Elizabeth A. Green, elizabeth.a.green@ttu.edu

(3087)

Examining the Roles of Familiarity and Fluency in Value-Directed Remembering. DONALD SKINNER, HILLARY ERWIN, WILSON LESTER, KENNETH HAMMETT, MATTHEW DYER and JODI PRICE, *University of Alabama in Huntsville* — Younger adult participants (N=145) studied both student loan and Medicare application forms to allow examination of how the familiarity of information and the font styles (regular versus combination of bold/regular) in which the information was presented would combine to affect participants' perceived ease of processing (i.e., fluency) the information and value-directed remembering. Arguably younger adults are more familiar with student loan applications than with Medicare applications. Of interest was whether value-directed remembering would occur as a function of familiarity without arbitrarily assigning point values to information. Counterbalanced conditions revealed that participants expected better memory performance for whichever form came first, but they obtained better recall and recognition performance for the less familiar, Medicare form, than for the student loan form. Trends also suggested better memory for conditions with regular font than for those with bold font. Results are interpreted in light of fluency/disfluency effects and value-directed remembering.
Email: Jodi Price, jodi.price@uah.edu

(3088)

Higher Judgments of Learning for Emotional Words: Processing Fluency or Memory Beliefs? BENTON H. PIERCE and JASON L. MCCAIN, *Texas A&M University-Commerce*, MELISSA J. HAWTHORNE, *Louisiana State University in Shreveport* — Previous research (e.g., Zimmerman & Kelley, 2012) has shown that emotionally-valenced words are given higher judgments of learning (JOLs) than are neutral words. The current study examined potential explanations for this emotionality effect on JOLs. Experiment 1 replicated the basic

emotionality/JOL effect. Experiment 2 utilized a lexical decision task, resulting in lower reaction times for positive words than for neutral words, but equivalent RTs for negative and neutral words, suggesting that processing fluency may partially account for higher JOLs for positive words, but not for negative words. In Experiments 3 and 4, we used pre-study JOLs and a memory beliefs questionnaire, finding that beliefs about future recall were greater for both positive and negative words than for neutral words. Our findings suggest that memory beliefs underlie higher JOLs for negative words, but that higher JOLs for positive words may depend on both memory beliefs and processing fluency.
Email: Benton H. Pierce, benton.pierce@tamuc.edu

(3089)

Metacognitive Awareness Not Required for One's Metacognitive Accuracy to Benefit From Retrieval Practice. TYLER MILLER, *South Dakota State University* — The Matthew Effect is when an intervention designed to benefit all provides a greater benefit for those that need it the least. For example, one intervention designed to improve metacognitive accuracy for all participants with repeated testing, but no feedback, yielded the most benefit for high-aptitude participants (Kelemen, Winningham, & Weaver, 2007). Previous research has shown a retrieval practice intervention has a significant influence on participants' metacognitive judgments without feedback (Miller & Geraci, 2014; 2016). The current experiments examined whether all participants were affected by the retrieval practice intervention, or if its effects interacted with metacognitive awareness. In other words, does the intervention only benefit those that have the most metacognitive awareness? Participants completed the Metacognitive Awareness Inventory, studied 40 Lithuanian-English paired associates and then reported a global performance prediction. Then, participants completed a short-run of retrieval practice and reported an updated prediction before the cued-recall memory test. In contrast to a Matthew Effect, the results of both experiments indicated a non-exclusive effect of retrieval practice on metacognitive accuracy.
Email: Tyler Miller, tyler.miller@sdstate.edu

(3090)

Are Retrospective Confidence Ratings Better Predictors of Future Performance Than Judgments of Learning? ADAM L. PUTNAM, *Carleton College*, KURT ANDREW DESOTO, *Association for Psychological Science*, PETER DEKHES and GRACE GILMORE, *Carleton College* — Judgments of learning (JOLs) are assessments of how material will be remembered on a future test, whereas confidence ratings are assessments of how likely a response is correct. Recent theory hints, however, that confidence ratings may predict performance just as accurately as JOLs. To test this, we conducted two preregistered experiments; MTurk workers studied word pairs (Experiment 1) or psychology vocabulary (Experiment 2) and then completed a practice cued-recall test. Subjects provided either a JOL or a confidence rating after each retrieval attempt. Afterward, all participants took a final test. In Experiment 1, confidence ratings were better predictors of future performance than JOLs, as measured by gamma correlations. In Experiment 2, however, no difference was found between confidence ratings and JOLs as predictors of performance. Thus, under some conditions, retrospective confidence ratings may be better metacognitive predictors than JOLs, even though JOLs explicitly ask subjects to predict future performance.
Email: Adam Putnam, adamlputnam@gmail.com

(3091)

Differences in Associative Memory and Metamemory Across Domains: Foreign Vocabulary and Medications. ADAM B. BLAKE, MARY B. HARGIS and ALAN D. CASTEL, *University of California, Los Angeles* — Paired-associate learning (PAL) is a common tool for assessing cognitive and metacognitive strategies. This study examined the generalizability of PAL for foreign-language vocabulary to the medical domain. Participants studied a list of Lithuanian–English translations (e.g. tvora–fence) or a list of medication–side-effect pairs (e.g. Scopolamine–coughing). Immediately following each pair, participants made a judgment of learning (JOL). After a short distractor, participants were presented with the cue (Lithuanian, medication) and prompted to recall the target (English, side-effect). Results showed better cued-recall performance for translations than medications, and global ease-of-learning (EOL) judgments followed the same pattern. Strikingly, predicted performance (JOLs) did not differ between translations and medications, despite differences in recall and EOLs for these two materials. These results support a common finding that JOLs track current performance rather than learning, and suggest that PAL mechanisms may not always generalize to other domains.
Email: Adam B. Blake, adamblake@g.ucla.edu

(3092)

How Learning Strategies Affect Metamemorial Monitoring in Sixth Grade Children. GREGORY HUGHES and AYANNA K. THOMAS, *Tufts University*, JOHN B. BULEVICH, *Stockton University* — Recent research has shown that adult learners express higher judgments-of-learning (JOL) when using more effective rather than less effective learning strategies. The purpose of the present research was to determine whether this finding extends to children. We conducted an experiment examining the relationship between metamemorial judgments and three learning strategies with varying levels of efficacy in a sixth grade population. Of interest was the magnitude and accuracy of judgments-of-learning when learners encoded information through rote restudying, elaborative encoding, and retrieval practice. We found that sixth grade learners exhibited limited metacognitive awareness of the memory benefits of retrieval practice over rote restudying. While retrieval practice did result in higher JOLs than rote restudying, this increase in JOL magnitude was small relative to the profound advantage of retrieval practice on memory performance.
Email: Gregory Hughes, gregory.hughes@tufts.edu

(3093)

More Than a Feeling: Does Sensitivity to Emotional Valence Indicate That JOLs Are Based on Emotional Valence? ETHAN FLURRY and DEBORAH K. EAKIN, *Mississippi*

State University — When metamemory sensitivity varies significantly in terms of an experimental factor, the inference is that the metamemory predictions were based on this factor. For instance, judgments of learning (JOLs) have been shown to vary significantly with emotional valence (Zimmerman & Kelly, 2010). However, without an independent measure, this inference is not empirically confirmed. This study examined the degree to which JOLs sensitive to emotional valence were based on that factor. Participants gave JOLs for positive and neutral words using a 0–100 scale. After a free recall test, participants gave emotional valence judgments (EVJs) for each word using both a continuous 0-100 scale and dichotomous positive/neutral rating. JOL magnitude was higher for positive than neutral words—as was free recall—suggesting that JOLs were sensitive to emotional valence. However, JOLs and EVJs produced a significant, but small correlation indicating that JOLs were also based factors other than emotional valence.
Email: Ethan Flurry, sef96@msstate.edu

(3094)

Metacognitive Pitfalls of Using Animations to Illustrate Scientific Processes. THOMAS D. GRIFFIN, DAVID SARMENTO, JENNIFER WILEY, and TIMOTHY GEORGE, *University of Illinois at Chicago* — Readers often experience illusions of understanding as they attempt to learn from scientific texts. For example, including illustrations or analogies within a text can alter monitoring judgments. The present research extends this work to the effects of animations on monitoring judgments. Results of one study showed that when science texts were accompanied by animated images, topic interest was the only unique predictor of judgments. In contrast, for texts accompanied by static images, judgments of understanding were related to prior knowledge and interest, but also to actual comprehension. In fact, comprehension was the only unique predictor of judgments. Results are discussed in terms of how beliefs about learning from animations may bias readers, and reduce the likelihood of using valid cues as a basis for their judgments of understanding.
Email: Thomas D. Griffin, tgriffin@uic.edu

(3095)

The Impact of Metacomprehension Accuracy on Control Processes During Comprehension. ELAINE W. TAN and DEBORAH K. EAKIN, *Mississippi State University* (Sponsored by Jarrod Moss) — Most metacomprehension literature concludes that people are typically poor at assessing the degree to which they comprehend texts (e.g., Dunlosky & Lipko, 2007; Glenberg & Epstein, 1985; Maki, 1998; Thiede & Anderson, 2003). However, accurate metacomprehension, the degree to which judgments of comprehension match actual comprehension, is crucial to the comprehension process. If students are not able to accurately assess their comprehension, they will not select effective learning strategies to use during comprehension. Two experiments were designed to investigate whether improving metacomprehension accuracy via the monitoring process impacted learning strategy selection via the control process with the goal of also improving comprehension. In Experiment 1, the new Multi-Trial Metacomprehension Paradigm was tested to determine whether it improved metacomprehension accuracy more than typical metacomprehension paradigms. In Experiment 2, the impact of accurate metacomprehension on both selection of learning strategies and on comprehension accuracy was tested.
Email: Elaine W. Tan, ewt38@msstate.edu

(3096)

The Contribution of Knowledge Updating and Belief to Producing Between-Participant Effects on Judgments of Learning. MICHAEL L. MUELLER and JOHN DUNLOSKY, *Kent State University* — Beliefs about cues available to a learner during study can play a substantial role in how judgments of learning are made, and the beliefs about the memorability of the cues can be formed during a task. In the present experiments, we evaluated whether list construction in a second study-test trial would lead to differential effects of the cue on the magnitude of judgments of learning. Participants studied pairs that would impact later memory performance for which they had minimal prior beliefs (i.e., Ja – Jade vs. A type of gem – Jade). In the second study-test trial, pairs were either intermixed or blocked by type, and the impact on judgments of learning was similar regardless of list construction. This outcome suggests that if a belief about the memorability of the manipulated cue is formed, then participants base judgments on their beliefs about the cues regardless of the order of presentation.
Email: Michael Mueller, mmuelle8@kent.edu

(3097)

Letting Students Decide What to Study During Category Learning Will Help Their Performance, but Only if They Make the Right Decisions. KAYLA E. MOREHEAD and JOHN DUNLOSKY, *Kent State University* — When students use their category learning judgments to make restudy decisions, will that help them perform better on a future test? We tested this question in the current experiment, using the honor-dishonor method. Participants first practiced categorizing members of six artificial categories (Fribbles). After practice they selected half of the categories for restudy. Their selections were either honored: they restudied the categories they selected, or dishonored: they restudied the categories they did not select. Participants whose decisions were honored performed better on the final test than those who were dishonored. However, we also found an imbedded interaction: participants who selected the less-well-learned categories performed better at final test when their selections were honored, but those who selected the more-well-learned categories performed better when their selections were dishonored. These findings suggest (1) that most students do regulate their learning of categories well, and (2) that studying less-well-learned categories is a better strategy than studying more-well-learned ones.
Email: Kayla Morehead, kmorehea@kent.edu

(3098)

Examining the Roles of Fluency and Memory Beliefs in Participants' Encoding Strategies, Judgments of Learning, and Memory Performance. ALAN HARRISON, HILLARY ERWIN, MICHAEL A. WALDON, DONALD SKINNER,

BREANNA CRANE and JODI PRICE, *The University of Alabama in Huntsville* — We investigated fluency and memory beliefs' roles in the font-size effect using a 5 x 3 x 2 (Condition x Block x Font size) mixed design. We manipulated collection of strategy reports and use of a pre-experiment strategy questionnaire to investigate the role of encoding strategies in the font-size effect. Biasing instructions suggesting small/large fonts are more memorable were provided in two of the conditions to examine whether altering participants' memory beliefs would impact their judgments of learning (JOLs). Instructions did not alter JOLs. Participants provided higher JOLs to large than small font words in all conditions, but font size did not impact recall performance. Results further suggest that using the strategy questionnaire and collecting strategy reports may alter metacognitive awareness and that encoding strategies may influence the role of font size in learners' JOLs. Overall, the results suggest that fluency plays a key role in the font-size effect.
Email: Jodi Price, Jodi.price@uah.edu

(3099)

Timing Alters the Effects of Font Size Manipulations on Judgments of Learning. DEBBIE A. MAGREEHAN, *Odessa College*, MICHAEL J. SERRA, *Texas Tech University* — Manipulations of font size can affect learners' judgments of learning (JOLs) for simple memory materials. Specifically, participants often judge larger items to be more memorable than smaller items even though font size typically does not affect actual recall. Examinations of this effect typically involve concordant font size manipulations during both the study and judgment phases. In the present experiments, we examined the effects of separate (Experiment 1) and discordant (Experiment 2) font size manipulations during the study and judgment phases. In both experiments, font size variations during the study phase but not during the judgment phase affected participants' JOLs. Importantly, these effects only occurred for participants who reported that they believe font size affects memory performance. Taken together, these results support current theories of metacognition stressing the importance of people's naïve theories of memory for the making of JOLs.
Email: Debbie Magreehan, debbie.magreehan@ttu.edu

(3100)

Studying Lecture Notes Increases Overconfidence as Measured by JOLs and Recall Scores. EEVIN AKERS, JOHN R. SCHUMACHER and ROMAN TARABAN, *Texas Tech University* — Note-taking increases recall (Akers et al., 2015). Higher recall is associated with more accurate judgments of learning (JOLs) (Kruger & Dunning, 1999). However, it is not known how notetaking and studying notes affects JOL accuracy, where JOL accuracy is calculated as the discrepancy between a participant's JOL and actual recall score. Ninety participants watched a 30-minute video lecture, taking notes on a computer, by hand, or just listening. Twenty four hours later participants completed a JOL and initial recall test. They then studied their notes or reflected (listeners) for 12 minutes before completing another JOL and final recall test. No differences were found between conditions on the initial test. On the final test computer notetakers recalled significantly more than the other groups (Percent recall: computer M = 7.5, hand M = 5.8, listeners M = 5.1). Both notetaking groups were also significantly less accurate and more overconfident than listeners (Percent overconfidence: computer M = 59, hand M = 62, listeners M = 48). These results show that studying notes increases recall, but also increases students' overconfidence regarding how much they can actually recall.
Email: Eevin Akers, eevin.akers@ttu.edu

(3101)

Hard-Easy Is Not the Opposite of Easy-Hard: Asymmetric Effects of Difficulty Order During Study. YANA WEINSTEIN and GABRIELE M. BARD, *University of Massachusetts - Lowell* — When questions on a test start out hard and get easier, students are more pessimistic about their performance than when the same test questions are presented in the opposite order. Here we demonstrate that this illusion also affects the subjective experience of studying. When learning general knowledge facts starting from very hard to very easy, students anchored to the difficult facts and did not shift their impression as the material got easier. In the flipped condition, in stark contrast students accurately shifted their impression from easy to hard. Organizing the material from hard to easy seemed to disrupt impression updating.
Email: Yana Weinstein, yana_weinstein@uml.edu

PROSPECTIVE MEMORY

(3102)

Intention Superiority and Cancellation Effects for Participant-Generated Prospective Memories. ARLO CLARK-FOOS, CHRISTOPHER URBANIK and JONATHON S. WHITLOCK, *University of Michigan - Dearborn*, GABRIEL I. COOK, *Claremont McKenna College* — Intention superiority (ISE) and intention cancellation effects (ICE) are phenomena within prospective memory (PM) research, characterized by differences in reaction times when comparing neutral and intention-specific material. ISE is the finding that response latencies are shorter for material associated to incomplete intentions, while ICE shows retrieval times for intention-related items are slower once an intention has been completed. Having previously been examined utilizing only laboratory-provided tasks, this research was a naturalistic study of PM. Focusing on participant-generated intentions, we were able to examine specific intentions that were of personal relevance to each participant. Results of Lexical Decision Task trials showed an increase in latency for cue words related to finished intentions compared with control words, which demonstrates an ICE for intentions completed by participants prior to returning to our lab, $F(2,690) = 13.72$, $p < .001$, $\eta^2_p = .38$. This effect only occurred in participants who do not use electronic calendars.
Email: Arlo Clark-Foos, acfoos@umich.edu

(3103)

Examining Differential Involvement of Executive Functions in Event-Related Prospective Memory Based on Focality. TATSUYA T. SHIGETA and DAWN M. MCBRIDE, *Illinois*

State University — Aspects of executive function (EF) have been linked to non-focal prospective memory (PM) performance (e.g., Schnitzpan et al., 2013). Yet it is unclear whether these relations translate to focal PM. The multi-process framework (McDaniel & Einstein, 2000) suggests that spontaneous retrieval of the PM cue can occur when an ongoing task is focal to the PM task. Therefore, a focal PM task may be less processing intensive; thus, EF may be unrelated to PM under such circumstances. The current study tested this prediction by examining a sample of college-aged subjects on two event-based PM (category/syllable judgment) and two EF (inhibition and task-switching) tasks. Subjects were assigned to focal or non-focal conditions for the PM tasks. PM condition differences and some positive relationships were found between PM and EF measures, but not all predictions were supported. These findings necessitate further exploration of the key EF features important for PM performance.
Email: Tatsuya Shigeta, shigeta.t@husky.neu.edu

(3104)

The Effects of Prospective Memory Task Importance and Target Salience on Retrieval Mode and Target Checking. EDIN SABIC and MELISSA J. GUYNN, *New Mexico State University* — Prospective memory (PM) is memory to perform an intended task at an appropriate moment. Task interference occurs when an ongoing task is hurt by embedding a PM task. We manipulated task importance and target salience in ongoing lexical decision and explored the resulting task interference. We also applied our 4-quadrant paradigm to assess the effects on retrieval mode and target checking. In this paradigm, ongoing task stimuli appear in any quadrant, but PM targets appear in one particular quadrant. Retrieval mode is evidenced by a difference between nontarget quadrants when there is, versus is not, a PM task. Target checking is evidenced by a difference between target and nontarget quadrants when there is a PM task. Retrieval mode was evident in the nonsalient condition. Target checking in the nonsalient condition persisted in the salient condition when PM task importance was emphasized, but not when only the ongoing task was emphasized.
Email: Melissa Guynn, mguynn@nmsu.edu

(3105)

Multiple Prospective Memory Targets and Responses Differentially Affect Retrieval Mode and Target Checking. ADAM G. UNDERWOOD and MELISSA J. GUYNN, *New Mexico State University* (Sponsored by Gilles Einstein) — Prospective memory (PM) refers to remembering to fulfill an intention at an appropriate moment. Task interference is the finding that an intention interferes with performance on a concurrent task. We investigated task interference on lexical decision when an intention (PM task) involved multiple PM targets and/or responses. Participants had either 1 target/1 response (1T1R), 1 target/4 responses (1T4R), or 4 targets/1 response (4T1R). Experiment 1 indicated significant task interference with 1T4R and 4T1R but not 1T1R, and a greater cost to a verbal PM response with 1T4R than 1T1R or 4T1R. We then used our 4-quadrant paradigm to separate task interference into two components, retrieval mode and target checking. Interference on non-target positions suggests a retrieval mode, whereas even greater interference on possible target positions suggests an additional process of target checking. Experiment 2 implicated a retrieval mode in all three conditions, and target checking in only the 4T1R condition.
Email: Adam Underwood, aunderw1@nmsu.edu

(3106)

Context-Specific Prospective Memory Monitoring in Young and Older Adults. B. HUNTER BALL and JULIE M. BUGG, *Washington University in St. Louis* — The present study investigated young and older adults' ability to strategically deploy prospective memory (PM) monitoring processes in a context-specific manner. Participants performed a lexical decision task in which words/nonwords were presented in upper/lower locations on screen. Importantly, participants in the *specific*, but not the *nonspecific*, condition were informed that PM targets would occur only on word trials in the upper location. When context varied randomly trial-by-trial, young adults in the specific condition were only able to use location information to reduce monitoring in unexpected (i.e., lower) contexts, whereas older adults showed little evidence of strategic monitoring. In contrast, when context was blocked (i.e., stimulus type/location changed every eight trials), young and older adults in the specific condition similarly used the complex contextual cue to reduce monitoring in unexpected contexts. These findings suggest older adults are able to strategically deploy PM monitoring processes selectively in conditions with reduced attentional demands.
Email: Hunter Ball, HunterB1005@gmail.com

(3107)

The Fate of Completed Intentions. FRANCIS T. ANDERSON, *Washington University in St. Louis*, GILLES O. EINSTEIN, *Furman University* — Two experiments examined whether and how people deactivate prospective memory (PM) intentions after they have been completed. In Experiment 1, participants were given a PM intention embedded within an ongoing task during Phase 1, after which participants were told either that the PM task had been suspended until later or completed. During Phase 2, participants were instructed to perform only the ongoing task and were periodically prompted to report their thoughts. Critically, the PM targets from Phase 1 reappeared in Phase 2. All of our measures, including thoughts reported about the PM task, supported the existence of persisting activation. Experiment 2 varied conditions that were expected to mitigate persisting activation. Despite our best attempts to promote deactivation, we found evidence for the persistence of spontaneous retrieval in all groups after intentions were completed. The theoretical and practical implications of this potential dark side to spontaneous retrieval will be discussed.
Email: Francis Anderson, anderson.f@wustl.edu

(3108)

The Role of Context in the Beneficial Effects of Implementation Intentions on Prospective Memory. JILL TALLEY SHELTON, *University of Tennessee at Chattanooga*, MICHAEL K. SCULLIN, *Baylor University*, TREVOR SLAYTON, TOMMY

VORWERK and TYRONNE JAMES, *University of Tennessee at Chattanooa* — An implementation intention (II) is an encoding strategy that is used to bolster prospective memory (PM), although the mechanisms responsible for observed benefits are unclear. The purpose of this research was to examine the role of context in IIs' beneficial role in PM. We hypothesized that II's would benefit performance in a task in which the context of the PM target event could be predicted; conversely, no II benefit was anticipated in a task that had minimal contextual certainty associated with the PM target event. Participants completed two PM tasks, an eye-tracking task with a high level of contextual certainty and a behavioral task with a low level of contextual certainty, with either standard or II encoding instructions. Preliminary results supported the hypothesis that IIs are only beneficial if individuals can imagine the context of their future intention. Strategic monitoring processes were evaluated using both behavioral and eye-tracking measures.
Email: Jill Shelton, jill-shelton@utc.edu

(3109)

About the Encoding of Prospective Memory Intentions, II: Implementation Intentions Increase Encoding Specificity. COURTNEY KURINEC, *Baylor University*, KHUYEN NGUYEN, *Washington University in St. Louis*, CHENLU GAO and MICHAEL K. SCULLIN, *Baylor University* — Remembering to execute delayed intentions (prospective memory) constitutes a daily challenge to attentional and memory systems. Implementation intention encoding ("When I see cue X, then I will perform intention Y") effectively improves prospective memory in laboratory and naturalistic settings. A key question that has elicited substantial research and debate concerns the mechanism(s) by which implementation intention encoding is effective. We conducted multiple experiments, all pre-registered to Open Science Framework, in which we utilized a thought probe procedure to directly assess the cognitive processes operating during intention encoding. Implementation intention strategies doubled the number of specific cues generated at encoding, particularly when mental imagery (Experiment 1b) or mental imagery plus statement (Experiment 1c) were used (weaker, nonsignificant effects were observed when only statement was used; Experiment 1a). Our findings confirm that implementation intention encoding differs qualitatively from standard encoding, and demonstrate an encoding mechanism by which mental imagery augments prospective memory.
Email: Michael Scullin, michael_scullin@baylor.edu

(3110)

Remembering for Later: Exploring Prospective Memory Development in Preschool Children. AUDREY E. PARRISH, *The Citadel*, ANDREW J. KELLY, *Georgia Gwinnett College*, BONNIE PERDUE, *Agnes Scott College*, MELANY LOVE, WILL WHITHAM, PEGGY Y. LUK, VICTORIA KELLY and MICHAEL J. BERAN, *Georgia State University* — Prospective memory (PM) involves remembering to do something later. Preschool children (3 to 5 years of age) completed a computerized task in which they navigated varying targets through a 2-dimensonal maze on screen via joystick controller. They also were told to remember to make a different response when encountering special targets that had a unique feature but otherwise looked like all other targets. We then presented these children with focal and nonfocal PM cues in which children were instructed to remember a specific pair of target stimuli for the focal condition (e.g., a boat and zebra) and a general category qualifier for the nonfocal condition (e.g., things with wings). Older children outperformed younger children in all tasks, although less-salient PM cues and nonfocal PM performance yielded the greatest difficulty for all ages. These results shed light on the development of PM in preschoolers and offer a PM paradigm appropriate to developmental and comparative investigations.
Email: Audrey Parrish, audrey.parrish1@gmail.com

(3111)

Acute Pain Disrupts Prospective Memory Processes. MARGARIDA PITÃES, CHRIS BLAIS, PAUL KAROLY, MORRIS OKUN and GENE A. BREWER, *Arizona State University* — Pain often disrupts executive processes known to be important for prospective memory (PM) performance. However, limited research has explored PM under conditions of acute or chronic pain. The present study investigated the influence of experimentally-induced acute pain on PM tasks varying on the demands of executive control required for prospective remembering. To this end we compared the effects of cue focality on PM performance while participants were under acute pain compared with no pain. A set of complex-span working memory tasks was also administered. Acute pain experiences preferentially impaired performance on highly demanding PM tasks. Individual differences in working memory capacity did not moderate these effects. Our findings provide new insights into PM dysfunction in pain conditions. If we can better understand which specific task characteristics influence PM performance under pain conditions, we can improve our ability to predict which individuals are most at risk for PM disruption.
Email: Margarida Pitães, margaridapitaes27@gmail.com

(3112)

Effects of Age on Laboratory Tests of Memory Disappear When Using Self-Report Questionnaires and a Diary Method of Everyday Memory Failures. ANDREW LAUGHLAND and LIA KVAVILASHVILI, *University of Hertfordshire* — Research shows that younger adults significantly outperform older adults on numerous laboratory tests of memory and cognition. It is assumed that this age related decrement generalises to everyday life with older adults experiencing more memory problems than younger adults. However, studies using everyday memory questionnaires have often failed to show significant age effects. To assess everyday memory failures more accurately, in the present study, 19 young and 18 older adults kept a diary of their failures (subsequently classed as absent-minded, retrospective, and prospective memory failures) for 28 days. No age effects were found on the number or type of recorded memory failures, as well as the scores on everyday memory questionnaires. In contrast, strong negative age effects emerged on several

laboratory measures of memory and cognition. The findings indicate that older adults' everyday cognitive functioning may be significantly better than suggested by laboratory research.
Email: Andrew Laughland, a.laughland@herts.ac.uk

(3113)

Caregiving Impacts Self-Reports of Prospective Memory Performance. ASHLEY J. SCOLARO, *Central College* — Successful prospective remembering often relies on attentional resources. Lovell et al. (2014) found that caregivers with lower attentional capacity, due to higher stress levels, experienced lower performance on prospective memory. The goal of this study was to further investigate the way caregiving might impact prospective memory performance by examining other individual differences that might contribute to lower prospective remembering. Participants completed the PRMQ (Smith, et al. 2000), Perceived Levels of Stress Scale (Cohen, Kamarck, & Mermelstein, 1983), Scott-McIntosh Rumination Inventory (Scott, V., & McIntosh, W., 1999), and the Beck Depression Inventory. Participants were split into groups based on the age of their children and stress levels were found to be equal across all groups. Analyses indicated that parents of adolescent children had more prospective and retrospective memory failures followed by parents of children in middle-childhood. There were no significant differences in prospective memory performance between parents of infant and early childhood aged children. This difference could be due to assisting children with their more complicated schedules of school, work, extra curricula, etc.
Email: Ashley J Scolaro, scolaroa@central.edu

HUMAN LEARNING AND INSTRUCTION III

(3114)

Examining the Short vs. Long Term Testing Effect by Constraining Trials Based on Subjects' Confidence Rating. XIAONAN LIU, *Xiamen University*, LYNNE REDER, *Carnegie Mellon University* — Despite the spate of research concerned with understanding why testing is superior to study, it is still unclear whether the benefits of testing only emerge when the retention interval between the initial test and the final test is long or whether tests are superior to re-study even with short-term retention. Prior research suggested that the contradictory results are due to biases associated with different analyses employed when examining testing effect data. In this study, we proposed a more neutral analysis constraining both test and re-study trials by subjects' confidence rating on intervening trials (tests or re-study). The results showed that for high confidence trials, performance on a final test that follows intervening tests is better than one that follows re-study events regardless of the lag between the intervening trials and final test. This supports the view that testing benefits memory regardless of retention interval.
Email: Xiaonan Liu, xliu@xmu.edu.cn

(3115)

I'm Doing Better on My Own: Social Inhibition in Vocabulary Learning in Adults. CLARA D. MARTIN, AMY UNDERWOOD and NICOLA MOLINARO, *Basque Center on Cognition, Brain and Language* — Vocabulary learning is better achieved by children facing a teacher than when presented to the same teacher through video, which has significant implications for toddlers' education. Since millions of adults also learn new vocabulary when acquiring a second language, it is important to explore whether adults also suffer from "video deficit" effects. Here, Spanish-English late bilinguals were involved in a vocabulary learning task. A teacher was showing them objects and uttering their names, through *Video* or in *Live*, and each condition was followed by a recall test. Unlike what was previously shown in children, adults learned better through *Video* than in *Live*. We argue that adults suffer from social inhibition, meaning that they perform worse when in the presence of another person during task performance. We show that adults gain from video-mediated tools for proper vocabulary learning, which has important implications for pedagogical programs targeting adults' second language vocabulary learning.
Email: Clara D. Martin, c.martin@bcbl.eu

(3116)

The Influence of Divided Attention on Directed Forgetting. TRISHA N. PATEL and LILI SAHAKYAN, *University of Illinois at Urbana Champaign* — Updating long-term memory is critical to filtering through the vast amount of information encountered daily. The process of intentionally forgetting irrelevant information has been studied using the directed forgetting paradigm. However, the literature lacks a clear understanding of attentional resources underlying these effects. Previous findings argue that directed forgetting is eliminated when inhibitory resources are utilized by a concurrent task during List 2 (eg. Conway et al. 2000). The current study manipulates attention on List 1, List 2, or both to further investigate the effects of divided attention on list-method directed forgetting. Attention was divided using a concurrent digit load (Experiment 1), a spatial task (Experiment 2), and suppression of articulatory loop (Experiment 3). Not all divided attention tasks eliminated directing forgetting effects, indicating the nature of attentional resources utilized for intentional forgetting. Findings have implications for the theoretical mechanism underlying directed forgetting.
Email: Trisha Patel, tpatel65@illinois.edu

(3117)

Enhancing Conceptual Learning by Generating Analogies. KALIF E. VAUGHN, *Northern Kentucky University*, NATE KORNELL, *Williams College* — We hypothesized that coming up with an analogy, which involves simultaneously thinking about deep structure and retrieving information from memory, would enhance learning. In Experiment 1, participants read a text about bats and then did one of three tasks: (A) free recall, (B) retrieved key ideas based on prompts (e.g., echolocation), or (C) generated analogies for key ideas (e.g., how is echolocation like the game "Marco Polo"?). On a final test 24 hours later,

the analogy group performed best on conceptual questions (including transfer questions about novel analogies) and factual questions. In Experiment 2, a new condition was added in which participants generated an analogy (e.g., for echolocation) but no target (e.g., "Marco Polo") was provided. This condition still out-performed the free-recall condition, but the analogy-with-target condition was the most effective. In sum, generating analogies is a powerful way to accomplish conceptual learning and transfer.
Email: Kalif Vaughn, kevaughn2@gmail.com

(3118)

Not All Retrieval Is Equal: Concept Maps Lead to Greater Test Performance Compared to Multiple Choice Quizzes in a College Classroom Study. MAREIKE B. WIETH and ANDREA P. FRANCIS, *Albion College*, KEVIN L. ZABEL, *Western New England University*, THOMAS H. CARR, *Michigan State University* — The Retrieval-Based Learning literature suggests that active retrieval is a powerful tool for learning (Karpicke & Blunt, 2011). Retrieval practice in college classrooms often takes the form of multiple choice quizzes. Though effective at increasing performance compared to simply restudying the material (Butler & Roediger, 2007) quizzes do not necessarily encourage systematic retrieval that highlights connections between concepts. This study explores the impact of retrieval practice through concept mapping versus quizzing on exam performance. Creating a concept map from memory requires students to retrieve and organize information, potentially enhancing memory more than simply recalling information. Results showed that on exams students got proportionally more multiple choice items correct on a topic previously tested with a concept map format than when they were previously tested with multiple choice questions on a quiz, suggesting that retrieving connections between concepts leads to greater memory than simply recalling information.
Email: Mareike B. Wieth, mwieth@albion.edu

(3119)

H.M. in the Flesh or as a Cartoon: The Influence of Video Type on Learning and Test Performance. NICHOL CASTRO, CYNTHIA SIEW and MARSHA J. MCCARTNEY, *University of Kansas* — The use of multimedia in the classroom is important for student engagement and learning. In this study, we examined how two different video styles (animated cartoon vs. live-action documentary) influenced learning of course material. Introductory Psychology students were shown either an animated cartoon or a live-action documentary about the famous case study of the amnesic H.M., and tested on material relevant to the Memory unit of the course. Students were assessed with an in-class quiz administered immediately after video presentation, a post-quiz administered one day later, a unit exam administered two weeks later, and a final exam administered 14 weeks later. Video type had a significant effect on the post quiz and final exam scores. Implications for student learning and instructional design are discussed.
Email: Nichol Castro, ncastro@ku.edu

(3120)

Effect of Question Placement on Learning of Educational Materials. OYKU UNER and HENRY L. ROEDIGER, III, *Washington University in St. Louis* (Sponsored by Janet Duchek) — Retrieval practice enhances learning of short passages, but its effectiveness for authentic educational materials such as textbook chapters is not well established. In the current experiment, students studied a 40-page textbook chapter on biology. Retrieval practice with correct-answer feedback was manipulated within-subjects: Some questions appeared only after a chapter section, others only after the whole chapter, and yet others at both times. Two groups served as controls: The reread group read the feedback presented in the retrieval practice condition, and the other group simply read the chapter once. Students took a final test two days later. Practicing retrieval resulted in greater recall relative to the two control groups. On the final test, the two single testing conditions produced comparable benefits, but testing twice produced the greatest benefit. Retrieval practice is effective in learning from authentic text material and placement of the initial test does not matter.
Email: Oyku Uner, uner@wustl.edu

(3121)

Investigating the Use of Retrieval Practice to Improve the Efficacy of a Refutation Text. CYNTHIA ALARCÓN, *University of Texas at Austin*, MICHAEL BARGER, *Duke University*, LISA LINNENBRINK-GARCIA, *Michigan State Univeristy*, ANDREW C. BUTLER, *University of Texas at Austin* (Sponsored by Paula Hertel) — Research on conceptual change has found that refutation texts are effective at correcting misconceptions. Our study explored whether engaging in post-refutation retrieval practice would improve the efficacy and/or durability of the intervention. Participants took a pre-test and then read a refutation text about Newton's theory of motion. In Experiment 1, after studying the text participants either engaged in retrieval practice or a distractor task, and then took an immediate post-test. Experiment 2 was the same as Experiment 1 except the post-test occurred after a delay of one month and the retrieval practice was spaced over three weeks. The refutation text improved performance on application questions about force and motion on the immediate post-test in Experiment 1, but these gains disappeared after one month in Experiment 2. In both experiments, retrieval practice improved retention of information from the refutation text, but did not improve performance on application questions.
Email: Cynthia Alarcón, cynthiaalarcon@utexas.edu

(3122)

Pause, Think, and Listen: Generating Key Points During Lecture Pauses and Then Receiving Feedback Promotes Learning. KATIE A. CORIA and PHILIP A. HIGHAM, *University of Southampton* (Sponsored by Anne Hilstrom) — Coria and Higham (2016) showed that longhand note-taking during lectures led to improved memory of lecture material compared to annotating printed slide handouts (PSHs) or passively observing. Here, we replicate those results and investigate a potential mechanism: *self-generation*. Participants

watched a 45-minute lecture in one of four encoding groups: passive observation, PSH annotation, longhand note-taking, and a new group, *key-point note-taking*. The last group only wrote three self-generated key points of the previous lecture segment during pauses. On both immediate and delayed memory tests, the key-point note-taking group scored highest, followed by longhand note-takers, annotators, and passive observers. Furthermore, key-point note-takers had high confidence in their answers, suggesting some metacognitive awareness. They also demonstrated the least amount of mind wandering and the highest enjoyment ratings compared to the other groups. The results suggest that self-generation with feedback is a highly effective learning strategy which can easily be implemented in classrooms.
Email: Katie Coria, k.a.coria@southampton.ac.uk

(3123)

Individual Differences in Retrieval-Based Studying in Meaningful Learning: Learning Strategies and Motivation. RYO SAITO, KAZUNORI SATO, KEIYU NIIKUNI, TATSUYA HORITA and TOSHIAKI MURAMOTO, *Tohoku University* (Sponsored by Hidetsugu Tajika) — This study explored individual differences in retrieval-based studying in meaningful learning by focusing on each learner's use of learning strategies (MSLQ: Motivated Strategies for Learning Questionnaire) and motivation (NFC: Need for Cognition). We enrolled 48 primary school children (11-12 years of age) to complete retrieval-based studying of a text during the learning phase, and to take a test (verbatim and applied questions) and a questionnaire during the final test phase (one week after the learning phase). The results showed positive correlations between the organization subscale of the MSLQ and the test score (verbatim [r=.32] and applied [r=.47]). The results also revealed a positive correlation between the NFC and the test score (applied [r=.34]). These results indicate that retrieval-based studying is related to both a learner's use of learning strategies, and motivation. Considering these relationships, acquiring organization and elaboration skills is important for learners. In addition, teaching students how to organize and elaborate information should be a necessary task for primary school teachers, because many of their students are likely to have had little opportunity to acquire these skills. Therefore, teachers should teach their students not only with regard to retrieval practice but also organization and elaboration.
Email: Ryo Saito, ryosaito@cog.is.tohoku.ac.jp

(3124)

Retrieval Practice and Contextual Variability Improve Transfer of Learning. NATHANIEL RALEY and ANDREW BUTLER, *University of Texas at Austin*, ALLISON CANTOR and ELIZABETH MARSH, *Duke University* (Sponsored by James Pomerantz) — Introducing variability during learning improves transfer (i.e., generalization). We investigated the concept of variability in an area of research where its effects have received little attention: learning through repeated retrieval practice. In two experiments, participants watched a lecture about geological science and answered application questions about various concepts. For each concept, they received either the same question three times or three different questions. In a repeated study control condition, participants repeatedly studied the information in the application questions using either the same example or three different examples. Two days later, participants took a final test with novel application questions. Experiment 2 included an additional phase on the final test that was designed to better measure deeper understanding of the concepts; the second phase involved re-answering the questions with an explanation of the concepts present. The results indicate that both retrieval practice and contextual variability produce superior transfer of learning.
Email: Andrew Butler, andrewbutler@austin.utexas.edu

(3125)

Discerning Misconceptions Through Retrieval Practice. JACLYN K. MAASS and PHILIP I. PAVLIK JR., *University of Memphis* — The testing effect is the well-replicated benefit of "quizzing oneself" through retrieval practice, in which participants must actively retrieve a response, rather than passively re-reading or re-studying information (e.g., Roediger III & Karpicke, 2006). Several studies have suggested that the success during retrieval practice determines the benefit to learning (e.g., Pyc & Rawson, 2009). While we do not disagree, the current work focuses on the incorrect responses to short answer/ free-entry questions, which revealed several misconceptions regarding the circulatory system. Targeting specific misconceptions may be a powerful way to lead to conceptual learning (e.g., Sungur, Tekkaya, & Geban, 2001). We identified several misconceptions across 2,000 incorrect responses from 178 participants during retrieval practice. Discovering these misconceptions is key to focusing on information that students commonly misinterpret and can be specifically utilized in creating multiple choice alternative answer options or "lures."
Email: Jackie Maass, jkmaass@memphis.edu

(3126)

Pretesting to Facilitate Conceptual Learning From Reading Texts. HANNAH HAUSMAN (Graduate Travel Award Recipient) and MATTHEW G. RHODES, *Colorado State University* — Prior research suggests that taking pretests enhances learning from reading a text. Specifically, taking a pretest on factual information that is explicitly stated in the text increases the likelihood that participants can answer identical questions after reading than if they had not answered pretest questions. Yet, a central goal of education is to develop conceptual understanding. The present experiments investigated whether conceptual pretest questions facilitate learning concepts from reading texts. Participants were given either factual or conceptual pretest questions; a control group was not given a pretest. All participants then read passages and took a final test consisting of both factual and conceptual questions, some of which were repeated from the pretest and some of which were new. Although factual pretest questions improved learning for identical factual questions, conceptual

pretest questions did not enhance conceptual learning. These data have important implications for theories of how tests enhance learning.
Email: Hannah Hausman, hannah.erin.hausman@gmail.com

(3127)

Explorations of the Testing Effect Under Self-Paced Versus Fixed-Pace Learning Conditions. JARRETT T. LOVELETT, STEVEN C. PAN and TIMOTHY C. RICKARD, *University of California, San Diego* — Retrieval practice yields better performance on a later test than does non retrieval based restudy. That testing effect (TE) is believed to show that testing is fundamentally more effective than restudy. Crucial to that interpretation is equivalent time on task, which researchers often attempt to achieve by holding constant both trial duration and item repetition (i.e., fixed-pace practice). But some evidence hints that learners may disengage earlier on restudy trials than on retrieval trials in the fixed-pace design, which could exaggerate the magnitude of the TE. One solution is to use self-paced practice, in which subjects presumably disengage from learning when they end each trial. We present several experiments using a novel self-paced design in which total practice time is controlled at the task level. We found no evidence that early disengagement from restudy in the fixed pace design exaggerates the TE. Instead, we show that the TE is robust to the self-paced design, and we explore the potential of increasing repetition rate while holding total time constant to further improve retrieval-based learning. Finally, we discuss potential advantages of self-paced designs, emphasizing their flexibility and ecologically validity.
Email: Jarrett Lovelett, jlovelet@ucsd.edu

(3128)

The Effects of Pre-Questions on Enhancing Learning From Video Lectures. ALEXANDER R. TOFTNESS and SHANA K. CARPENTER, *Iowa State University* — Previous research has shown that asking pre-questions about a reading passage leads to enhanced later memory for the pre-questioned information, but can sometimes impair later memory for information from the passage that was not pre-questioned. This may be due to selective reading, in which the student focuses on finding the answers to the pre-questions and not on other parts of the passage. The current experiment explored the effects of pre-questions on learning from an educational video, which is not paced by the student and less likely than a reading passage to lend itself to selective processing. Unlike the research based on reading passages, it was found that learning of the information from the video was enhanced for both the pre-questioned material and the non-pre-questioned material when compared to students who did not receive pre-questions. These results suggest that pre-questions may be an effective means of enhancing learning from class lectures.
Email: Alexander Toftness, toftness@iastate.edu

(3129)

Is the Method of Loci an Effective Learning Strategy for Elementary School Students? JOSHUA W. WHIFFEN, JEFFREY D. KARPICKE, JANELL R. BLUNT and STEPHANIE S. KARPICKE, *Purdue University* — Ever since ancient times, the Method of Loci has reportedly been used to memorize vast amounts of information. However, most of what is known about this method is based on personal accounts of its effectiveness, rather than empirical research. In particular, the method of loci has rarely been compared to other types of effective encoding tasks, and the criterial test is most often given immediately. In addition, there is little research on the effectiveness of this method with elementary school students. Thus, a series of experiments compared the method of loci to various control conditions on immediate and delayed recall tests, with fourth and fifth grade students. The control conditions included pleasantness rating, study only, and imagery processing. We also investigated the effectiveness of incorporating retrieval practice into the method of loci compared to the method of loci alone. The results demonstrated superior recall when students used the method of loci as compared to the other encoding tasks, both immediately and at a delay. Also, incorporating retrieval practice into the method of loci appeared to provide a memorial benefit beyond the method of loci alone.
Email: Joshua Whiffen, jwhiffen@purdue.edu

(3130)

Retrieval Practice and Conceptual Fact Learning With Diagrams and Definitions. SARAH A. HUTTER, *Princeton University*, STEVEN C. PAN and TIMOTHY C. RICKARD, *University of California, San Diego* — Does taking a practice test on one term of a concept promote learning that generalizes (i.e., transfers) to the rest of the concept? In four experiments we examined the utility of retrieval practice for inducing generalizable concept learning. Participants first studied one-sentence college biology concepts. In subsequent practice, they restudied half of the concepts and were tested with feedback on the remaining half. After a 48 hr. delay, a final test on both previously tested and untested terms was administered. Experiment 1 yielded a large benefit of retrieval practice (i.e., a testing effect) but no transfer relative to restudy for untested terms. In an effort to increase conceptual understanding, diagrams (Mayer and Gallini, 1990) and component term definitions were added during initial study (Experiment 2) or during both initial study and practice (Experiment 3). That elaborative processing increased final test accuracy by 31% but did not alter transfer results. Recalling two terms per concept during practice (Experiment 4) produced comparable results. Thus, learners and educators should use practice tests for concepts with the understanding that they may yield potent but piecewise learning.
Email: Steven C. Pan, stevencpan@ucsd.edu

COGNITIVE CONTROL OF WORKING MEMORY

(3131)

Reading Between the LNS: Presentation Modality and Bilingual Performance. MARTA K. MIELICKI, REBECCA H. KOPPEL, GABRIELA VALENCIA, JENNIFER CHUN and JENNIFER WILEY, *University of Illinois at Chicago* — The letter-number sequencing (LNS) task is a standard

cognitive assessment included in the WAIS and WISC test batteries. It involves hearing a series of letters and digits, and then reporting back the stimuli with the letters in alphabetical order, and digits in ascending numerical order. Because the standard administration of the LNS task is oral, this may disadvantage certain vulnerable populations. Emery, Myerson, and Hale (2007) have used a visual version of the task to assess working memory in older participants. The current studies tested whether the modality of task administration might impact bilingual performance on LNS. Results suggest that the standard oral presentation of the LNS task may lead to less accurate measurement of ability for bilingual participants, and that visual presentation may be preferable in order to avoid bias.
Email: Marta K. Mielicki, mmieli2@uic.edu

(3132)

Mind Wandering: Frequency vs. Degree of Disengagement. JASON S. TSUKAHARA and RANDALL W. ENGLE, *Georgia Institute of Technology* (Sponsored by Mark Wheeler) — Most research on individual differences in mind wandering is concerned with explaining how frequently we mind wander. Research has shown that we tend to mind wander anywhere from 30-50% of our waking life, more cognitively demanding tasks reduces mind wandering, and important cognitive abilities are related to how often we mind wander. However, this is not the only dimension to mind wandering episodes. For instance, when a mind wandering episode does occur, there is likely variability in the degree to which one gets disengaged from the task. In the current study, subjects were given thought-probes while performing attention tasks and asked to rate, on a scale of 1-5, 'To what extent was your attention on the task?'. Using a structural equation modelling approach, we showed that frequency and degree of disengagement are two separate, yet related, dimensions of mind wandering and are related to important cognitive abilities.
Email: Jason Tsukahara, jtsukahara3@gatech.edu

(3133)

Working Memory, Goal Maintenance and the Antisaccade Task: Comparing N-Back and OSPAN. LAUREN A. SUSSMAN, NATASHA M. BUTKEVITS, SARAH A. BLUMENTHAL, DARREN O.J. GEIGER, SARAH E. FISENNE and JANINE M. JENNINGS, *Wake Forest University* — Although OSPAN and N-back are well-used measures of working memory (WM), they do not correlate highly (Redick & Lindsay, 2013), and appear to assess different aspects of WM function. Based on a recent finding in our lab showing a stronger relationship between antisaccade performance and N-back relative to OSPAN, we further explored the differences between these measures by focusing on goal maintenance. To manipulate goal maintenance, participants completed an antisaccade task in which the delay between the end of fixation and antisaccade cue onset (gap interval) was set at 0, 150, 300 or 600 ms. The results showed: 1) significantly stronger correlations between antisaccade accuracy and N-back versus OSPAN, and 2) the OPSAN/antisaccade correlations became significantly greater as gap interval increased while the N-back correlations remained constant. These findings suggest that, with respect to antisaccade performance, OSPAN largely taps goal maintenance whereas N-back assesses other aspects of attentional control.
Email: Janine M. Jennings, jenningj@wfu.edu

(3134)

Response Versus Task-Set Interference: Evidence From a Go/No-Go Task-Switching Paradigm. PETER DIXON, *University of Alberta* — On each trial, subjects made a go/no-go response to one of three colors, and then pressed the space bar to initiate the next trial. Thus, trial initiation time on the no-go trials provide an index of the time to reject the no-go stimuli. Trials were arranged in runs of twelve in which the same color was the go stimulus. The first trial in each run showed a substantial (residual) switch cost, but only when the stimulus was the previous go stimulus. The results suggest that residual switch cost occurs at the level of the individual stimuli and responses, not the task set.
Email: Peter Dixon, peter.dixon@ualberta.ca

(3135)

Inducing Shifts in Cognitive Control in a Sternberg Memory Paradigm. MAXWELL L. DRASCHER, *University of Oregon*, ANDREW R. A. CONWAY, *Claremont Graduate University*, TODD S. BRAVER, *Washington University in St. Louis* — The strategic approach to working memory tasks is largely dependent on the memory-set size of particular trials. When the set size is small, participants are more likely to successfully employ an active maintenance strategy. As the set size increases, however, retrieval-focused strategies may be more effective. What is not as clear, is the effect of the overall context on how participants may approach these trials. The Dual Mechanisms of Control framework suggests that when participants are in a context that promotes either proactive or reactive strategies, they may approach the same trials with a different strategy than they would in a neutral context. In this study we attempted to shift participants towards proactive control in a session with smaller set-sizes and towards reactive control in a session with more recent-negative trials. The results demonstrate that participants behaved differently on matched trials depending on the overall context.
Email: Andrew Conway, andrew.conway@cgu.edu

(3136)

Differentiating Stages of Mind Wandering in Relationship to Working Memory Capacity. MEERA ZUKOSKY and RANXIAO FRANCES WANG, *University of Illinois at Urbana-Champaign* — Although widely studied, the process of how mind wandering occurs still remains unclear. Based on Voss and Wang (2014), the present study expanded on a novel way of combining the self-caught and probe-caught method to better understand time of focus and mind wandering separately. Participants performed an O-span task and subsequently a basic FA meditation. During the meditation task, participants first indicated when they became aware they were mind wandering (self-caught method). Participants were then asked if they were mind wandering when probed (probe-caught method), where probes were based on the average duration of their self-caught

session. Results showed that time of focus but not time of mind wandering increased with greater working memory capacity. This suggests that individuals with higher working memory capacity were able to focus on the current task longer, but had no effect on the ability of self monitoring to catch themselves mind wandering.
Email: Meera Zukosky, zukosky1@illinois.edu

(3137)

Going Deep on the Antisaccade: Informing the Nature of WMC-Related Attentional Control. MATT E. MEIER and ADAM J. LYONS, *Western Carolina University*, BRIDGET A. SMEEKENS, THOMAS R. KWAPIL, PAUL J. SILVIA and MICHAEL J. KANE, *University of North Carolina at Greensboro* — Working memory capacity (WMC) is considered an attentional construct, in part because of a strong association with antisaccade task performance (Kane, Bleckley, Conway, & Engle, 2001; Unsworth, Schrock, &Engle, 2004). To better understand the attentional-control characteristics required in antisaccade tasks and their relation to WMC, we tested whether mind wandering and attentional fluctuations (operationalized as RT variation) moderate the WMC-antisaccade association. In addition, we tested whether any influences of WMC, mind wandering, and attentional fluctuations: (a) are moderated by the interval between fixation and the flashing location cue, and; (b) differentially predict performance on consecutive trials where the target switches sides. In a quasi-experimental study, we examined the data provided by 470 subjects who participated in a study with six WMC measurement tasks, five attentional tasks with embedded thought probes to measure mind wandering, five tasks from which we took intraindividual RT variation measures, and two antisaccade task variants.
Email: Matt Meier, mmeier@wcu.edu

(3138)

Influences of Working Memory Load on the Congruency Sequence Effect. CHAEEUN LIM, YANG SEOK CHO, *Korea University* — Previous studies have reported inconsistent results regarding how working memory (WM) load affects the congruency sequence effect (CSE). The present study examined whether the similarity between representations of contents in WM and stimulus dimensions of a conflict task modulates the effect of WM load on CSE. In Experiment1, a color memory task was performed with one of three different conflict tasks, of which only a task-relevant stimulus dimension (color Simon task), both task-relevant and irrelevant stimulus dimensions (color flanker task) or none of stimulus dimensions (shape flanker task) was overlapped with contents in WM, respectively. The magnitude of CSE differed significantly with conflict tasks and CSE disappeared when WM load was placed on the task-irrelevant stimulus dimension (color flanker). In Experiment2, a spatial memory task was performed with a color Simon or flanker task. The difference of the magnitudes of CSE between the tasks approached significance. These results suggest that WM and CSE mechanisms may share certain resources at a dimension level.
Email: Lim, Chaeeun, 1992eun@gmail.com

(3139)

Adjusting Working Memory's Focus of Attention Influences Long-Term Memory Retention. MARK D. ZUPPICHINI, NATHAN J. ZLOCHEVSKY and NATASHA VILANOVA, *Montclair State University*, TIMOTHY RICKER, *College of Staten Island & The Graduate Center, City University of New York*, JOSHUA SANDRY, *Montclair State University* — When verbal information is sequentially presented, the last serial position is typically retrieved faster and more accurately than earlier serial positions. This has been interpreted as evidence for a static focus of attention (FoA) within working memory. Contrary to past research, recent evidence suggests that the FoA is not static but instead a flexible resource capable of maintaining nonterminal items at a high level of accessibility when participants are adequately motivated. The present aims were to (1) investigate whether flexibility within the FoA holds for semantic information and (2) test whether items that are flexibly oriented to, thereby increasing opportunities for attentional refreshing, will also improve memory on a surprise long-term retention test at the end of the experimental session. Our results corroborate the flexible nature of the FoA and further demonstrate that increasing attentional refreshing positively impacts accessibility to representations stored in long-term memory.
Email: Joshua Sandry, sandryj@montclair.edu

(3140)

Conflict Monitoring Under Pressure: Load-Specific Modulation of Conflict Adaptation With Concurrent Working Memory Load. MYEONG-HO SOHN, *The George Washington University*, KAYLEIGH A. RYHERD, *University of Connecticut*, REBECCA B. WELDON, *Juniata College*, BIA KIM, *Pusan National University* — The current study examined the hypothesis that working memory (WM) affects cognitive control via conflict monitoring, a process that detects conflict signals in the task environment and triggers the regulation of cognitive control. In Experiment 1, participants performed a letter version of a flanker task while concurrently maintaining a set of digits in WM load. The level of WM load was either low or high, and randomly intermixed within a block of trials. We found a significant conflict adaptation effect that did not differ by load level. In Experiment 2, letters were used as WM load, and the conflict adaptation effect disappeared at both levels of memory load. The same patterns of results were obtained when the memory load was blocked with number load (Experiment 3) and letter load (Experiment 4). These results suggest that conflict monitoring is subjected to the working memory process in a domain-specific manner.
Email: Myeong-Ho Sohn, mhsohn@gmail.com

(3141)

Exploring the Mechanisms Underlying the Working Memory - Executive Attention Relationship. EDDIE A. CHRISTOPHER and TOM S. REDICK, *Purdue University* (Sponsored by Darryl Schneider) — Individual differences in working memory are correlated with executive attention. For example, in a pro/anti-saccade task paradigm subjects with higher working memory make fewer errors than low working

memory subjects during blocks of anti-saccade trials, but not pro-saccade blocks. These performance benefits associated with high working memory have been attributed to better goal maintenance (intentionally looking away) and more effective inhibition (inhibiting automatic response to look toward). The current experiments used eye tracking technology to test these explanations. Pro/anti-saccade trials were randomly intermixed within blocks. Subjects with high working memory produced fewer errors on both pro and anti-saccade. Working memory differences on pro-saccade challenge an inhibition account, since subjects shouldn't be inhibiting any automatic response. Moreover, when a given trial was different from the one immediately preceding (going from pro-saccade to anti-saccade or vice-versa), all subjects produced more errors, suggesting no connection between working memory and goal/task switching.
Email: Eddie Christopher, chris119@purdue.edu

(3142)

Cognitive Control Gradients and Executive Attention in a Response Conflict Task. CHAD MOFFITT, *University of Utah*, JASON M. WATSON, *University of Colorado Denver*, KEITH HUTCHISON, *Montana State University* — Braver, Gray and Burgess (2007) discussed two modes of cognitive control: a proactive, preparatory mode in which task goals are engaged prior to response selection, and a reactive mode in which goals are engaged in a "wait and see" fashion during response selection. The current study investigated whether fixation delays could be used to determine when the engagement of proactive control occurs in a response conflict task, and whether executive attention modifies this pattern. Participants completed the OSPAN task, followed by a saccade task with 25% antisaccade trials. The fixation period prior to saccade trials varied from 100 to 1000 ms, in 100 ms increments, in an attempt to capture control gradients. Participants engaged control early on and continued to increase control. However, high-span participants continued to engage control to a greater extent as a function of delay. Results are discussed in relation to individual differences in proactive control gradients.
Email: Jason M. Watson, jason.watson@ucdenver.edu

(3143)

What Can n-Back Tasks Tell us About Working Memory Capacity? TYLER L. HARRISON, *Georgia Institute of Technology*, RANDALL W. ENGLE, *Georgia Institute of Technology and University of Edinburgh* (Sponsored by David Hambrick) — One of the most important findings in differential cognitive psychology, is the relationship of working memory capacity to a host of important cognitive activities. However, one often over-looked problem is that researchers use different cognitive tasks to measure and study working memory capacity: differential studies often use complex span tasks to assess working memory capacity while neuroimaging studies frequently use n-back tasks. The implicit assumption is that both types of tasks measure the same construct. New research suggests that these two working memory tasks might not measure the same construct (e.g., Redick & Lindsey, 2013). For the present study we were interested in whether n-back and complex span tasks are both valid measures of working memory capacity and how two manipulations in our n-back tasks (lures and the size of the stimulus pool) change the tasks' relationships to other cognitive abilities. We had 350 subjects complete 3 complex span tasks, 6 n-back tasks, and 3 measures of fluid intelligence. We found that n-back tasks and complex span tasks measure different abilities and that n-back tasks with a smaller pool of stimuli correlate more strongly with cognitive ability.
Email: Tyler Harrison, tharrison9@gatech.edu

(3144)

Gender Differences in Sustained Attentional Control Relate to Gender Equality Across Countries. ELIZABETH B. RILEY and HIDEFUSA OKABE, *VA Boston Healthcare System*, LAURA GERMINE, *Massachusetts General Hospital*, JEREMY WILMER, *Wellesley College*, MICHAEL ESTERMAN and JOSEPH DEGUTIS, *VA Boston Healthcare System* — Executive functions are critical for everyday tasks and success in school and employment. Understanding gender differences in these functions, and their potential sources, is an important goal of psychology and neuroscience and of great relevance to society. We used a large web-based sample (Exp 1: n=21, 484, Exp 2: n=10,468, from testmybrain.org) to examine two executive functions, sustained attentional control and working memory. We found significant gender differences in aspects of sustained attentional control only. With participants from 41 countries, we examined how gender differences in each country relate to national indices of gender equality. We found that overall sustained attentional control performance was lower in countries with less equality and that there were greater gender differences in omission and commission errors in countries with less equality. These findings suggest that sociocultural conditions which value women and men equally can improve executive functioning and reduce gender disparities in cognition.
Email: Elizabeth Riley, lissariley@gmail.com

(3145)

The Effect of Context Provided by a Person on Reading Span Performance. SHO ISHIGURO, SATORU SAITO, *Kyoto University* — Working memory is thought to be essential for performing everyday activities, and is thus assumed to interact with many potential factors operating in everyday life. The present study focused on social factors, and examined whether person information (e.g. occupational title), presented as useful contextual information, promotes working memory performance. In the experiment, occupational titles were used as the subject of sentences in the processing component of a reading span test, and were manipulated in their variability. Forty-eight participants took part in two conditions: a varied-context condition in which occupational titles of the sentences differed across trails, and a constant-context condition in which an occupational title of the sentences was repeated across trials. The results showed that reading span scores in the varied-context condition were higher than the constant-context condition. This suggests that person information can provide context to help support working memory functioning.
Email: Sho Ishiguro, ishiguro.sho.grocio@gmail.com

(3146)

Stimulus and Decision Type Influence Go/No-go Performance. ELIZABETH A. WIEMERS and THOMAS S. REDICK, *Purdue University* — Though it is typical to use only one sustained attention to response task (SART) or go/no-go task to measure mind-wandering or inhibition, respectively, performance differences based on the stimulus and decision type have been largely unexamined. Both perceptual and semantic task versions were compared within subjects and between subjects across three experiments with between 101 and 106 participants each. Participants were more accurate and faster on perceptual versions compared to semantic versions, and show a distinctly different pattern of response times between versions. Additionally, switching the "go" and "no-go" stimuli between subjects resulted in performance differences largely in the error rates. Relationships with working memory were consistent across versions. These performance differences are important to consider when selecting which task to measure mind-wandering and/or inhibition.
Email: Elizabeth Wiemers, ewiemers@purdue.edu

(3147)

The Role of Lures in n-Back Working Memory Training. BENJAMIN D. KATZ, *University of Michigan - Ann Arbor*, MASHA R. JONES, *University of California - Irvine*, MARTIN BUSCHKUEHL, *MIND Research Institute*, JOHN JONIDES, *University of Michigan - Ann Arbor*, SUSANNE M. JAEGGI, *University of California - Irvine*, PRITI SHAH, *University of Michigan - Ann Arbor* — The n-back task is widely used in cognitive training, individual differences, and neuroimaging research. Here we examine the effect of temporal lures — items presented approximately but not precisely n-back — on performance and practice. Use and proportion of lures is not always systematically manipulated, but the frequency of lures likely increase Inhibitory control demand of the n-back task. Study 1 demonstrates that n-back performance is better, and practice curves steeper, in the absence of lures compared to their presence. Reasoning was more highly correlated with n-back without lures whereas response inhibition was more highly correlated with n-back with lures. Study 2 compares two n-back practice adaptivity paradigms: (1) standard increase of n-level with improvement or (2) finer-grained adaptivity varying either lure proportion or n-level. Progress is slower but steadier in the finer-grained adaptivity group, suggesting that this paradigm might have advantages in cognitive training contexts.
Email: Benjamin Katz, benkatz@umich.edu

(3148)

Working Memory Training Improves Inhibitory Control in ADHD. MASHA R. JONES, *University of California - Irvine*, BENJAMIN KATZ, *University of Michigan - Ann Arbor*, SUSANNE M. JAEGGI, *University of California - Irvine*, MARTIN BUSCHKUEHL, *MIND Research Institute - Irvine*, PRITI SHAH, *University of Michigan - Ann Arbor* — ADHD is a developmental disorder characterized by inattention, hyperactivity, and impulsive behavior. Studies of individuals with ADHD provide insight into the underlying mechanisms of cognitive functions. Many current models of ADHD argue that the primary impairment in ADHD is poor inhibitory control, specifically, a deficit in executive inhibition, such as that required to inhibit a prepotent response or maintain the contents of working memory. In the present study, children with ADHD trained on the n-back task, and their performance was compared with an active control group who trained on general knowledge and vocabulary. The experimental group demonstrated near transfer to working memory and far transfer to measures of inhibitory control and parent-reported ADHD symptoms. These effects, which persisted up to three months after training, are correlated with the magnitude of training gains. Our results suggest that working memory training may be an effective, supplementary intervention for children with ADHD.
Email: Masha R Jones, m.jones@uci.edu

(3149)

Math Anxiety and High-Pressure Math Exams: An Exploration of Poor Performance Under Multiple Anxieties. JASON R. SATTIZAHN, ANDREA T. HENRY and SIAN L. BEILOCK, *University of Chicago* — Math anxiety is a fear of math. When solving difficulty math problems, math anxiety disrupts working memory (WM), a cognitive resource used to store and manipulate information. In turn, higher math anxiety is related to lower math performance, even when accounting for math ability. Anxiety that disrupts cognitive performance can also be induced from high-pressure situations. Little research has analyzed how math anxiety interacts with anxiety experienced from our environment to impact performance, even though we face daily pressures that may interact with math anxiety. We measured the cognitive performance of high and low math anxious individuals before and after experiencing a high-pressure math testing situation (N=85). Results showed an interaction of math anxiety and pressure on math performance ($F(1,83)=4.5$, $p>.04$, $h^2=.05$). High math anxious individuals displayed initially lower math performance but, after experiencing pressure, all participants' performance dropped to a similar level. While math anxiety is a handicap for some, there is no additive deficit in math performance when environmental pressures are high.
Email: Jason Sattizahn, sattizahn@uchicago.edu

VISUAL SEARCH I

(3150)

The Low Prevalence Effect Counteracts Confirmatory Bias in Visual Search. STEPHEN C. WALENCHOK and STEPHEN D. GOLDINGER, *Arizona State University*, MICHAEL C. HOUT, *New Mexico State University* — Recent research from Rajsic, Wilson, and Pratt (2015) suggests that people are biased to use a *target-confirming* strategy in visual search: Imagine searching a fruit platter for an apple you know is present. Your initial strategy might be to "confirm" that the apple is red by restricting your search to red items. However, if the majority of fruits on the platter are red (e.g., strawberries), the more efficient strategy is actually to restrict search to the minority (e.g., green) items; yet Rajsic, et al. found that people involuntarily adopt the inefficient, confirmatory strategy, when

searching through simple colored letters. We recently replicated Rajsic, et al.'s findings and tested whether people adopt a more flexible strategy if the target rarely occurs in one color versus another: People indeed demonstrated greater flexibility in this condition of low prevalence, suggesting that statistical learning of prevalence information counteracts confirmatory strategies in visual search.
Email: Stephen Walenchok, swalench@asu.edu

(3151)

Clusters of Response Time Distributions in the Same-Different Task. VINCENT LEBLANC, *Université d'Ottawa*, GUILLAUME DURAND, *Maastricht University*, SÉBASTIEN LAUZON, ALEXANDRA TURGEON and DENIS COUSINEAU, *Université d'Ottawa* — The same-different task (Bamber, 1969) is still missing a complete model of response times (RT) and accuracy (Proctor, 1981). Although some models (e. g., Ratcliff, 1985) perform well under certain conditions, they account for the fast-same phenomenon in atypical conditions only. Because processing strategies affect RT distributions and accuracies in many tasks, we looked for a similar effect by analyzing the data of 80 participants obtained in 4 different variations of the same-different task. In all the experiments, the two stimuli to be compared were strings of 1 to 4 letters presented successively 400 ms apart. Participants' RT distributions were clustered using the EP-Means method (Henderson, Gallagher, & Eliassi-rad, 2015), based on k-means clustering. When applied to different conditions, we systematically find the same three types of RT distributions: 1) a positively skewed distribution with few fast guesses (RT below 200 ms), 2) a near symmetrical distribution with numerous fast and slow responses, and 3) a distribution with much slower RT, no fast guesses and many responses exceeding 1 sec.
Email: Denis Cousineau, denis.cousineau@uottawa.ca

(3152)

The Low-Prevalence Effect Transfers to Across Tasks. JUAN D. GUEVARA PINTO (Graduate Travel Award Recipient) and MEGAN H. PAPESH, *Louisiana State University* (Sponsored by Stephen Goldinger) — In visual search, the low-prevalence effect (LPE) occurs when observers fail to detect rare targets, relative to targets that occur more frequently. To date, the LPE has only been documented when observers make the same decision (e.g., target present/absent) across many trials, leaving open the possibility that the LPE is task-specific. In the present study, observers completed visual search tasks in which we manipulated the relative prevalence of targets (45% versus 5%). Later, they completed change-detection tasks in which the high- and low-prevalence targets from visual search appeared among an array of pictures, each of which were equally likely to change after a brief delay. Observers who exhibited a search LPE were less likely to detect changes in low-prevalence targets, relative to high-prevalence targets, revealing that the LPE transfers across tasks. This effect is not limited to the specific exemplars from visual search, but also transfers to other within-category exemplars.
Email: Juan Guevara Pinto, jgueva3@lsu.edu

(3153)

Effects of Feedback Interventions on Low Target Prevalence Visual Search. MATTHEW A. PALMER and CATHERINE BISHOP, *University of Tasmania*, NEIL BREWER and JASON MCCARLEY, *Flinders University* — When targets are rare (i.e., low target prevalence), performance on visual search tasks is notoriously poor: targets are often missed when they do appear. This study examined the effectiveness of two previously-proposed training interventions to improve performance in low-prevalence visual search tasks. Participants completed a security screening task, deciding if a target (a knife) was present or absent in each of 1200 X-ray images of luggage (2.5% of images actually contained a target). A no-training control condition was compared with a true feedback training condition (involving higher target-prevalence with accurate feedback) and a false feedback training condition (designed to promote a more lenient decision criterion). Task performance was improved by training with true feedback, but impaired by training with false feedback. Patterns of errors and response times were analyzed to test whether differences in performance were due to differences in sensitivity or response criterion.
Email: Matthew Palmer, matthew.palmer@utas.edu.au

(3154)

Expertise Fine-Tunes Mental Representations of Targets During Challenging Visual Search. MICHAEL C. HOUT, ALEXIS LOPEZ and ARRYN ROBBINS, *New Mexico State University*, MEGAN H. PAPESH, *Louisiana State University* — We investigated effects of expertise on accuracy and oculomotor behavior during difficult visual search. Participants completed up to 23 sessions, searching simultaneously for 20 different categorically-defined targets. Zero to three targets could appeared on each trial, with variable frequency, akin to "prevalence effects." Unsurprisingly, searchers got faster over time. Despite increased efficiency, with expertise, they were more likely to directly fixate targets, and to spend proportionately more time examining them, relative to distractors. Prevalence effects (better accuracy to more frequent targets) diminished but did not disappear across sessions, and more frequent targets were consistently located more quickly than infrequent ones. Importantly, despite receiving equal attention (indexed by oculomotor behaviors), low-frequency targets suffered more recognition failures (failure to perceive targets after direct fixation) than high-frequency targets. Our findings suggest that, with expertise, searchers refine their mental representations for target categories, particularly common ones, and become more effective at restricting attention to the most relevant features.
Email: Michael C. Hout, mhout@nmsu.edu

(3155)

How Do We Think Collaboration Affects Visual Search Performance: Metacognitive Accuracy in the Collaborative Search Process. YUKI MIYAZAKI, *Fukuyama University* — Visual search is sometimes collaborative work (e.g., security screening), although most laboratory studies have examined the process of how individuals search on their own. The purpose of this study was to compare performance when searching with someone (collabo condition) to performance when searching

alone (individual condition), and to measure participants' metacognition of their performance (speed and accuracy in Experiments 1 and 2, respectively) under the two conditions. First, the participants individually predicted their performance for search displays twice (i.e., for the individual and collabo conditions). They rated how fast/accurate they expected to be on a scale from 1 (fast/accurate) to 100 (slow/inaccurate). After the metacognitive ratings, the participants performed a visual search task under the collabo and individual conditions. The results showed that the participants underestimated (and overestimated) collaborative search speed (and accuracy), suggesting metacognition is inaccurate in the collaborative search process.
Email: Yuki Miyazaki, ymiya@fuhc.fukuyama-u.ac.jp

(3156)

Severity of Aquatic Incidents During Free-Viewing and Focused Attention. LYNDSEY K. LANAGAN-LEITZEL, *Eastern Connecticut State University* — Lifeguard surveillance is a highly challenging search for multiple diverse and ill-defined targets among multiple diverse distractors. Lanagan-Leitzel (2012) found that lifeguards were inconsistent in reporting severe incidents during free-viewing conditions; this could be explained either by a lack of knowledge or by the division of attention across the scene. A new sample of lifeguards was asked to report the severity (0 – 7) of 100 isolated incidents from Lanagan-Leitzel (2012). Although there was a relationship between report under free-viewing conditions and severity rating during focused attention, it was only moderate. Some incidents that were rated severe had been missed during free viewing, especially those involving submersion or horseplay. It is proposed that missed incidents during free viewing are due to attention being diverted to other critical events as opposed to lack of knowledge or attentional disengagement. Implications for lifeguard practice and instruction are discussed.
Email: Lyndsey K. Lanagan-Leitzel, lanaganleitzell@easternct.edu

(3157)

Expertise and the Effects of Density on Detection and Localisation in Rapid Presentation of Mammograms. ANN J. CARRIGAN, SUSAN G. WARDLE and ANINA N. RICH, *Macquarie University* (Sponsored by Kim Curby) — Humans are capable of making decisions when shown rapid presentations of natural scenes. The ability of an experienced radiologist to rapidly detect an abnormality on a mammogram may build upon this general capacity. Although abnormality detection has been shown to be above chance at short durations, the extent to which abnormalities can be localised at these brief presentation times is less clear. We extended previous work by Evans and colleagues (2013), and presented mammograms at very short durations [250, 500, 750ms], where half contained a mass. In Experiment 1 we showed that even at 250ms, detection and localisation accuracy was high, most likely due to target saliency. In Experiment 2 we manipulated target saliency by selecting mammograms with varying mammographic breast density (visual clutter). The results emphasise the importance of visual clutter in rapid target detection, and are clinically relevant regarding abnormality detection in dense versus fatty breast tissue.
Email: Ann Carrigan, ann.carrigan@mq.edu.au

(3158)

Survival Processing Enhances Search Efficiency. KIT W. CHO, *University of Houston-Downtown* — Rating items on their survival relevance leads to superior long-term episodic memory for those items than almost all other well-known memory-enhancement techniques. This finding, known as the survival processing effect, suggests that our brain and memory systems evolved and are molded by natural selection pressures. Although the survival processing effect has been demonstrated in the memory domain, there is no research examining whether the benefits extend to visual search processes. The present study employed a visual search task in which participants first rated an object-picture based on its survival relevance or pleasantness and then located that object-picture target in a search array with 7 or 15 distractors. Rating instructions did not affect search RTs when there were 7 distractors; however, survival-relevance ratings reduced search RTs relative to pleasantness ratings when there were 15 distractors. These results suggest that survival processing enhances visual search efficiency.
Email: Kit W. Cho, ChoK@uhd.edu

(3159)

The Influence of Perceptual Load on Detection of Singleton Distractors: A Replication of Forster and Lavie (2008). TESSA ABAGIS and JOHN JONIDES, *University of Michigan - Ann Arbor* — Perceptual load has a significant effect on distractibility. According to the Perceptual Load theory of attention, high perceptual load leaves few resources for processing extraneous information and results in less distractor interference. We conducted a replication of Forster and Lavie (2008) using a visual search task with meaningful singleton cartoon distractors presented infrequently above or below the display. Perceptual load was either high (making the task perceptually difficult) or low (making the task perceptually easy). We replicated the distractor and load effects of Forster and Lavie (2008). Our results show that distractor presence significantly increased reaction time. High perceptual load also significantly increased reaction time and error rate. Distractor interference was significantly lower in the high- compared to the low-load condition. Furthermore, we examined the relationship between inattention and recall of the distractors. We hypothesized that people with higher inattention are more likely to be distracted by and retain irrelevant information, such as the cartoon distractors presented in this study. Data will be presented about this prediction.
Email: Tessa Abagis, tabagis@umich.edu

(3160)

Selection and Suppression in Priming of Popout Search. BRYAN R. BURNHAM and KRISTEN PASKO, *The University of Scranton* — Intertrial priming effects are ubiquitous, with studies showing visual search is faster when the features of a singleton target and of nontargets are repeated than when the

features are switched. This priming of popout effect (PoP) is thought to reflect both activation from the preceding target's features along with inhibition of the preceding nontarget features. The present study employed a letter-probe detection task developed by Gaspelin, Leonard and Luck (2015, Psychological Science), to examine whether activation and inhibition bias attention toward the previous target's features and away from previous nontarget features, respectively. Typical PoP effects were observed in response times; however, accuracy was *lower* for probes appearing on the singleton target when its color was repeated. Additionally, accuracy was *greater* for probes appearing on the nontargets when that color was repeated. The results may suggest intertrial feature repetition facilitates selection, but not feature encoding.
Email: Bryan R Burnham, bryan.burnham@scranton.edu

(3161)

How Target/Distractor Discriminability Affects Search Guidance Strategy. JUNHA CHANG and KYLE R. CAVE, *University of Massachusetts Amherst*, TAMARYN MENNEER, *University of Southampton*, ELINA KAPLAN, *University of Massachusetts Amherst*, NICK DONNELLY, *University of Southampton* — A search template that guides attention toward visual targets can be adjusted according to experience. The present study manipulated the discriminability between target and distractor colors to determine whether difficult (low) discriminability elicits more precise representation of the target colors than easy (high) discriminability. It also explored whether participants shift away from color guidance when forced to make more difficult discriminations. One group searched through randomly mixed trials with easy- or difficult-discriminability arrays of colored *T* targets among colored *L*s, and another group searched through easy-discriminability displays only. We compared fixation data from the easy-discriminability trials in both groups: participants with experience of difficult discriminability had more unguided fixations to distractors with very different colors from the target, suggesting that participants use color information less to guide search when color discriminability might be difficult. There was no evidence that difficult discriminability prompted participants to encode target colors more precisely.
Email: Kyle R. Cave, kcave@psych.umass.edu

(3162)

Guiding Attention Using Compositional Spatial Representations: Why Theories of Attention Need Space to be Represented in Two Formats. PEDRO SZTYBEL and BRADLEY S. GIBSON, *University of Notre Dame* — Reference frames are used in attention research to explain how spatial locations are defined, but they are also commonly interpreted as having a compositional structure that encodes spatial locations in terms of separate parts, much like a Cartesian coordinate system. This latter conclusion may be unjustified though because reference frames can be used to define a location without being compositional in nature. A novel spatial cuing paradigm was devised to address this issue, and three experiments were interpreted to suggest that visual attention can be guided by "compositional gradients" that reflect the combined activation arising from the separate spatial dimensions. Altogether, the present findings were interpreted within a theory of conceptual control that distinguished between conceptual and perceptual representations of space. Conceptual representations are compositional, but they depend on non-compositional, perceptual representations to bind the activations arising from their separate spatial dimensions, much like non-spatial feature dimensions do.
Email: Bradley S. Gibson, bgibson@nd.edu

(3163)

The Reliability of the Attentional Momentum as an Explanation of IOR Is Not Tied to Eye-Movements. ELISABETH KREYKENBOHM, BERTRAND SAGER, CAITLYN MCCOLEMAN and THOMAS M. SPALEK, *Simon Fraser University* — Posner and Cohen (1984) provided evidence for a mechanism that deters us from re-examining previously attended locations (Inhibition of Return, IOR). The Attentional Momentum account of IOR proposes that our history of tracking moving objects biases our attentional deployments towards locations consistent with the principle of momentum. The consequence being that performance should be facilitated to the degree that a target appears in a location consistent with the established momentum (Pratt, Spalek, & Bradshaw, 1999). This account has been questioned on the grounds that the facilitation at the opposite location (Opposite Facilitation Effect; OFE) appears to be unreliable and might merely be a consequence of eye movements. Inconsistent with these notions, OFE was reliably obtained in all three experiments, regardless of whether participants were merely asked to maintain fixation, fixation was enforced by way of eye-tracking, or they were asked to move their eyes (Experiments 1, 2 and 3, respectively).
Email: Elisabeth Kreykenbohm, ekreyken@sfu.ca

(3164)

Target Present Guessing as a Function of Target Prevalence and Accumulated Information. CHAD PELTIER and MARK W. BECKER, *Michigan State University* — Target prevalence influences visual search behavior. At low target prevalence, miss rates are high and false alarms are low, while the opposite is true at high prevalence. There have been several models of search that aim to describe search behavior, one of which has been specifically intended to model search at varying prevalence levels. This model, the Multiple Decision Model (Wolfe & Van Wert, 2010) posits that all searches that end before the observer detects a target result in a target absent response. However, researchers have found high false alarms in high prevalence searches, which may indicate an observer who uses relevant information to make an "educated guess" after search termination. Here we manipulate target prevalence and the amount of information that an observer can accumulate about a search display to test if these sources of evidence are used to inform target present guess rates. We find that observers use both information about target prevalence rates and information

about the proportion of the array inspected prior to making a response to make an informed and statistically driven guess about the target's presence.
Email: Chad Peltier, peltie11@gmail.com

(3165)

Loss Aversion in Visual Search: Value-Driven Attentional Capture Is Modulated by Potential Loss. CASEY M. PHIFER, *Arizona State University* (Sponsored by Donald Homa) — Recent research has shown that reward-related stimuli capture attention in an automatic and involuntary manner (Anderson, Laurent, & Yantis, 2011; Theeuwes & Belopolsky, 2012). Although previous studies have typically focused on the effect of reward on attention, *prospect theory* states that potential losses are weighed more heavily than gains (Kahneman & Tversky, 1979). In the current study, we investigated the effect of loss aversion on attention by making losses worth more than partnering gains. In a visual search task, response time and accuracy were measured as participants searched for targets among distractors. Participants were informed that singleton distractors indicated the magnitude of an available gain or loss during a trial. Although the optimal strategy was to respond quickly and accurately, participants were significantly slower and less accurate during high magnitude trials. The data suggest that attention is automatically captured by potential loss, even when it is counterproductive to task goals.
Email: Casey Phifer, Cmphifer@asu.edu

ATTENTION: FEATURES AND OBJECTS

(3166)

Problems Using Size Judgements to Study Statistical Summary Representations. LARIS M. RODRIGUEZ, CHARLES E. WRIGHT and CHARLES CHUBB, *University of California, Irvine* — Ariely (2001) initiated interest in using mean size judgments to study statistical summary representations (SSRs). Lately, this topic has generated considerable interest. However, as first noted by Myczek and Simons (2008), mean size judgments are inefficient. In the research reported here, observers were briefly presented with a cloud of either 3 or 9 squares and, in different sessions, were asked (a) to estimate its mean size, (b) to calculate its centroid ignoring size difference, or (c) to calculate its centroid weighting the elements of the cloud according to their size. Efficiency was high in both centroid tasks, and substantially lower in the mean-size task. These results suggest that stimulus size is registered accurately and can be used effectively in the context of centroid judgments but not for judgements of mean-size. Given these results, size judgments may be a poor task to use to study SSRs.
Email: Laris Rodriguez, larisr@uci.edu

(3167)

Target-Item Heterogeneity Undermines Performance in Estimating Centroids. VIVIAN LU, CHARLES E. WRIGHT and CHARLES CHUBB, *University of California - Irvine* — In a centroid task, the participant views a briefly presented cloud of dots and then indicates with a mouse-click the apparent center of the "target" dots, a subset identified by a single, instructed feature level, e.g., one of several hues. An advantage of the centroid task is that attention filters, which estimate for a participant the influence of each stimulus type in the cloud on the perceived centroid, can be obtained easily and efficiently. Previous research from our lab has explored human ability to construct and efficiently apply attention filters for single-feature targets drawn from a variety of stimulus dimensions. Here we document the strong, negative impact on performance that results when the participant is instructed to attend to target dots that consist of two or more levels of a single feature dimension, even when those levels differ categorically from those of the distractor dots.
Email: Vivian Lu, luvt@uci.edu

(3168)

Frequency of Target Appearance Modulate Object-Based Attention. JOSEPH C. NAH and SARAH SHOMSTEIN, *George Washington University* — Most evidence for object-based attentional allocation is drawn from studies employing the two-rectangle method where the distribution of targets is biased to the cued object. Thus, it remains unclear to what extent object-based effects are a byproduct of contributions from object representations or from spatial attention that is based on statistical imbalances. Here, we investigate the extent to which target frequency modulates object-based attention by systematically manipulating frequency of target appearance in a particular spatial location. In a set of 5 experiments, participants were presented with a variant of the two-rectangle method paradigm in which we systematically manipulated probabilities of targets appearing either in the cued, uncued-same, uncued-different, and diagonal locations. Combined results suggest that object-based contribution to attentional guidance is a combination of spatial-probabilities and object contribution, but that contribution of object representations is fragile and is easily replaced by spatial biases.
Email: Joseph C. Nah, nah@gwu.edu

(3169)

Target-Distractor Similarity in Feature and Conjunctive Centroid Judgements. A. NICOLE WINTER, CHARLES CHUBB, CHARLES E. WRIGHT and GEORGE SPERLING, *University of California at Irvine* — Tresiman and Gelade's (1980) Feature Integration Theory proposed that, in the context of visual search, feature targets are detected more easily because they allow for parallel search of the entire display, whereas conjunctive targets are more difficult because they require serial search. However, in the context of centroid judgments, conjunctive targets are not necessarily more difficult. Our previous research (VSS, 2016) demonstrated improved performance for conjunctive centroids relative to the centroids of some component features. Here, we extend these findings by varying target-distractor similarity in feature and conjunctive centroid judgments, using the feature dimensions of luminance and shape. Results: centroid performance closely mirrors target-distractor similarity. Performance on conjunctive centroid estimations is as good or better than on component-feature

centroids estimations. These results are consistent with Buetti's recent account of stage 1 processing (Buetti, Cronin, Madison, Wang & Lleras, 2016).
Email: Nicole Winter, nicole.winter@uci.edu

(3170)

The Impact of Cross-Modal Attention Entrainment on Visual Gap Detection in Older Adults. ASHLEY S. BANGERT, *The University of Texas at El Paso*, JENNIFER COANE, *Colby College* — Regular auditory signals drive peaks in visual attention, leading to improved performance on simple visual attention tasks in younger adults (Miller, Carlson & McAuley, 2013). The current study investigated whether older adults show similar benefits of cross-modal attention entrainment. Fifty-eight older adults completed a task where they identified the side (left or right) in which a gap was located on a briefly presented and backward masked square presented on the computer screen. Prior to each trial participants heard seven equidistant tones. The trial was then presented at the moment an 8th tone would be expected (600 ms after the 7th tone) or earlier or later than that expected moment by ±21 ms or ±76 ms. Quadratic patterns in performance were found; higher accuracy and faster reaction times emerged for trials presented at or close to the expected moment. This suggests that cross-modal entrainment of attention is preserved with age.
Email: Ashley S. Bangert, asbangert2@utep.edu

(3171)

Integrating Cue and Value Information in the Value-Driven Attention Network During Associative Learning. BRIAN A. ANDERSON, *Johns Hopkins University* — Through associative reward learning, arbitrary cues acquire the ability to capture visual attention. Previous studies have examined the neural correlates of value-driven attentional orienting, revealing elevated activity within a network of brain regions encompassing the visual corticostriatal loop and intraparietal sulcus. Such findings raise the broader question of how visual signals are combined with reward signals during learning to create a representation that is sensitive to the confluence of the two. In the present study, the entire value-driven attention network was activated by the receipt of high reward during a cue-reward associative learning task. Further examination of these reward signals revealed information about the identity of the preceding cue in the caudate tail and lateral occipital complex, and information about the location of the preceding cue in the intraparietal sulcus, while early visual cortex represented both location and identity. The results reveal stimulus-specific reward signals within the value-driven attention network.
Email: Brian A. Anderson, bander33@jhu.edu

(3172)

Are Non-Reported Attended Attributes Really Forgotten? GEOFFREY W. HARRISON, MELISSA KANG and DARYL E. WILSON, *Queen's University* (Sponsored by D. J. K. Mewhort) — Recently, Chen and Wyble (2015) demonstrated that attending a target feature does not result in that feature being encoded into working memory (WM). This conclusion was supported by participants' failure to report the attended attribute during a surprise memory test. However, the surprising nature of the test question might contribute to forgetting. To test whether attended attributes are encoded in WM, we modified Chen and Wyble's paradigm to include a second shaped-based singleton search task. Critically, if an attribute being held in WM is present in this second search task, it will capture attention. Across two experiments, we replicated the failure to report the attended attribute using a surprise memory test, but also found the presence of the previously attended attribute in the second search task captured attention. These findings suggest attended attributes are maintained in WM, though to a weaker extent than if the attribute is required for report.
Email: Geoffrey W. Harrison, 8gh3@queensu.ca

(3173)

Do Intervening Events Always Turn Repetition Benefits Into Repetition Costs? MATTHEW D. HILCHEY, JASON RAJSIC, GREG HUFFMAN and JAY PRATT, *University of Toronto* — When successive stimuli require identification, repeating and alternating features yield benefits and costs, respectively. According to episodic integration theory, features are bound together into a memory trace such that subsequent matching and mismatching events are efficiently and inefficiently re-enacted. Recently, it has been shown that intervening response events between identification targets disrupt episodic integration, which turns stimulus-response repetition benefits into costs. These findings suggest that other episodic integration effects, like location-response repetition benefits, may reverse when separated by intervening response events. To test this, we inserted intervening response events between identification targets that randomly repeated or switched locations, while distinguishing stimulus from response repetition by mapping two instead of one stimulus onto each hand. Neither the stimulus-response nor location-response repetition benefits were reversed, suggesting that an intervening response event is not always sufficient for repetition costs, and that memory traces may be more robust in demanding tasks.
Email: Matthew Hilchey, matthew.hilchey@utoronto.ca

(3174)

Is Tracking Capacity Limited by a Discrete or Continuous Resource? ANNIE TRAN and JAMES E. HOFFMAN, *University of Delaware* — There is a limit to the number of objects that our visual system can track at any given moment, as exemplified by the multiple object tracking task (MOT; Pylyshyn & Storm, 1988). One explanation for capacity limits on tracking performance is that tracked objects compete for a limited attentional resource. Resource allocation can either be discrete or continuous. In discrete allocation, each object receives a fixed portion of the resource while continuous allocation allows for flexible distribution of resources between objects. We examined this question by measuring the precision with which targets are tracked. A mixture model was used to derive separate estimates of tracking resolution and the maximum number of targets that could be tracked. We found marked individual differences in

results at high tracking loads, where half of the participants tracked only a few targets with high precision while others tracked many targets with low precision.
Email: Annie Tran, atran@psych.udel.edu

(3175)

Turn That Frown Upside-Down - or Into any Shape You Want. LIA N. KENDALL, QUENTIN RAFFAELLI, ALAN KINGSTONE and REBECCA M. TODD, *University of British Columbia* — Cartoon images can be seen as simplified and exaggerated depictions of real world stimuli. Yet most cartoon media also contain symbolic elements that require learning or culture to understand. It is unclear to what degree the communicative power of cartoon images relies on verisimilitude versus learned associations. We hypothesized that cartoons are unique in their use of symbolic elements even at the cost of real-world resemblance. To test this, we employed a face sensitive ERP component, the N170 as an index to examine whether, in a pre-post design, a learned arbitrary symbol (e.g., :&) could replace a previously known one (e.g., :)) in effective communication of facial emotion. Results showed that, while there was a distinct ERP amplitude pattern for unknown relative to recognized emotional expressions, this pattern shifted to match known expressions once their meaning is learned. This finding supports the role of symbolic communication in cartoon imagery.
Email: Lia N. Kendall, lia.noelle.kendall@gmail.com

(3176)

Object Closure Affects the Strength of Object-Based Attentional Filtering. GRACE NICORA and ADAM S. GREENBERG, *University of Wisconsin-Milwaukee* — Shifts of object-based attention (OBA) are affected by object closure in the double-rectangle paradigm (Marino & Scholl, 2005). We investigated how closure affects object selection strength, using flanking distracters. We manipulated a set of vertical rectangles by removing the horizontal ends of each rectangle. A centrally presented rectangle (*rectangles condition*), or two parallel lines (*lines condition*), were flanked by four identical objects. One end of the central object was then exogenously cued. Target/distracter letters were presented on the objects and subjects performed a letter discrimination. Flankers were congruent/incongruent with the target. Experiment 1 (homogenous objects) showed that OBA selection is strong when objects are closed, preventing flankers from influencing performance. Experiments 2 (flankers always lines) and 3 (flankers always rectangles) showed that both target & flanking objects aid distracter filtering. Experiment 4 (cue-less) showed that closure doesn't affect performance without OBA. Thus, OBA selection strength critically depends on object closure.
Email: Adam S. Greenberg, agreenb@uwm.edu

SCENE PROCESSING

(3177)

How Blanking Affects Detection of Stimulus Displacements Across Saccadic Eye Movements. DAVID E. IRWIN and MARIA M. ROBINSON, *University of Illinois* — Displacements of visual stimuli during saccadic eye movements are usually not perceived unless the displacement is large relative to saccade amplitude. In two experiments we show that presenting a blank interval after the saccade before presenting the displaced stimulus improves people's ability to detect that the stimulus has been displaced and also their ability to judge the direction that it has been displaced, but only for displacements in the direction opposite to the saccade (backward displacements). A third experiment showed that this was due to subjects misperceiving the saccade target location as being closer to the initial fixation point at saccade onset but remembering its location more veridically 50 ms later. This has the effect of improving the detection of displacements as well as their direction of displacement, but preferentially for backwards vs. forward displacements. The results have implications for theories of perceptual stability across saccades.
Email: David E. Irwin, irwin@illinois.edu

(3178)

Eye Movement Patterns Among Salient Regions Predict Individual Differences. TAYLOR R. HAYES and JOHN M. HENDERSON, *University of California, Davis* — An understudied area in scene perception is the degree to which individual differences influence scene-viewing behavior. The present study investigated this issue by predicting individual differences in viewer cognitive capacities from regularities in their sequential eye movement patterns. Seventy-nine participants completed a free-view memorization task for 40 real-world scenes while their eye movements were recorded. Cognitive individual difference measures including intelligence, speed of processing, and working memory capacity were collected across subsets of participants. Successor Representation Scanpath Analysis (SRSA, Hayes, Petrov, & Sederberg, 2011) was used to capture statistical regularities in each participant's scanpaths across the 5 most salient regions in each scene based on overall fixation density. Leave-one-out cross validation demonstrated SRSA could explain individual differences in viewer intelligence (r^2=0.40), speed of processing (r^2=0.36), and working memory capacity (r^2=0.37). These results suggest that underlying individual differences in observers significantly influence how salient information is encoded during real-world scene perception.
Email: Taylor R. Hayes, trhayes@ucdavis.edu

(3179)

The Relationship Between Eye Movements and Task Performance Depends on How Quickly Observers Settle Into a Particular Mode of Viewing. MONICA L. ROSEN and MARK MILLS, *University of Nebraska - Lincoln*, EDWIN DALMAIJER, *University of Oxford*, MICHAEL D. DODD, *University of Nebraska - Lincoln* — During scene viewing, eye movements shift from a global mode (long saccades, short fixations) to a local one (short saccades, long fixations), possibly reflecting a shift in priority for spatial information early on to object recognition/encoding later. In support, Velichkovsky et al. (2002, 2005) used a recognition paradigm to demonstrate that local mode fixations are positively related to recognition. Whether this pattern is modulated by task-related factors is

unclear. While studies have shown that eye movements differ by task, these studies did not measure task performance, making it unclear whether task-related variation in eye movements is reflective of a task-dependent shift from spatial-to-identity processing. To examine this issue, subjects viewed scenes while performing either a search, memorization, or evaluation task. We found that local mode eye movements were related to memory performance only when the global-to-local shift occurred rapidly such that the local mode was dominant longer during viewing.
This research was supported by the NIH grant R01EY022974 to M.D.D.
Email: Monica L. Rosen, rosen.monica@huskers.unl.edu

(3180)

Variance Decomposition of Two Million Eye Movements: A Guide for Focusing Resources in Scene Perception Research. MARK MILLS and MONICA L. ROSEN, *University of Nebraska - Lincoln*, EDWIN DALMAIJER, *University of Oxford*, MICHAEL DODD, *University of Nebraska - Lincoln* — An effect of current task goals on eye movements during scene viewing is well-supported, though, studies disagree on its time course. An obvious, albeit unexciting, explanation is that some aspect of the experimental context (and independent of the task) differing between studies is responsible. To investigate this, random coefficients modeling was used to examine the extent to which different contextual variables explained variability in the effect task over time for a sample of 2,000,000 eye movements nested in 1,200 subjects viewing 120 scenes (sampled randomly from the same set) for 8 seconds each while performing the same set of viewing tasks (scene search, memorization, and rating) under one of 26 experimental contexts. We found that the nature of the semantic relationship between the target of the task and the content of the scene (semantically congruent versus orthogonal) explained a substantial portion of this variance, suggesting target-scene associations deserve further scrutiny.
This research was supported by the NIH grant R01EY022974 to M.D.D.
Email: Mark Mills, mark.mills2@huskers.unl.edu

(3181)

Using Computational Models to Quantify Stimulus-Driven Influences in Webpages. JEREMIAH D. STILL and JOHN HICKS, *Old Dominion University*, JAY GALL, *San Jose State University* — One critical factor in whether a search will be fast and effortless is visual saliency. If we are searching for an object, it is easier to find one that is visually salient than one that is not. Although many researchers have examined the performance of stimulus-driven computational models within natural scenes, relatively few have explored interfaces. Still and Masciocchi (2010) suggested that the classic Itti, Koch, and Niebur (1998) Saliency model is capable of predicting the initial fixations in webpages. The present study expands on that research by comparing the performance of popular saliency models across a variety of webpages (i.e., mostly images, half text and images, mostly text). Results of this study reveal the strengths and weaknesses of each model within these atypical stimuli. These findings ought to help interface designers create easier to search interfaces by making implicit stimulus-driven information that guides attention visible.
Email: Jeremiah Still, jstill@odu.edu

(3182)

Default Visual Perspective-Taking for Multiple Agents and Attentional Sets. LEWIS J. BAKER and DANIEL T. LEVIN, *Vanderbilt University* — Researchers have proposed that humans employ a rapid, default and early-developing system for encoding another's perspective. Some proponents of this idea imply that the processing costs incurred when another agent holds a different perspective reflect an exhaustive guidance of attention to all regions accessible by every agent in a scene. This study investigated perspective taking in scenes containing multiple agents and attentional sets. Participants responded whether they or another agent could see a number of objects from one of two salient sets. Participants responses were equally slower and more error prone when *any* perspective differed from their own, and this interference was limited to attended sets of objects. Default perspective taking is not sensitive to multiple perspectives and is limited to attended objects.
Email: Lewis J. Baker, lewisjbaker@gmail.com

(3183)

An Eye-Tracking Study to Identify Variables That Affect the Interpretation of a Purportedly Paranormal Event. ANDREW HUNT, TYLER HUBBARD, KEVIN ANDERSON, CHRISTOF FEHRMAN and WILLIAM LANGSTON, *Middle Tennessee State University* — We evaluated the relationships between belief, experience, and personality with the interpretation of a purportedly paranormal event. Participants watched a video of ghost investigators communicating with a spirit. We measured schizotypy, paranormal belief (pre and post) and cognitive reflection. Data regarding participants' visual fixations were recorded. The influence of the dependent measures was assessed for prior belief, change in belief, interpretation of the video, and what participants watched. Similar to the predictions from a model of positive delusions proposed by Garety et al. (2001), different variables were associated with prior belief versus the interpretation of the event. Prior belief was associated with ghost experience and schizotypy. Interpretation was associated with prior belief and suspicion. These results extend the application of a model for delusions to more routine anomalous beliefs and highlight the fact that variables influencing the formation of beliefs are less relevant for understanding how beliefs influence perception and how beliefs change.
Email: William Langston, william.langston@mtsu.edu

(3184)

Perception of Dynamic Scenes: What is Your "Heider Capacity"? FARAHNAZ AHMED WICK, *University of Massachusetts Boston*, SAHAJ GARG, *Bridgewater-Raritan High School*, ABLA ALAOUI SOCE and JEREMY M. WOLFE, *Harvard Medical School and Brigham & Women's Hospital* — The classic animation experiment by Heider and Simmel (1944) demonstrated our strong tendency to impose

narratives on interactions of three simple geometric shapes. We investigated the limits on our ability to use such narratives in communications about dynamic scenes. We created 30-second, Heider-style cartoons containing 3 to 9 items whose trajectories were generated by simple rules (follow, avoid etc). Ten Amazon Mechanical Turk participants wrote short narratives for each cartoon which were scored for accuracy by lab assistants. A new group of participants (N= 48) were shown a cartoon and then presented with a narrative that either did or did not match that specific cartoon. Participants rated the fit of the narrative to the cartoon. ROC curves, generated from the rating scale data, show good performance with three objects but poor performance for larger set sizes, suggesting a limit on visual working memory and/or multiple identity tracking.
Email: Farahnaz Ahmed Wick, fwick@cs.umb.edu

(3185)

How Eye Movements Illuminate Bridging Inference Generation in Wordless Sequential Narratives. JOHN P. HUTSON, *Kansas State Univeristy*, JOE P. MAGLIANO, *Northern Illinois University*, TIM J. SMITH, *Birkbeck, University of London*, LESTER C. LOSCHKY, *Kansas State University* — The current study investigates the process of generating bridging inferences while viewing visual sequential narratives. Using a series of children's wordless sequential narratives, we created ellipses, in which during selected 3-image sequences, a highly inferrable action in the middle of the sequence was either shown or missing. Previously, we found when the inferrable actions were missing, viewers readily inferred them, as shown by viewing times and think-aloud protocols. Here, we investigated the effects of such bridging inference generation on eye-movements, both in terms of basic eye-movement parameters (fixation counts, saccade lengths, and fixation durations), and fixation density heat maps. We found that greater fixation counts, but not longer fixation durations, account for the longer viewing times when viewers must infer actions. We also investigate whether the judged inference-generation utility of various objects in a scene is related to the probability of fixating those objects in the ellipsis versus non-ellipsis conditions.
Email: John Hutson, jphutson@ksu.edu

(3186)

Dwelling on Memorability: Effects of Long-Term Picture Memorability on the Attentional Blink. MARK R. NIEUWENSTEIN, MAXIMILIAN LINDE and HEDDERIK VAN RIJN, *University of Groningen* — Although people have an extraordinary ability to recognize and remember pictures of visual scenes, there are also large and consistent differences in how well different pictures are remembered (Isola et al., 2014). What determines a picture's worth in memorability is not fully understood. Here, we used the attentional blink as a tool to investigate how memorability affects the selection and consolidation of a picture into working memory. Participants had to remember or ignore a picture of high or low memorability and they had to identify a trailing, masked letter that appeared at an SOA of 140-700 ms. Memorable pictures produced a longer attentional blink than non-memorable pictures, but only when the pictures had to be remembered. This suggests that memorability does not affect attentional engagement for a to-be-ignored picture, while it does increase the time it takes to consolidate a to-be-remembered picture into working memory.
Email: Mark Nieuwenstein, m.r.nieuwenstein@rug.nl

(3187)

The Role of Context in Boundary Extension. A. EZGI MAMUS and AYSECAN BODUROGLU, *Bogazici University* — Boundary extension (BE) is a prediction error arising from the expectation of the continuation of the current scene view and it has been argued that context may promotes BE (Intraub, 2012). In two separate studies we investigated the role of context in BE. In Experiment 1, observers viewed scenes that either contained semantically consistent or inconsistent objects as well as objects on white backgrounds. In Experiment 2, observers viewed abstract shapes on blank backgrounds. We also measured individual differences in visual and spatial imagery ability. In all types of scenes and the white background condition there was a BE effect; this was mediated by individual differences in spatial imagery. Critically, semantic inconsistency in scenes reduced BE. When abstract shapes were used instead of meaningful objects, no BE effect was seen. These results suggest that factors like semantic consistency and individual imagery ability impact one's likelihood of extending scene boundaries.
Email: A. Ezgi Mamus, zgmamus@gmail.com

(3188)

Linear Ranking Scales of Naturalness and Openness of Scenes. HANSHU ZHANG, JOSEPH WOODWORTH HOUPT and ASSAF HAREL, *Wright State University* — There is clear evidence that people use global scene properties faster than basic-level information in scene categorization. However, there is uncertainty about the degree to which scenes are characteristic of various global properties. The current study aims to establish a reference scale to capture the degree to which scenes contain particular global properties. Participants were asked to judge which of a random pair of scenes was more natural, man-made, open, or closed. To assess how the scenes were ordered along these dimensions, we applied a standard ranking system for generating a scale for each property. Split-half reliabilities were high for each individual scale, although there were significantly smaller correlations between the opposing scales (e.g., more open compared with more closed) than within a single scale. In future work, we hope to use these scales as the basis for studies on the interrelations between the perceptual processing of these attributes.
Email: Hanshu zhang, zhang.180@wright.edu

LANGUAGE PRODUCTION/WRITING

(3189)

Effects of Situational Stress on Word Retrieval in Young, Middle-Aged, and Older Adults. CHRISTOPHER J. SCHMANK, LORI E. JAMES and ADAM SILVER, *University of Colorado Colorado Springs* — High-stress testing conditions (i.e., evaluative observation while performing challenging tasks) cause increases in the word retrieval failures known as tip-of-the-tongue states (TOTs) compared to low-stress testing

conditions. In the present study, young (ages 18-29), middle-aged (ages 30-60), and older adult (ages 61-85) participants were randomly assigned to a high- or low-stress testing condition. They named famous faces (producing proper names) and definitions (producing common nouns), and indicated TOTs as they occurred. For all age groups, participants in the high-stress condition had more TOTs than those in the low-stress condition, using various calculations of TOT rates. There were effects of item type, with proper names being harder to retrieve than common nouns, but item type did not interact with stress condition. There were some main effects of age group, but age group never interacted with stress condition. Results indicate that situational stress impairs word retrieval similarly for names and non-name words, irrespective of participant age.
Email: Christopher Schmank, cschmank@uccs.edu

(3190)

Spontaneous Rates: Evaluating Domain-Specific and Domain-General Factors in Production Timing. EMMA B. GREENSPON, *University at Buffalo, State University of New York*, CAROLINE PALMER, *McGill University*, PETER Q. PFORDRESHER, *University at Buffalo, State University of New York* — The current study addressed whether spontaneous production rates are driven by an endogenous timing mechanism. Pianists uttered sentences from memory, played melodies on the piano from memory, and tapped their finger repeatedly on different trials, all at a comfortable self-selected rate. We analyzed spontaneous rates within and across tasks. Absolute values of spontaneous rates were domain-specific: Spontaneous speech rates were significantly faster than spontaneous rates in piano or tapping performance. However, individual differences in spontaneous rates were correlated across domains: Individuals who were relatively slow speakers tended to also be relatively slow pianists and tappers. In addition, the magnitude of rate differences across individuals varied across domains: The ranges of displayed rates across individuals in tapping and piano were much greater (over four times larger) than those displayed in speech production. In sum, we found evidence for a general endogenous timing mechanism that is constrained by domain-specific factors.
Email: Emma Greenspon, ebgreens@buffalo.edu

(3191)

Keep It Simple? The Effects of Simple vs. Complex Input in Adult Second Language Development. KATHERINE A. BRILL-SCHUETZ and KARA MORGAN-SHORT, *University of Illinois, Chicago* — The current study examined how second language (L2) input, simple vs. complex, may differentially affect initial adult L2 development (e.g., Kersten & Earles, 2001). Participants were assigned to L2 training conditions where they received either simple or complex input. Afterwards, participants completed a grammaticality judgment task (GJT) and a comprehension task to assess L2 development. Participants also responded to subjective measures that were embedded in the GJT to assess knowledge development (Rebuschat &Williams, 2012). Results showed better overall development for learners who received simple input. Participants who received complex input showed above-chance performance on test items that paralleled the structure of training items. When examining knowledge development, learners in the simple input condition evidenced more diverse types of knowledge than learners in the complex input condition. These results suggest that providing L2 learners with simple input may facilitate overall L2 development at the initial stages of learning an L2.
Email: Katherine Brill-Schuetz, kbrill@uic.edu

(3192)

Factors That Would Affect Adults' Learning of Summary Writing. HAIYING LI, *Rutgers University*, ARTHUR C. GRAESSER, *University of Memphis* — Summarizing is an important skill not only in academic writing but also in career development. This study explored three latent factors that would potentially affect adults' learning of summary writing in a conversation-based intelligent tutoring system with computer agents (AutoTutor): individual differences, engagement, and learning progression of summarization. Indicators of individual differences were age, gender, years of English learning, native language, education, prior comprehension and summarizing skills, and computer experience. Indicators of engagement were self-reports of affect, mind wandering, and text difficulty in addition to summary writing time. Indicators of learning progression were acquisition of macro-level text structures (compare-contrast and cause-effect) in the formats of multiple-choice questions, summary writing, and summary evaluation. Structural equation models confirmed that engagement was a distinctive predictor of the quality of summaries in addition to individual differences and learning progressions.
Email: Haiying Li, haiying.li@gse.rutgers.edu

(3193)

From Left to Write: Optimality Theory Modelling of Handwriting in Hebrew and English. GALI ELLENBLUM and MICHAEL MCCLOSKEY, *Johns Hopkins University* — Why do we write letters the way we do? The writing strokes comprising a particular letter could be produced in many orders and directions, but most of those are never observed. Researchers have proposed principles underlying stroke patterns (e.g., no down-up strokes), but those often conflict and are frequently violated. In this study, Native Hebrew and English speakers wrote on a graphics tablet, and the order and direction in which they produced strokes was analyzed. Applying the principles of Optimality Theory (OT; Prince & Smolensky, 1993), a computational framework originally developed in the context of phonology, we argue that violable, ranked constraints account for the way Hebrew and Roman characters are produced. We further show that OT sheds light on differences between the writing of the two scripts, between the handwriting of different participants, and between the prescribed and actual writing, and that it can resolve previously unanswered questions.
Email: Gali Ellenblum, gali@jhu.edu

(3194)

Is There Corn When You Write Corner? Evidence of Decomposition in Written Production of Semantically Transparent and Opaque Words. VICTORIA SHUSTER and MICHELE MIOZZO, *The New School* — Various results suggest

that the same neural substrates support the processing of orthographic information in reading and spelling. These shared brain mechanisms could cause features that are important for either reading or spelling to play a role in the other task. We explore this hypothesis by examining morphology. In reading, decomposition has been shown to occur with both semantically transparent (*camper*) and opaque (*corner*) words. We investigate an individual (LC) with acquired brain damage and spelling deficits. LC was more accurate in writing inflected and derived words than matched monomorphemic words. The same advantage appeared with morphologically opaque words (*corner*) and striking similarities were observed between morphologically opaque and transparent words. These findings provide the first evidence that opaque words are represented in a decomposed form within the orthographic information accessed in writing. In addition to suggesting that there are shared processes for reading and writing, our findings reveal that processes that have a specific function in one orthographic task may surface in another orthographic task where this function may not be relevant.
Email: Victoria Shuster, shusv046@newschool.edu

(3195)

Taboo Distractors Influence Processing of Negative Distractors in Picture-Word Interference. KATHERINE K. WHITE and NICOLETTE P. GLIDDEN, *Rhodes College*, LISE ABRAMS, *University of Florida* — Strong emotional words are known to capture attention and slow speech production. For example, taboo distractor words slow picture naming more than other types of distractors. The present experiments investigated whether the effect of negative and positive distractors on picture naming is moderated by the presence of taboo distractors. Target pictures were accompanied by distractors that varied in valence (negative, positive, neutral), including taboo distractors in Experiment 1 but not Experiment 2. Carryover effects of emotional distractors were measured on subsequent filler pictures without accompanying distractors. Negative distractors slowed target naming times only in Experiment 1 when taboo trials were present. Carryover effects occurred where target trials with negative or positive distractors sped filler naming times but only in Experiment 2 when taboo trials were absent. Results suggest that the presence of taboo words changes how negative words are processed, which has implications for theories of emotional word processing.
Email: Katherine White, whitek@rhodes.edu

(3196)

Saying Emotionally Arousing Words Decreases Tip-of-the-Tongue States. LISE ABRAMS and DANIELLE K. DAVIS, *University of Florida*, LORI E. JAMES, *University of Colorado Colorado Springs* — Tip-of-the-tongue (TOT) states represent a temporary inability to retrieve a known word. Despite anecdotal claims that arousing states such as stress or anxiety increase TOTs, evidence linking emotional arousal and TOTs has been mixed. In two experiments with college-aged participants, we induced emotional arousal by having participants produce a taboo word, a positively-valenced word, or a neutral word. Then, they were presented with a general knowledge question whose answer was a specific proper name or non-name, and they indicated whether they knew, did not know, or were having a TOT. Results demonstrated a causal link between emotionally-arousing words and TOTs: Saying taboo words decreased TOTs for non-names, while positive words decreased TOTs for both non-names and names. Results are discussed in terms of mechanisms that may be responsible for a relationship between emotional processing and phonological retrieval.
Email: Lise Abrams, abrams@ufl.edu

(3197)

Process of Metaphor-Literal Expression Production in Emotional Contexts. RYUNOSUKE OKA and TAKASHI KUSUMI, *Kyoto University* — The present study aimed to verify whether topic description affects metaphor production. It also aimed to verify whether the effect of topic description differs between metaphor and literal expressions. In Experiment 1, participants (N = 23) recalled and explained their past emotional experiences separately in two different topics: (i) actions, and (ii) feelings they had at that time. In each topic, participants had to make two different expression types separately: (a) metaphor, and (b) literal. Explanation time and subjective difficulty rating in producing each expression were recorded. Participants took longer and felt it more difficult to produce metaphoric than literal expressions. In addition, in the metaphor condition, participants took longer and felt it more difficult to explain actions than feelings. In Experiment 2, participants (N = 22) read a short story and were asked to explain their emotional experience if they were a character in the story. Participants took longer and felt it more difficult to make metaphoric than literal expressions. In addition, in the metaphor condition, participants felt it more difficult to explain actions than feelings. However, the magnitude of the interaction effect between description target and expression type on explanation time decreased in this experiment.
Email: Ryunouske Oka, oka.ryunosuke.45s@st.kyoto-u.ac.jp

(3198)

Changing Expectations in Preparation of Word Beginnings. ALEXANDRA K. FRAZER, *Muhlenberg College*, PADRAIG O'SEAGHDHA, *Lehigh University* — Speakers benefit from knowing how the words in a small set may begin. Previously, we found graded preparation in iterative picture and word naming (O'Seaghdha & Frazer, 2014), favoring an attentional account. Here we examined how preparation was modulated when consistent or inconsistent items were added to established sets (e.g., BOOT or TAIL added to the base set {bake, beach, bore}). In Experiment 1, participants who expected a set change withheld preparation at first. In Experiment 2, without such expectations, base items showed preparation immediately. In both experiments, graded preparation of base items relative to an unrelated baseline emerged in subsequent blocks. Thus attention was modulated both strategically depending on instructions (Experiment 1) and tactically based on set composition (both experiments). We propose an attentional

account of preparation in word production that involves both abstract construal of the experimental situation and allocation of attention on a trial by trial basis.
Email: Padraig O'Seaghdha, pat.oseaghdha@lehigh.edu

(3199)

Advance Phonological Planning in Mandarin Word Production is Limited to the First Syllable. JENN-YEU CHEN, *National Taiwan Normal University* — Previous studies employing the form preparation task have shown consistently that speakers of Mandarin Chinese could take advantage of the fore knowledge of the first tonal syllable or segmental syllable, but not the first segment, of a set of disyllabic words and speed up their production responses. In the present study, we found that the syllable preparation effect did not increase when the second segmental syllable was also known in advance. The results suggest that advance phonological planning in Mandarin word production is limited to the first syllable, and that additional planning is carried out online.
Email: Jenn-Yeu Chen, psyjyc@ntnu.edu.tw

(3200)

Inhibitory Abilities and the Decline of the Ability to Name Pictures With Age. LUCIA COLOMBO, *Università di Padova* — In the present study we tested the idea that a deficit in the ability to inhibit irrelevant information may be one of the reasons why old people are slower in naming pictures, and often show a tip of the tongue effect in speaking. A group of elders was tested in a picture naming task and in a Stroop colour test. The data were compared to those of a control group of young University students. Older participants were slower in naming pictures, and showed a greater interference effect in the Stroop colour test than younger participants (Hasher & Zacks, 1999; Faust & Balota, 2004). Picture naming latencies and Stroop interference effect were positively correlated only in old participants, indicating an inhibition deficit as a possible cause for the loss of the ability to name.
Email: Lucia Colombo, lucia.colombo@unipd.it

(3201)

Independent Contributions of Semantic Factors to Subject-Verb Agreement Errors During Production. DARRELL PENTA and NEAL J. PEARLMUTTER, *Northeastern University* — Subject-verb agreement computation can be influenced by factors that do not involve grammatical or conceptual number information, but the extent to which such factors separately contributed to previously-reported agreement-error effects (Penta & Pearlmutter, 2014; P&P) is difficult to ascertain through ANOVAs. We conducted several linear mixed-effect regressions on data from two preamble-completion experiments. Separately obtained normative measures of the experimental preambles were used to model error rates as a function of semantic integration (e.g., Solomon & Pearlmutter, 2014), semantic relatedness (e.g., Barker et al., 2001), word associations (P&P), and their interactions. Both integration and relatedness reliably increased the probability of errors when the effect of either factor was held constant, clarifying the results of P&P Experiment 1; the analyses further confirmed the results of P&P Experiment 2, which found no effect of relatedness on agreement in the absence of association.
Email: Darrell Penta, penta.d@husky.neu.edu

(3202)

Assessing the Influence of Feedback During a Multiple Document Writing Task in Science. KRISTOPHER KOPP, KATHRYN RUPP, DYLAN BLAUM, PATRICIA WALLACE and M. ANNE BRITT, *Northern Illinois University* — Scientific explanations explicitly connect initiating causes to outcomes using intermediate causes. Prior research has shown that students struggle creating these explanations especially when reading multiple sources. In this study we assessed the extent to which targeted feedback could improve explanation quality. 110 participants were first given a definition of a causal explanation and asked to construct an explanatory essay from reading five documents about coral bleaching. After writing, participants were randomly assigned either targeted (coherence or completeness) or control feedback (simply asked to revise or reminded of the definition) and then revised their essay. Overall, students' explanations included significantly more connected concepts after revision. For students whose initial essays lacked coherence, receiving appropriate feedback helped them significantly improve their explanations. The same benefit was not found for those whose initial essays lacked completeness. These results replicate the difficulty of this task and indicate the importance of targeted feedback.
Email: Kristopher Kopp, kristopherkopp@gmail.com

(3203)

Second-Order Implicit Learning of a Nonverbal Analogue to Phonotactics. NATHANIEL D. ANDERSON and GARY S. DELL, *University of Illinois - Urbana-Champaign* — When asked to speak nonsense syllables in which phonemes have restricted distributions (e.g. /f/ must be syllable onset), participants learn these rules within minutes. This learning is reflected in participants' speech errors, e.g. when /f/ is said in error, it shows up in onset position. However, when the phonotactic patterns involve conditionals such as "if the vowel is /i/, /f/ must be an onset", sleep consolidation is required before slips follow the rules. Unconditional (1^{st}-order) rules may be learned quickly because of prior linguistic experience. We examined a non-verbal analogue of the speaking task, in which participants use a button box to key in sequences of buttons presented visually on a screen. Again, we observed fast learning of 1^{st} order rules and learning of 2^{nd} order rules only after second session on a separate day. The effect of rule complexity in speech is not the result of prior linguistic experience and, instead, may be a fundamental property of sequence learning.
Email: Nathaniel Anderson, nandrsn3@illinois.edu

(3204)

Preventing Co-Verbal Gestures Impacts Speech Fluency. SARA A. GORING, LORI E. JAMES and UI'LANI SCHNACKENBERG, *University of Colorado Colorado Springs* — The current study examined the impact of co-verbal gestures on speech fluency by comparing a variety of dependent measures

(including pauses, errors, fillers, speech rate, and description time) from participants' speech. Participants were placed in conditions in which they were free to gesture, restricted from gesturing, and required to make a single repetitive movement while performing a detailed object description task. Other factors (e.g., working memory ability, stress, personality traits and bilingual status) were measured to determine their relationship with speech and gestures. Results indicate that speech was least fluent in the restricted gesture condition, followed by the required movement condition, and most fluent in the unrestricted gesture condition for most dependent measures, with medium effect sizes. This pattern replicates past research in showing that restricted gesturing can reduce speech fluency. Additionally, several individual difference variables predicted overall speech fluency, regardless of condition.
Email: Sara A. Goring, sgoring@uccs.edu

PSYCHOLINGUISTICS II

(3205)

The Impact of Minimal Context on Predictions Generated During Sentence Comprehension. EDWARD W. WLOTKO, BRAM VANDEKERCKHOVE, CONNIE CHOI, MINJAE KIM and GINA KUPERBERG, *Tufts University* — We examined the impact of minimal context on the brain's responses to fulfilled or unfulfilled predictions during comprehension. Proper names were paired with verbs that were either predictive or not predictive of a specific direct object noun (John evacuated...vs. John departed...). Nouns were either predictable (John evacuated the BUILDING), unpredictable but plausible (....the SUBWAY), or they violated selection restrictions of the verb (...the PASTE). We observed semantic facilitation on predictable nouns, as reflected by a selective reduction of the N400 amplitude. However, unlike context effects observed in discourse contexts, later positivities were not robustly elicited on nouns that either violated the verb's lexical predictions or its selection restrictions. Thus, minimal context based on the lexical properties of a verb may not provide enough time or promote a rich enough representation of context for the brain to generate and commit to specific lexical or event structure predictions during online comprehension.
Email: Gina Kuperberg, kuperber@nmr.mgh.harvard.edu

(3206)

Processing Ambiguous Words Interactively: An Eye-Tracking Study. MICHAEL C. W. YIP and MINNA M. ZHAI, *The Education University of Hong Kong* — Following up on our previous eye-tracking study on Mandarin Chinese, a parallel experiment was further conducted to examine the similar research questions on word recognition processes of Cantonese Chinese. Sixty native Cantonese listeners were recruited to participate in the eye-tracking experiment. In this experiment, Cantonese listeners were instructed to listen carefully to a spoken sentence, ended with an ambiguous word (Cantonese homophone), and look attentively at different Chinese characters or different pictures presented on the computer screen. We varied different types of sentence context and lexical information across different experimental conditions in the eye-tracking experiment. The results further confirmed that (1) sentence context played an early role on the disambiguation processes; (2) sentence context interacted with frequency of the individual meanings of the ambiguous word during lexical access; and (3) phonological information of the distracters only had a weak effect on the spoken word recognition processes of the ambiguous word even the sentence context was non-biasing. Together with other previous evidence, the patterns of eye-tracking results seemed to support the interactive approach in spoken word recognition of Chinese.
Email: Michael Yip, mcwyip@ied.edu.hk

(3207)

The Use of Lexical Context to Disambiguate Homophone Meanings in School-Aged Children. ANGELE YAZBEC, MICHAEL P. KASCHAK, ARIELLE BOROVSKY, JOHN L. JONES and CHRISTOPHER J. LONIGAN, *Florida State University* — Khanna and Boland (2010) investigated the development of lexical ambiguity resolution in 7 – 10 year old children, and reported that children across this age range were able to use simple lexical contexts to select the appropriate sense of a homophone. We report a replication and extension of Khanna and Boland's work, including a much larger sample size (n = 32 children in the original study; n > 200 in the current study) and a wider age range (4 – 11 year old children). We replicated Khanna and Boland's finding that the use of simple lexical contexts to disambiguate homophone meaning does not appear to change across age (in this case, children ranging from Pre-K to 5th grade). We also found that the use of lexical context to disambiguate homophone meaning was related to measures of vocabulary and executive functioning.
Email: Michael Kaschak, kaschak@psy.fsu.edu

(3208)

Listeners Tolerate Pragmatic Infelicities From Non-Native Speakers. SARAH FAIRCHILD and ANNA PAPAFRAGOU, *University of Delaware* — Foreign-accented speech affects language comprehension, but whether this primarily reflects increased processing demands or qualitative differences in processing strategy is unclear. Here, we demonstrate that readers are more accepting of pragmatically infelicitous sentences ("Some people have noses") when told that the sentences were produced by non-native speakers as compared to native English speakers (Exp. 1). Pragmatic tolerance disappears when participants believe that sentences belong to a highly proficient non-native speaker (Exp. 2) or a child native speaker (Exp. 3), suggesting that the effect is specific to speaker linguistic competence. When non-native speech is presented auditorily, selective tolerance to pragmatic infelicities is only observed in participants with high language processing ability as measured by independent tasks (Exp. 4). Thus, non-native speech is interpreted differently from native speech because of beliefs about the interlocutor's language background. In the auditory modality, these beliefs further interact with processing demands and are subject to individual differences.
Email: Sarah Fairchild, sarahf@udel.edu

(3209)

Sensitivity to Anomalies in Aphasia Supports Dissociation of Verb-Based and Event-Based Knowledge. MICHELLE B. HOLCOMB, MICHAEL W. DICKEY and TESSA C. WARREN, *University of Pittsburgh* — Event-related world knowledge (McRae & Matsuki, 2009) and verb-specific constraints (Pacynski & Kuperberg, 2012; Warren & McConnell, 2007) rapidly influence comprehension. Warren, Milburn, Patson, & Dickey (2015) found that neurotypical readers showed strong eye-movement disruption to selectional restriction violations (SRVs), but little disruption to similarly impossible anomalies cued only by event knowledge. In the current self-paced reading study, people with aphasia (PWA) read Warren et al.'s items. PWA showed disruption to both kinds of anomalies, but the disruption appeared on different word regions and was modulated by different participant characteristics. On the critical word, only PWA who were slower readers showed disruption to SRVs. On a spillover region, only PWA with milder impairment to event-based knowledge had longer reading times for impossible events. These findings are consistent with Warren et al.'s in supporting a dissociation between the processing of SRVs and event-based violations (cf. Hagoort, Hald, Bastiaansen, & Petersson, 2004).
Email: Tessa Warren, tessa@pitt.edu

(3210)

Learning to Predict Words Gives Children Semantic Knowledge for Free. PHILIP A. HUEBNER and JON A. WILLITS, *University of California, Riverside* — Language acquisition requires semantic differentiation of words. Can semantic knowledge be learned via the same process used to learn sequential orderings of words, or is a separate process necessary? To investigate this question, we constructed a recurrent neural network that learned to predict word sequences from naturalistic child-directed speech. On the model's primary task (learning to predict word sequences), the model achieved a high match to the true posterior conditional probability distribution of word occurrences, given the previous context. Critically, the internal representations learned by the model in the course of learning to predict words could also be used to classify words according to their grammatical and semantic categories. This was true despite the model never being explicitly trained on that task. These analyses demonstrate that recurrent neural networks can use naturalistic linguistic input to learn grammatically correct English phrases without prior knowledge of grammar. Moreover, these findings support the claim that semantic knowledge can emerge naturally from the statistical structure of the naturalistic linguistic input without requiring a second, explicitly semantic representation or process.
Email: Philip Huebner, phueb001@ucr.edu

(3211)

The Impact of Visible Intervenors on Form and Identity Priming. MARK MCPHEDRAN, ALEXANDER TAIKH, GIACOMO SPINELLI and STEPHEN J. LUPKER, *University of Western Ontario* — Forster (2009) reported that presenting a visible word (an "intervenor") between a masked form (e.g., talendar) or identity (e.g., calendar) prime and a target (e.g., CALENDAR) did not influence the form priming effect while reducing the identity priming effect to the same level as the form priming effect (e.g., approximately 25 ms). Based on these and other data, Forster argued that the identity priming effect has two components (a semantic one that is affected by a visible intervenor and a form-based one that is not, hence, the form priming effect can survive an intervenor). In the present experiments, we investigated the impact of the nature of the visible intervenor (a mask (i.e., %%%%%%), a nonword or a word) on form and identity priming. Although our pattern of priming effects did not replicate Forster's, our latency distribution analyses did produce evidence for a two component account of identity priming.
Email: Mark McPhedran, mmcphedr@uwo.ca

(3212)

The Role of Executive Functions and Conventionality in Metaphor Comprehension. FARIA SANA, JUANA PARK, CHRISTINA L. GAGNÉ and THOMAS L. SPALDING, *University of Alberta* — Metaphor comprehension can be viewed as a form of selective retrieval from long-term memory (LTM) during which alternate figurative and literal meanings compete for access. We examined the extent to which executive functions (EF) are recruited to resolve this competition. Comprehension of more conventional metaphors should be faster than of novel metaphors as the figurative meanings associated with the former can be directly (and automatically) retrieved from LTM without the need to compete with literal meanings. Indeed, in Exp1 metaphor comprehension during a semantic decision task (SDT) was faster and more accurate when metaphors were conventional compared to novel. In Exp2 participants completed a secondary task while responding to a SDT. If the figurative meaning is automatically retrieved from LTM for conventional metaphors, taxing EF during SDT should not affect response latencies for these metaphors. However, we found that responses to all metaphors slowed regardless of conventionality, but comprehension accuracy on conventional metaphors improved under high load relative to low load condition. These results suggest that EF play a role when metaphor comprehension is highly demanding due to novelty or processing demands.
Email: Faria Sana, fsana@ualberta.ca

(3213)

Comprehenders Rationally Adapt Semantic Predictions to the Statistics of the Environment: A Bayesian Model of Trial-Level N400 Amplitudes. NATHANIEL DELANEY-BUSCH and EMILY MORGAN, *Tufts University*, ELLEN LAU, *University of Maryland*, GINA KUPERBERG, *Tufts University* — When semantic information is activated prior to bottom-up input (i.e. when a word is predicted or "primed"), semantic processing of an incoming word is typically facilitated, attenuating the amplitude of the N400 component. This N400 semantic priming effect is sensitive to the probability of seeing an associated prime-target pair within an experiment, suggesting that participants may be adapting the strength of their predictions to the predictive validity of the broader experimental environment. Using nonparametric local

regression, we show that this adaptation takes place on a trial by trial basis. We formalize this adaptation using a Bayesian mixture model to show that the N400 amplitude evoked by words (whether associated or unassociated) in both low- and high-predictive contexts can be described as a function of word surprisal. These findings support the idea that comprehenders rationally adapt their semantic predictions to the statistical structure of their broader environment.
Email: Nathaniel Delaney-Busch, Nathaniel.Delaney-Busch@tufts.edu

(3214)

Prediction Strategies in Comprehension: Stimulus Probability or Individual Variability? MEGAN ZIRNSTEIN, *University of California, Riverside*, MELINDA FRICKE, *University of Pittsburgh*, JANET G. VAN HELL, *Pennsylvania State University*, JUDITH F. KROLL, *University of California, Riverside* — The engagement of prediction during comprehension has been characterized as a top-down strategy on the part of the reader or a bottom-up repercussion of text properties (DeLong et al., 2014). In addition to facilitating processing when predictions are borne out, prediction may be useful when unexpected input is encountered, allowing the updating of expectations (Kuperberg & Jaeger, 2015). However, little is known about how these mechanisms work together, how malleable they are, and whether they are influenced by individual cognitive ability. The current study comprises a series of eye-tracking experiments to assess the degree to which stimulus probability (i.e., proportion of predictive sentences) and text properties (i.e., semantic constraint) influence prediction during reading. We relate these results to performance on tasks of executive function, and on a fill-in-the-blank naming task with cloze-normed sentences, in order to assess the relationship between prediction and individual variation in lexical retrieval and executive control.
Email: Megan Zirnstein, zirnstein@gmail.com

(3215)

Learning to Expect the, Uhh, Unexpected: Adapting to the Implicit Utility of Speech Disfluencies in an ERP Paradigm. MEREDITH BROWN, *Massachusetts General Hospital*, NATHANIEL DELANEY-BUSCH, BARBARA STORCH, EDWARD W. WLOTKO and GINA R. KUPERBERG, *Tufts University* — Previous work indicates that the N400 expectancy effect can be attenuated following speech disfluency (e.g. "um"), suggesting that disfluency decreases listeners' certainty about upcoming words' semantic features. This study investigates whether and how listeners adapt to the implicit utility of speech disfluencies over time. First, we ask whether disfluency influences effects of violating very high-certainty lexical predictions, by examining its effect on a late frontal positivity evoked by unexpected words in highly lexically-constraining (relative to low-constraint) sentence contexts. Second, we explore how listeners dynamically adapt to speaker variability by manipulating how frequently disfluency precedes unexpected versus expected words between two participant groups. We replicated the diminished N400 effect after a disfluency while varying the distributional characteristics of disfluent utterances in the experiment. We further predict that disfluency attenuates the processing cost of violating high-certainty lexical predictions, and that neural effects of disfluency depend on how reliably disfluency signals unexpected words.
Email: Meredith Brown, meredith@nmr.mgh.harvard.edu

(3216)

Negation and Word Learning in an Artificial Language. ARIEL MATHIS and STEPHANIE HUETTE, *University of Memphis* (Sponsored by Art Graesser) — The connections between words and meaning are one of the fundamental puzzles in the study of cognition. This work used an artificial language, consisting of nouns and two prefixes denoting "not the" or "the" to signify both affirmative and negated word forms. Nouns were divided into pairs that were yoked throughout training. Pairings were either trained with only the negated prefix, only the affirmative prefix, or both negated and affirmative prefixes. Participants went through a training phase where two pictures were presented and one word was spoken. Participants chose the picture to indicate which picture they believed went with the word, and were then presented with correct or incorrect. Participants were then tested with the addition of a third picture and the omission of prefixes to measure word-stem learning. Participants' learning rate, performance, and processing will be discussed.
Email: Ariel Mathis, apmathis@memphis.edu

(3122)

Individual Differences in the Comprehension of Novel and Conventional Metaphors. JUANA PARK, FARIA SANA, CHRISTINA GAGNE and THOMAS SPALDING, *University of Alberta* — A metaphor (e.g., *Lawyers are sharks*) is a type of figurative language in which the topic (*lawyers*) and the vehicle (*sharks*) share properties (*being aggressive*). Metaphors vary in their level of conventionality, ranging from crystallized to novel. The Career of Metaphor hypothesis (CoM; Bowdle & Gentler, 2005) claims that novel metaphors are comprehended by comparing the properties of the vehicle and the topic, whereas crystallized metaphors are comprehended by including the topic inside the category that is represented by the vehicle. We test these claims using a sense-nonsense task––where participants determine whether a metaphor makes sense––and the similarities subtest of the WAIS-4––where participants state in what way two concepts are similar. According to the CoM claims, the similarities subtest should predict performance on the sense-nonsense task for novel metaphors, which recruit comparison processes, but not for conventional metaphors, which recruit categorization processes.
Email: Juana Park, juana@ualberta.ca

(3218)

Exemplar Versus Prototype Models in Predicting Children's Category Membership. FARAH M. DJALAL and GERT STORMS, *KU Leuven* — This research compared two classical models of semantic concepts, prototype and exemplar-based models, in predicting category membership. Heit and Barsalou's (1996) exemplar-based instantiation model was compared to a prototype predictor model based on Rosch and Mervis' (1975) family resemblance. For three semantic categories (clothes,

fruit, and vehicles), category judgements were collected for 25 possible exemplars. Four age groups (5-, 7-, 10-year-olds, and adults) performed a category membership judgement task and either a feature generation task or an exemplar generation task. The category judgement scores were correlated with the family resemblance measure based on the generated features to assess the validity of the prototype-based model. The exemplar-based model was tested by correlating category judgement scores with rated similarity of the 25 possible exemplars towards generated category exemplars. Results of the model comparison and the specific tendencies across age groups will be discussed in the light of the development of category representations.
Email: Farah M. Djalal, farahmutiasari.djalal@kuleuven.be

(3219)

Influence of Cognitive Approaches on Reading Comprehension. MEGAN NAKAMURA, *California State Polytechnic University of Pomona*, DEBORAH BURKE, *Pomona College*, ELEONORA ROSSI, *California State Polytechnic University of Pomona* — Reading comprehension is a dynamic process. Theories in relevant literature suggest the importance of cognitive skills as well as different cognitive approaches while encoding information. This study seeks to understand the possible relationship between cognitive approaches to learning and reading comprehension. One hypothesis is that different cognitive approaches such as holistic or analytic, will provide information on this relationship. A secondary hypothesis is that holistic learning will be correlated with higher reading comprehension performance. So far, nine English monolingual speakers (more data is being collected) have been tested in their reading comprehension test abilities using portions of the SAT test, and tested for their learning aptitudes using the Analytic-Holistic test, the ILS (Inventory of Learning Styles) test, and a working memory task. Preliminary results point towards a correlation between learning aptitudes and text reading abilities, suggesting that differences in learning styles impact high levels of reading comprehension.
Email: Megan Nakamura, msumiko777@gmail.com

(3220)

To Skip, or Not to Skip? Eye-Movements in Meaning-Driven Versus Form-Driven Readers. DANBI AHN and TAMAR H. GOLLAN, *University of California - San Diego*, MATTHEW J. ABBOTT, *Textio*, VICTOR S. FERREIRA, *University of California - San Diego* — Skilled readers skip predictable words (e.g., Balota et al., 1985), both because of form features seen peripherally, and meaning from preceding context (e.g., Altarriba et al., 1996). Meanwhile, individuals differ in reading strategy, such that some readers' behaviors are driven more than others by meaning (e.g., Rayner et al., 2010). Here, we distinguish meaning- versus form-driven bilingual readers using a mixed-language reading task (Gollan et al., 2014), whereby meaning-driven readers spontaneously translated printed words more frequently (reading "the" aloud as "el"). Then independently, we measured eye movements during silent reading of English sentences that included a Spanish target word, while manipulating target word predictability. During silent reading, frequent spontaneous translators skipped predictable other-language targets more than unpredictable ones; infrequent spontaneous translators skipped predictable and unpredictable other-language targets equally. We suggest that reading for meaning drives a "risky" reading strategy during both reading aloud and silent reading.
Email: Danbi Ahn, yoahn@ucsd.edu

MEANING/SEMANTICS I

(3221)

The Effects of Text Segmentation on Affective Reaction to a Text. HELLEN PHAM and CHRISTOPHER A. SANCHEZ, *Oregon State University* — Research has suggested that presenting text in longer contiguous formats, instead of smaller units, can negatively impact how well individuals understand a text. However, little is known about how such differences in text presentation might likewise influence affective reactions to a given text. In this experiment, participants read an emotional narrative text, presented either all at once, or instead sub-divided into either 4 or 8 smaller sections. Results indicate that presenting text in smaller sub-units does indeed produce a larger affective reaction to the text, while controlling for other factors. This suggests that simple differences in how information is presented can have significant impacts on how readers experience or react to a text beyond differences in comprehension.
Email: Christopher A. Sanchez, christopher.sanchez@gmail.com

(3222)

Print–Sound and Print–Meaning Systematicities Influence Behavioural Performance and Neural Representations When Learning to Read Artificial Orthographies. J. S. H. TAYLOR, *Royal Holloway University of London*, MATTHEW H. DAVIS, *Medical Research Council Cognition and Brain Sciences Unit*, KATHLEEN RASTLE, *Royal Holloway University of London* — We investigated how print–meaning systematicity influences reading acquisition. Over eight days, 24 English-speaking adults learned to read aloud and comprehend two sets of 24 novel words written in two unfamiliar alphabetic orthographies. Both orthographies had systematic print–sound relationships. One orthography also contained a print–meaning systematicity, whereby each word's final symbol denoted semantic category. The other orthography had no print–meaning systematicity. After training, 11 participants demonstrated awareness of symbol–category systematicities. However, this did not benefit reading comprehension, and these participants were also poorer at reading aloud both trained and untrained items. Thus, capitalising on print–meaning systematicities in alphabetic languages is not trivial. Representational similarity analyses were conducted on fMRI data from a meaning judgement task at the end of training. By comparing the patterns of similarity within and between orthographies we interrogated the sensitivity of occipitotemporal regions to orthographic, phonological, and semantic information.
Email: Jo Taylor, j.taylor@rhul.ac.uk

(3223)

Parafoveal Plausibility Effects in Sentence Reading. AARON VELDRE and SALLY ANDREWS, *The University of Sydney* — Recent eye movement evidence of parafoveal semantic processing appears to be inconsistent with the standard view that preview benefit effects arise from the integration of preview and target information. In order to better understand the source of these effects, we used the boundary paradigm to manipulate both the contextual plausibility of the preview and the relatedness of the preview to the target. Across two experiments we observed a robust plausibility preview benefit on first-pass reading: fixation duration was shorter on the target word when the preview was a plausible continuation of the sentence relative to an implausible word. This contrasted with the lack of benefit from preview/target semantic relatedness in Experiment 1. However, in Experiment 2 there was a significant orthographic relatedness benefit that was independent of plausibility. Taken together these data highlight two separate mechanisms underlying preview effects: a transitory contextual benefit from processing a plausible parafoveal word and a more sustained benefit from the integration of sublexical features shared by the preview and target.
Email: Aaron Veldre, aaron.veldre@sydney.edu.au

(3224)

Semantic Processing of Pain-Related Words. JESSICA DURIS, TAMARA KUMPAN, BRIAN DUFFELS and PAUL D. SIAKALUK, *University of Northern British Columbia*, PENNY M. PEXMAN, *University of Calgary* — To gain new insight about salient dimensions of semantic knowledge, we examined the effects of valence, arousal, emotional experience, physical pain experience, and emotional/psychological pain experience for physically pain-related and emotionally/psychologically pain-related words in lexical decision (LDT) and semantic categorization (SCT: is the word pain-related?) tasks. Using multiple regression analyses, we statistically controlled for numerous lexical variables, including log frequency, age of acquisition, and concreteness. In the LDT, only the dimension of emotional experience accounted for a significant amount of unique response latency variability, with faster responses for words eliciting higher levels of emotional experience. In the SCT, valence, physical pain experience, and emotional experience accounted for significant amounts of unique response latency and response error variability, with faster and more accurate responses for words eliciting higher levels of these three dimensions. Our findings are consistent with models that assume that multimodal simulation underlies semantic processing (e.g., Barsalou, 1999).
Email: Paul D. Siakaluk, siakaluk@unbc.ca

(3225)

A Scale-Invariant Computational Model of Natural Language. JOSEPH M. DI LASCIO and ZORAN TIGANJ, *Boston University*, PER B. SEDERBERG, *Ohio State University*, MARC W. HOWARD, *Boston University* — We present a novel model of natural language learning which is a scale-invariant extension of the Predictive Temporal Context Model (pTCM). During training on a corpus of naturally-occurring text, associations at multiple temporal scales are stored. Given a context, the model predicts the occurrence of future words. The predictions from these associations are combined to produce semantic representations of words. A novel word presented in a familiar context is rapidly made similar to previously learned words via these predictions. For instance, in a sentence such as "The baker reached in the oven and pulled out the FLOOB" the novel word FLOOB is made similar to the other words predicted by its temporal context at multiple scales. This scale-invariant model has properties that are very different from vector space models of semantic memory. The semantic and predictive capabilities of the model are evaluated using synonym and first associate tests and compared to other leading language models.
Email: Joseph Di Lascio, dilascio@bu.edu

(3226)

Measuring Semantic Distance as Path Length: A Graph Theory Approach. YOED N. KENETT, *Brown University*, DAVID ANAKI and MIRIAM FAUST, *Bar-Ilan University* — Semantic distance in semantic memory is usually measured with the latent semantic analysis approach. We propose a novel approach for computing semantic distance, based on network science. Path length in a semantic network represents the amount of steps needed to traverse between two words in the network. We examine whether path length can be used as a measure of semantic distance. In a series of studies, we examined how long and short path lengths affect performance in a semantic relatedness judgment task and recall from memory. We found that up to four steps between word-pairs, participants exhibit an increase in RT and decrease in the percentage of word-pairs judged as related. From four steps, participants exhibit a significant decrease in RT and word-pairs are dominantly judged as unrelated. Furthermore, as path length increases, success in memory recall decreases. Finally, our method outperforms latent semantic analysis in predicting participant's performance.
Email: Yoed Kenett, yoedkenett@gmail.com

(3227)

Type of Iconicity Affects Learnability: The Role of Embodiment. JENNY CHEN, *Wellesley College*, RACHEL MAGID, *Massachusetts Institute of Technology*, JENNIE PYERS, *Wellesley College* — While iconicity is prevalent in language, the degree to which children leverage iconicity during language learning is unclear. Studies reveal mixed findings about the age at which children begin to appreciate manual iconicity, which may result from the conflation of different types of iconic symbols in these studies. Embodiment theory suggests that children learn iconic gestures by accessing the motor representations of actions. In a fast-mapping paradigm, we tested (N=81) preschool children's ability to learn different types of iconic gestures with varying degrees of embodiment. We predicted that (1) sensitivity to iconicity overall would increase with age, (2) children would learn iconic better than arbitrary gestures, and (3) children would learn embodied gestures

better than non-embodied gestures. The findings supported our hypotheses, suggesting that children may leverage action experience as a way into understanding some types of iconicity.
Email: Jenny Chen, jchen12@wellesley.edu

(3228)

False Memory For Metaphorically Related Concepts. ALISON WHITEFORD DAMERALL, *Southeast Missouri State University* — Lakoff and Johnson (1980) argue that we understand abstract concepts like *life* through metaphoric associations, e.g., LIFE IS A JOURNEY. If so, our semantic networks should reflect a close relationship between the topic (*life*) and vehicle (*journey*) of these conceptual metaphors. In the current study, participants viewed lists of words literally related to the vehicles of conceptual metaphors before completing an "old/new" recognition task. In addition, participants in one group completed a free recall task following each list before completing the recognition task. The recognition task contained four probe types: presented words, filler words, unpresented literal lures (one for each metaphor vehicle, e.g., "journey") and unpresented metaphor lures (for each metaphor target, e.g., "life"). If the concept *life* is conceptualized as a journey, a high false recognition rate (FRR) for "life" would be expected. Preliminary data support this hypothesis with the FRR for metaphorically related lures significantly exceeding that for filler words. In addition, the free recall group produced significantly lower FRRs for the metaphor lures than the recognition-only group, suggesting that this is not simply a word-level effect.
Email: Alison Whiteford Damerall, awhiteford@semo.edu

(3229)

Snail, Tractor, Granny: Do Not Read Them or You Could Respond More Slowly! STEVE BUENO, ALIX SEIGNEURIC and HAKIMA MEGHERBI, *Université Paris 13 - Sorbonne Paris Cité* — The role of semantic-features dealing with speed or slowness on Reaction Time was investigated in a set of various experimental tasks: In a Lexical Decision Task, the recognition of velocity-neutral test-words (e.g. *umbrella*, *table*…) was slowed down when preceded by a slow-word context (e.g. *snail, tractor*…) - compared to a velocity-neutral-word context - but not accelerated when preceded by a speed-word context (e.g. *leopard, rocket*…). Similar effects were observed on the rejection of pseudowords. This pattern of results depended on the proportion of context words (slowing down observed for high- but not for low-proportion). Results also varied across task demands: Lexical Decision, Semantic Categorization or Non-linguistic tasks elicited different pattern of results even though the context material was similar. Results from these different tasks are discussed in the framework of the embodied theory of language.
Email: Steve Bueno, bueno@univ-paris13.fr

(3230)

Regressions in Braille Reading. DAISY LEI, MANFRED MACKEBEN and VALERIE S. MORASH, *The Smith-Kettlewell Eye Research Institute* — Regressions, which are backward eye movements to re-read words, are well-known to support reading comprehension during visual reading. In contrast, many braille teachers interpret braille regressions as a shortcoming of the reader. To investigate the commonalities of regressions in visual and braille reading, twelve blind adult participants' finger movements were recorded while they read braille versions of the International Reading Speed Texts (IReST). Texts were presented in high, medium, and low braille dot heights, and participants were asked to read using one or two hands. The lower the braille height, the more regressions participants made. Reading with one hand was also associated with more regressions, possibly because regressions in two-handed reading can be executed by the trailing hand. In summary, our results support the idea that regressions in braille and visual reading serve similar purposes, while deviating in regards to special characteristics of these senses.
Email: Val Morash, val@ski.org

(3231)

A Receiver Operating Characteristics (ROC) Analysis of How Language Context Affects Eye Movements to Complex Naturalistic Images. STEPHANIE HUETTE and JEFFREY VIAUD, *University of Memphis* — Models of visual saliency are used to predict eye movements and where attentional resources are likely to be allocated (Itti, Koch, & Niebur, 1998). However, eye movements change as a function of task (Yarbus, 1967) which requires linguistic and conceptual knowledge. To understand the fundamentals of how language context mediates perceived saliency, a study was designed using negation as the primary manipulation. We predicted negation functions as a context to drive eye-movements toward alternatives in a natural scene. Participants passively listened to a vignette while viewing a grey screen, and then the corresponding image was shown for 15 seconds. An ROC eye tracking analysis shows how many fixations on average hit places that were predicted to be salient from a GBVS model of saliency (Harel, Koch, & Perona, 2007). The results demonstrate salience of an image differ between language conditions and images.
Email: Stephanie Huette, shuette@memphis.edu

(3232)

Using Support Vector Machines to Identify Literacy Skills: Evidence From Eye Movements. YA LOU and YANPING LIU, *Chinese Academy of Sciences*, JOHANNA K. KAAKINEN, *University of Turku,* XINGSHAN LI, *Chinese Academy of Sciences* — The current study explored the possibility of using eye movements to predict a person's literacy skills. 61 undergraduate students were asked to read a multiple-paragraph, multiple-topic expository text and their eye movement behavior were recorded by the eye tracker. The Support Vector Machines (*SVM*) was imported in the eye movement data analysis processing, and forward fixation time, first-pass rereading time, second-pass fixation time, and regression path reading time on different regions of the text were provided as features. The *SVM* classification algorithm assisted in distinguishing high-literacy-skilled readers from low-literacy-skilled readers with 80.3% accuracy. Results demonstrate the effectiveness of combining

eye tracking and machine learning techniques to detect readers with low literacy skills, and suggest that such approaches can be used in predicting other cognitive abilities potentially.
Email: Ya Lou, louy@psych.ac.cn

COGNITION AND TECHNOLOGY

(3233)

Technology Use and Driver Mental Resources. MOLLY CORY and BEVERLY ROSKOS, *University of Alabama - Tuscaloosa* — In 2014 alone, 3,179 people were killed and 431,000 were injured in traffic accidents caused by distracted driving. With the presence of in-vehicle technology becoming a norm, it is important to consider the risks such technologies impose on drivers. The current study investigated the relative effects of hands-free cell phone conversation and verbal GPS use on driver mental resources during a simulated driving task, compared to a driving only comparison group. After viewing a map of a route, participants watched a first-person video of a car driving along the route. At each intersection participants had to indicate which way to turn (accuracy, RT). Afterwards, they recalled as many things as they could from the route, and completed a self-report questionnaire of the mental resources used during the driving task. Route performance was as expected: GPS > Driving-only > Cell phone. For proportion of items recalled, the GPS condition had much lower recall at the beginning of the route and much higher recall at the end of the route compared to the other conditions. Mental resources were 13% higher for the GPS group and 22% higher for the cell phone group compared to the driving only group.
Email: Beverly Roskos, broskos@ua.edu

(3234)

The Role of Mindset: Investigating Performance Feedback and Learning Strategies in an Online Statistics Course. LATASHA HOLDEN, *Princeton University*, DAVID MOREAU, *The University of Auckland*, DANIEL GREENE, *Stanford University*, ANDREW R.A. CONWAY, *Claremont Graduate University* — According to Dweck's mindset framework, individuals differ in their implicit beliefs about cognitive ability. Individuals with a fixed mindset tend to believe that their success is based on innate immutable traits. Individuals with a growth mindset tend to believe that their success is based on practice and learning. Importantly, performance feedback can influence a student's mindset. Here, we explored the roles of feedback and learning strategies during a massive online open course (MOOC) on statistics. Results indicated no significant effects of mindset feedback or learning strategy on course performance. However, students overwhelmingly reported more malleable mindsets at baseline, which may be reflective of the type of student who enrolls in a MOOC. Finally, despite large attrition rates, students showed an improvement in attitudes towards statistics (SATS scale) and a reduction in statistics anxiety (STARS scale).
Email: LaTasha Holden, latasha@princeton.edu

(3235)

Learning to Use New Technology: Developing a Scale to Measure Technological Adaptive Expertise. PHUOC (JIMMY) TRAN and DANIEL R. KIMBALL, *University of Oklahoma* — Technology is constantly changing. As new devices, interfaces, platforms, and software become available, the ability to adapt and learn to use these new products is becoming increasingly critical. This ability is captured in the concept of technological adaptive expertise (TAE). In contrast to routine expertise, which involves repetition of well-practiced routines, adaptive expertise involves the ability to transfer stored knowledge within a domain to novel situations within the domain and to novel domains. In the technological domain, adaptive expertise involves the ability to transfer knowledge acquired using previous technology to new technology. As a first step in exploring TAE, we sought to develop and test the validity of a scale comprising survey items targeting various aspects of the respondents' experience with technology that has changed over the past several years. Using exploratory factor analysis, structural equation modeling, and multiple regression, we developed a scale that included a few dozen items and yielded a good-fitting model of TAE comprising six factors. We discuss the import of this scale and its potential use in further investigation and promotion of technological adaptive expertise.
Email: Phuoc (Jimmy) Tran, jimmytr87@gmail.com

(3236)

The Effects of IClicker Bar Graph Feedback on Test Performance. ELIZABETH D. LARSON and KEITH A. HUTCHISON, *Montana State University* — This study examined the influence of receiving iClicker bar graph feedback on subsequent test performance. Participants were randomly assigned to either a control condition in which participants simply listened to a lecture, an iClicker-Feedback condition in which participants preemptively guessed the results of each study and received bar graph feedback on the frequency of each guess, or an iClicker-No Feedback condition in which iClickers were used, but without feedback. Following a 10 minute filler task, participants completed a multiple-choice test based on the lecture. Overall test performance was numerically best in the no feedback condition; however, the feedback and no feedback conditions did not significantly differ from each other. There was also a trending initial accuracy x feedback interaction, such that bar graph feedback appeared to impair performance, but only when the majority iClicker response was incorrect. These findings suggest both potential benefits to and disruption of learning when using iClickers during lectures.
Email: Keith Hutchison, khutch@montana.edu

(3237)

Shooting Trains Shifting: Playing a Focused Video Game Enhances Executive Function. JOCELYN A. PARONG and RICHARD E. MAYER, *University of California, Santa Barbara* — Executive function (EF) is comprised of three closely related, but distinguishable components: shifting, updating, and inhibition. Because of their importance in a classroom setting, ways to improve EF skills should be examined. One technique

is through video game training. This study examined whether a particular component of EF, shifting, could be enhanced using a game specifically designed to require shifting skill. Participants completed a pretest of cognitive tasks assessing shifting, including the Dimensional Card Change Sort task (DCCS) and Letter-Number task (LN), played either a custom designed video game requiring shifting, *Alien Game*, or a control game, and then completed a post-test of the same cognitive tasks. Those who played Alien Game performed significantly better on the post-test LN task ($d = 0.84$), but not the DCCS ($d = 0.21$), than the control group. The results provided evidence for the theory of specific transfer of a general skill.
Email: Jocelyn Parong, parong@psych.ucsb.edu

(3238)

Learning to Mastery Criteria: Comparisons of Adaptive and Fixed Spacing in Chemistry and Geography. EVERETT METTLER, CHRISTINE MASSEY and PHILIP J. KELLMAN, *University of California, Los Angeles* — Spacing exerts powerful effects on learning. Most studies of spacing have used a small, fixed number of presentations of each item (e.g., 3 or 4). In recent research, we compared beneficial fixed spacing schemes to an adaptive system, ARTS (Adaptive Response-Time-Based Sequencing). ARTS automatically adjusts spacing based on ongoing learning strength, assessed from accuracy and response times. With a fixed number of presentations, ARTS produces greater learning gains than fixed schedules. In real learning settings, it is desirable to continue learning to mastery rather than a predefined number of trials. Here we report tests of ARTS and fixed spacing using mastery and drop-out criteria by learning item. Using geography facts, we compared ARTS to random schedules with and without drop-out. Using chemistry nomenclature items with community college chemistry learners, we compared ARTS to continuously-expanding schedules. We found greater learning efficiency in ARTS compared to all of the non-adaptive conditions. (The first author is an employee of Insight Learning Technology, Inc., which features the ARTS system in many of its products.)
Email: Everett Mettler, mettler@ucla.edu

(3239)

Disentangling the Effects of Note-Taking Strategy: Generation and Summarization. LAKSHMI A. LALCHANDANI and ALICE F. HEALY, *University of Colorado Boulder* — Research on educational technology yields conflicting results in regards to learning impairment. Recent studies have shown that laptops, when used for note taking, can impair learning due to shallower processing than for longhand note taking. Computer note takers tend to use a verbatim note-taking strategy, whereas longhand note takers benefit from deeper encoding by using a generative note-taking strategy (summarizing). Generative note taking confounds generation and summarization effects. The goals of two experiments were to replicate and extend previous findings regarding note-taking media and to disentangle generation and summarization effects. Experiment 1 manipulated the presence of PowerPoint slides and reproduced previous findings for an immediate posttest; however the pattern changed after a 1-week delay. Experiment 2 removed the opportunity for generation. A significant interaction of question type (specific or conceptual) and note type (longhand or computer) reflected *worse* performance for longhand than for computer notes on conceptual questions. These results imply that the previously observed advantage of longhand notes for conceptual questions is due to generation, not summarization.
Email: Lakshmi Lalchandani, Lalchand@Colorado.edu

(3240)

The Importance of Community for Online Competency-Based Education. MEGAN SHEVENELL, FABY GAGNE, STEVE BROWN and JEROME REKART, *College for America at Southern New Hampshire University* — Online competency-based education offers a way for working adults to earn a college degree in a way that fits with their personal schedule. Such flexibly-paced programs, however, often lack mandatory discussion sections, which could result in students feeling isolated from peers. Given the relationship between students' sense of community and learning online (e.g. Garrison, Anderson, & Archer, 2000), we examined the role of a voluntary, online Learning Community (LC) on the academic achievement of 150 adult learners in a flexibly-paced program. Academic performance was measured using average number of competencies mastered before and after joining the LC. As predicted, students mastered significantly more competencies after than before joining the LC, $F(1, 149) = 17.33$, $p < .001$, partial $\eta 2 = .104$. Thus, online LCs may be beneficial to the academic achievement of online adult learners in flexibly-paced programs though future research is needed to understand the underlying causal mechanisms.
Email: Jerome Rekart, j.rekart@snhu.edu

(3241)

Posted, Uploaded, Tweeted: Low Credibility Yet High Memorability of Facebook as a Source of News. SERGE ONYPER, MARK OAKES, ROSE DOWLEY and BAILEY O'KEEFFE, *St. Lawrence University* — Individuals increasingly rely on social media to access news, yet there is little research on how news delivered via such media might impact perception and memory for the events described. Participants viewed one sentence statements through a credible (e.g., BBC), non-credible (e.g., Buzzfeed), social media (Facebook or Twitter), or blank online platform and were asked whether they believed each was true or false. Their answers were either discredited (half the time) or confirmed by an authoritative source (e.g., Scientific American). After completing surveys and a verbal IQ measure (10 min), they were asked to recall the correct version of each statement specified by the authoritative source and rate the credibility of the statements (half of which were given as opposites of the original) in a recognition test. Participants discounted source credibility: Statements delivered via Facebook were deemed the least credible, yet they were just as memorable as those presented through highly credible news sources. Regardless of the media platform, statements that were refuted were remembered better than those validated. Finally, participants with longer history of Facebook use had better memory overall.
Email: Serge Onyper, sonyper@stlawu.edu

FUNDING FROM US DEPARTMENT OF EDUCATION

(3242)

Funding Opportunities for Cognitive Psychologists Through the Institute of Education Sciences. ERIN HIGGINS, *Institute of Education Sciences* — The Institute of Education Sciences provides funding support for researchers to apply theories and recent findings from psychological science to education practice through the National Center for Education Research and the National Center for Special Education Research. For example, through the Cognition and Student Learning topic within the Education Research Grants program, the Institute supports research that capitalizes on our understanding of how the mind works to inform and improve education practice in reading, writing, mathematics, science, and study skills. Erin Higgins, the program officer for the Cognition and Student Learning topic, will be available to answer questions and talk to attendees about their proposed work at the Friday night and Saturday at noon poster sessions.
Email: Erin Higgins, Erin.Higgins@ed.gov

DIGITAL CONTENT EDITOR POSTER

(3243)

The Psychonomic Society and Social Media: Putting the Public Into Science and Making Science Public. STEPHAN LEWANDOWSKY, *University of Bristol* and the PSYCHONOMICS DIGITAL TEAM— The Psychonomic Society has been extending its digital presence for the last two years, and our blog posts at www.psychonomic.org have gathered a growing readership. Two "digital events" carried the scientific discussion from special issues of the Psychonomic Bulletin & Review into the public domain, and some of the Society's research has elicited increasing media interest. At a time when science and scientists are increasingly subjected to scrutiny by the public, politicians, and other stakeholders, the Society is committed to provide the public with information about its research and to solicit public commentary. Join the digital team at our poster to contribute to the discussion and to learn more about the Society's engagement on digital and social media.
Email: Stephan Lewandowsky, Stephan.Lewandowsky@bristol.ac.uk

POSTER SESSION IV

Saturday Noon
Hynes Convention Center, Grand Ballroom A-C
Viewing 11:00-1:30, Author Present 12:00-1:30

MULTI-SENSORY INTEGRATION

(4001)

Perceptions of Planned Versus Unplanned Malfunctions: A Human-Robot Interaction Scenario. THERESA T. KESSLER, KEITH MACARTHUR, MANUEL TRUJILLO-SILVA, THOMAS MACGILLIVRAY, CHRIS RIPA and PETER A. HANCOCK, *University of Central Florida* — The present study investigated the effect of malfunctions on trust in a human-robot interaction scenario. Participants were exposed to either a planned or unplanned robot malfunction and then completed two different self-report trust measures. Resulting trust between planned and unplanned exposures was analyzed, showing that trust levels impacted by planned malfunctions did not significantly differ from those impacted by unplanned malfunctions. Therefore, it can be surmised that the methods used for the manipulation of the planned malfunctions were effective and are recommended for further study use.
Email: Theresa Kessler, theresakessler@knights.ucf.edu

(4002)

The Effect of Cross-Modal Emotional Priming. DOYEON KWON and SOWON HAHN, *Seoul National University* — In two experiments, we investigated the role of affective states in cross-modal interaction of emotional priming. Previous literature provided only limited evidence for the effect of emotional auditory stimuli in the visual information processing. In Experiment 1, the auditory emotional prime (pleasant, unpleasant, neutral) was followed by a facial expression stimulus. Participants evaluated the valence of the facial expression as quickly as possible while ignoring the preceding sound. The results showed faster responses when the emotional valence of the auditory prime and the visual target was congruent compared to the emotionally incongruent conditions. In Experiment 2, we aimed to replicate the results of Experiment 1, while using geometric shapes with different valence as visual stimuli. Participants' affective states were also measured to understand the interaction between affective states and emotional priming. The results demonstrated that individual differences of affect also played a role as a moderator in cross-modal emotional priming.
Email: Doyeon Kwon, d.y.kwon0902@gmail.com

(4003)

Effects of Learning New Sounds or Meanings for Kanji Characters on Synesthetic Grapheme-Color Association. KAZUHIKO YOKOSAWA, TAKUYA TSUSHIRO and QI LI, *The University of Tokyo*, MICHIKO ASANO, *Rikkyo University* — Synesthetic colors tend to be associated with Japanese logographic Kanji characters based on their phonological and semantic information. What would happen to these synesthetic colors if Japanese grapheme-color synesthetes learn new sounds or meanings of Kanji characters? We taught Japanese synesthetes (N = 8) new sounds or meanings for familiar Kanji characters, using sounds or meanings in Chinese, which are different from those in Japanese. Synesthetes selected a color corresponding to each character from a color palette before and after learning new sounds or meanings. They also selected colors for control Kanji characters about which no novel information was taught. Results indicated that synesthetic colors associated with characters in the new-learning condition showed a small, but statistically significant decrease in pre- and post-learning consistency as compared to colors associated with control characters, suggesting that synesthetic colors are modulated to reflect the synesthete's latest knowledge about the graphemes.
Email: Kazuhiko Yokosawa, yokosawa@l.u-tokyo.ac.jp

(4004)

A Causal Inference Model Explains Perception of the McGurk Effect and Other Incongruent Audiovisual Speech. JOHN MAGNOTTI and MICHAEL BEAUCHAMP, *Baylor College of Medicine* — Audiovisual speech integration combines information from auditory and visual cues to increase accuracy. When auditory and visual speech emanate from different talkers, however, integration decreases accuracy. Therefore, a key step is causal inference: deciding whether speech cues have the same source. In the well-known McGurk Effect, incongruent audiovisual syllables are integrated, raising two fundamental questions: 1) why are incongruent auditory and visual syllables integrated; 2) why does the McGurk effect only occur for specific syllables? We describe a causal inference model to explain perception of audiovisual speech. We compared model predictions with data from 265 subjects viewing McGurk and non-McGurk syllables. The model accurately predicted integration for McGurk stimuli and no integration for non-McGurk stimuli. An identical model without causal inference failed to accurately predict perception. Our results demonstrate a fundamental role for causal inference in audiovisual speech perception, providing a computational framework for studying speech at varying audiovisual disparity.
Email: John Magnotti, magnotti@bcm.edu

(4005)

Audio-Visual Perception of Gender by Infants Emerges Earlier for Adult-Directed Speech and Female Faces. ANNE-RAPHAELLE RICHOZ, *University of Fribourg,* ANNE HILLAIRET DE BOISFERON, *Université Grenoble Alpes,* PAUL C. QUINN, *University of Delaware,* CAROLE BERGER and HÉLÈNE LOEVENBRUCK, *Université Grenoble Alpes*, DAVID J. LEWKOWICZ, *Northeastern University,* KANG LEE, *University of Toronto,* MARJORIE DOLE, *Université Grenoble Alpes,* ROBERTO CALDARA, *University of Fribourg,* OLIVIER PASCALIS, *Université Grenoble Alpes,* (Sponsored by Camos Valérie) — Early multisensory perceptual experiences shape the abilities of infants to extract various attributes of faces, including gender, age and emotion. Here, we investigated

whether multisensory perception of gender is influenced by infant-directed (IDS) or adult-directed (ADS) speech. Six-, 9-, and 12-month-old infants saw side-by-side silent video-clips of talking faces (a male and a female) and heard a soundtrack of a female or male voice telling a story in IDS or ADS. All age groups effectively matched female, but not male, faces and voices in the ADS condition. Audiovisual matching was however found only from 9 months of age with IDS, and again only for female face-voice combinations. Altogether these results indicate that the ability to efficiently perceive gender in audiovisual speech is influenced by speech manner and emerges earlier for female faces. Our data also suggest that infants may be more likely to extract gender information when looking at adults engaged in conversation with other adults (i.e., ADS) than when adults are directly talking to them (i.e., IDS). Overall, these findings imply that early multisensory ability to perceive gender is shaped by the very nature of social interactions.

Email: Richoz Anne-Raphaelle, anne-raphaelle.richoz@unifr.ch

(4006)

Are Bimodal Speech Adaptors Stronger Than Unimodal Speech Adaptors? JAMES W. DIAS and LAWRENCE D. ROSENBLUM, *University of California, Riverside* — Selective adaptation of speech information can change perception of ambiguous phonetic segments when the adaptor and test-stimuli are in the same sensory modality (auditory or visual) (for a review, see Dias, Cook, & Rosenblum, 2016). However, recent work suggests that selective adaptation can produce small changes *across* modalities (Dias & Rosenblum, 2016). Thus, adaptation to visual speech can change perception of auditory speech, and vice versa. The current investigation evaluates whether combined audio-visual information in speech adaptors can induce greater perceptual changes than unimodal adaptors. In one condition, we evaluated perception of ambiguous auditory segments before and after auditory or audiovisual speech adaptation. In another condition, we evaluated perception of ambiguous visual segments before and after visual or audiovisual speech adaptation. In both conditions, we observed that adaptation to audiovisual speech does not increase the strength of adaptation over that induced by the unimodal adaptors. The results suggest that the small amount of speech information that can be adapted across sensory modalities may not enhance the large amount of information adapted at the sensory-level.

Email: James W. Dias, jdias001@ucr.edu

(4007)

Using Cross-Modal Correspondences to Learn a New Orthography. REBECCA WELLES and EILING YEE, *University of Connecticut* — Would it be easier to learn to read if your orthography exploited intuitive visual-auditory-motor correspondences? E.g., if, congruent with the mouth shapes used for production, the vowel in /woo/ was depicted as a circle, and the vowel in /wee/ as a horizontal line (cf. Sweeney et al., 2009)? Field linguists, working with a new orthography (UniSkript) that attempts to exploit cross-modal correspondences by intuitively depicting articulator movements during speech, have reported that learners can become literate in just three hours. In controlled laboratory conditions, we compared learning a 13-letter "intuitive" orthography (modeled closely on the one used in the field) to learning a "scrambled" orthography of the same letters and sounds. Participants were first trained to criterion (approximately 15 min) on either the intuitive or the scrambled orthography. At test, the intuitive-trained group orally read untrained three letter nonwords significantly more accurately than did the scrambled-trained group. Thus, exploiting cross-modal correspondences may indeed facilitate learning to read.

Email: Eiling Yee, eiling.yee@gmail.com

(4008)

Motor Preparation of Lane Changes Using Advance Visual and Haptic Information. ILJA FRISSEN, *McGill University*, FRANCK MARS, *Ecole Centrale de Nantes* — Drivers' preparation of a lane change was studied in a driving simulator using the movement pre-cuing technique. The technique allows advance (pre-cue) information about the direction of an upcoming lane change before the imperative cue commands the actual direction. A pre-cue could be neutral, valid, or invalid with respect to the direction of the lane change. Unambiguous visual (arrows) and haptic (steering wheel oscillation) were used to create two unimodal (both cues in same modality) and two crossmodal conditions. First, we found the typical gains and costs reported in visual cueing studies and extend them to haptic and crossmodal cues. Second, conditions with haptic imperative cues produced faster responses than visual imperative cues. Third, having only haptic cues produces the largest gain in response time and smallest costs in steering errors. The results suggest that the haptic channel can be a powerful way to unload the visual channel.

Email: Ilja Frissen, ilja.frissen@mcgill.ca

(4009)

Face Recognition, But Not Categorization Differs in Sign Language Users Irrespective of Hearing Status. CHLOÉ STOLL, RICHARD PALLUEL-GERMAIN and OLIVIER PASCALIS, *Université Grenoble-Alpes* (Sponsored by Matt Dye) — Previous research has suggested that early auditory deprivation leads to differences in face processing. However, few studies have examined face processing in both hearing and deaf signers using the same tasks. Therefore, reported face processing differences in the deaf may be attributable to use of a visuo-spatial language that encodes affective and linguistic information on the face. Here, we compared performance for face categorization (human/non-human) and face recognition in early and profoundly deaf signers, late hearing signers and hearing non-signers. In the categorization task, all groups performed similarly in term of RT and accuracy. However, in the recognition task, signers (both deaf and hearing) were slower than hearing non-signers to accurately recognize faces, but had a higher accuracy rate. Sign language experience, but not deafness, drove a speed-accuracy trade-off in face recognition (but not categorization). This suggests strategic differences in face recognition for individuals who use a sign language, regardless of their hearing status.

Email: Chloé Stoll, chloe.stoll@univ-grenoble-alpes.fr

(4010)

Multi-Modal Context Influences Selection of Scale. ALEXANDRA LIST and EMMA FEITELSON, *Hamilton College* — Within the visual and auditory modalities, attending to local patterns primes subsequent attention locally, whereas attending to global patterns primes subsequent attention globally (e.g., Justus & List, 2005; Robertson, 1996; Ward, 1982). Here, we tested whether such level-priming was engaged across modalities, using hierarchical stimuli shown to elicit within-modality level-priming (Justus & List, 2005; List et al., 2013). Participants reported which of two assigned target patterns was presented, independently of their level (local or global) or modality (visual or auditory). In the multi-modal context, there was no evidence for level-priming within or between modalities. Though cautious in our interpretation, the design was robust enough to detect target/response-priming within both the visual and auditory modalities. Nevertheless, the data suggest that the multi-modal context eliminates scale as a useful selection dimension. The findings are discussed in the context of contrary, though controversial, research showing cross-modal level-priming (Forster, 2011, 2016), the double filtering by frequency theory (Ivry & Robertson, 1998) and perceptual dimension analogies across modalities.
Email: Alexandra List, alist@hamilton.edu

(4011)

Inside, Outside, Up and Down: Changing Body Representation With Response Demands and Posture. KAIAN UNWALLA, SERENA HO, MARIANA LANZINI, MICHELLE L. CADIEUX and DAVID I. SHORE, *McMaster University* — When the hands are crossed over the midline, the ability to judge the order of successive vibrations is reduced. A conflict between correct information from the internal reference frame and incorrect information from the external frame causes this crossed-hands deficit. We investigated how altering the reliability of the external reference frame, through manipulations of response requirements and body position, influences performance. Overall, crossed-hands accuracy was worst when adopting an external response demand. With an internal response demand, lying down on one's side produced a smaller crossed-hands deficit than lying supine. In contrast, no effect of body posture was observed when responding using external space. Altering the level of activation of the external reference frame influenced the magnitude of the crossed-hands deficit.
Email: David I. Shore, dshore@mcmaster.ca

(4012)

Color Associations for the English Alphabet in Non-Synesthetic Japanese People. JUN-ICHI NAGAI, *University of the Sacred Heart*, KAZUHIKO YOKOSAWA, *The University of Tokyo*, MICHIKO ASANO, *Rikkyo University* — Recent research has indicated that grapheme-color associations reported by grapheme-color synesthetes and non-synesthetes have certain regularities. It has been suggested that these regularities are affected by linguistic properties of graphemes. However, it is unclear whether frequency and ordinality of the English alphabet, which is known to regulate grapheme-color associations in synesthetes, also influence associations in non-synesthetes. Therefore, we investigated how Japanese non-synesthetes associate colors with the English alphabet. Participant chose the most suitable color from 11 basic color terms for each of 26 upper- and 26 lower-case letters. Similar to past studies, many associations, such as the association of *A* with red, *I* with white, and *X* with black were selected significantly more frequently. Further analyses demonstrated that these associations were sensitive to the letter frequency, but not to the alphabetical order. These results suggest that letter frequency plays a common role in grapheme-color association processes regardless of the populations.
Email: Jun-ichi Nagai, nagai@u-sacred-heart.ac.jp

EVENT COGNITION

(4013)

Seeing the Unseen? Illusory Causal Filling in FIFA Referees, Players, and Novices. MARKUS HUFF, ALISA BROCKHOFF, ANNIKA MAURER and FRANK PAPENMEIER, *University of Tübingen* — Humans often falsely report having seen an actually missing link between two dynamic scenes in case the second scene is causally related to the first scene. As an example, participants falsely report to have seen the release moment of a ball kick although it was not present in the scene. We explored the interplay of cognitive-perceptual expertise and event perception in three groups with differing interest in soccer (novices, players, and FIFA referees). We presented either complete or incomplete (i.e. contact moment omitted) clips. A causally linked scene or an incoherent scene followed a filmic cut in the incomplete videos. Causally linked scenes induced comparable false recognitions in all groups. Thus, conceptual interpretations of simple events are independent of expertise. In Experiment 2, we asked the participants to detect the ball release moment that was either visible or not and was either followed by a causally or non-causally linked scene. Participants' ability to discriminate between complete and incomplete stimuli was lower in the causal as compared to the non-causal condition, indicating that the effect observed in Experiment 1 is based on perceptual online-predictions.
Email: Markus Huff, markus.huff@uni-tuebingen.de

(4014)

Event Structure Over Time Predicts the Occurrence of Mind Wandering. MYRTHE FABER, SIDNEY K. D'MELLO and GABRIEL A. RADVANSKY, *University of Notre Dame* — An open question in mind wandering research is how environmental conditions influence self-generated thought. We explored the relationship between stimulus dynamics and self-caught mind wandering to establish whether changes in the environment predict attentional lapses. We analyzed mind wandering reports from 108 participants who watched the film *The Red Balloon*. We used measures of situational change and perceived event boundaries to predict mind wandering at a fine-grained level. Our findings suggest a temporal alignment between the structural dynamics of the film and mind wandering reports. Specifically, the number of situational changes and perceived event boundaries in the time leading up

to a mind wandering report negatively predict its occurrence. This suggests that mind wandering is less likely to occur when there are more event changes and boundaries. This research demonstrates that the incidence of mind wandering is related to the unfolding structural dynamics of the environment.
Email: Myrthe Faber, mfaber@nd.edu

(4015)

A Closer Look at the Updating of Situation Models in Audio-Visual Narratives: An Eye-Tracking Study. FRANK PAPENMEIER, *University of Tübingen*, TINO G.K. MEITZ, *Leibniz ScienceCampus Tübingen*, MARKUS HUFF, *University of Tübingen* — When watching audio-visual narratives, humans parse the perceptual input into meaningful events separated by event boundaries. In a previous set of experiments, we studied memory and prediction and showed that observers update their situation models incrementally across event boundaries. In the present experiment, we tracked participants' eye movements to further explore the updating of situation models across event boundaries in audio-visual narratives. We asked participants to watch an episode of the sitcoms "Two and a Half Men" and "Big Bang Theory", each. By analyzing gaze variability and gaze coherence, we found that participants' gaze behavior is determined by both semantic features and stimulus driven features. In particular, an increasing number of changes in situational dimensions (time, space, protagonist, action) across event boundaries resulted in an increasing gaze variability but unaffected gaze coherence. This indicates that the updating of situation models involves an information search process that is coherent across participants.
Email: Frank Papenmeier, frank.papenmeier@uni-tuebingen.de

(4016)

Spoiler Alert: Knowing the Ending of a Narrative Doesn't Ruin the Experience of It. ANNA-LISA COHEN, ARIEL ADLER, CHAIM GOLDBERG and SARAH NACHIMSON, *Yeshiva University* — *Narrative transportation* is a state of detachment that arises when one becomes immersed in a narrative. Cohen et al. (2015) showed that participants had trouble maintaining a goal in mind (i.e., remembering to respond to the cue "gun") while watching an engaging Hitchcock film. In the current studies, we examined whether reducing suspense by telling the subjects the end of the film would make it easier for participants to avoid being captured by the film (Study 1) and we offered a reward incentive (Study 2). Results showed that knowing the ending of the film did not prevent participants from being captured by the film; however, offering a reward incentive did help participants maintain their goal. A post-experiment questionnaire suggests that those in the reward incentive condition may have purposefully tried to lower their degree of attentional focus in the film as a way to resist becoming immersed in the narrative.
Email: Anna-Lisa Cohen, acohen11@yu.edu

(4017)

Objects in Previous Events Look Farther Away Than Objects in Current Ones. CHRISTOPHER A. KURBY and KYLE R. SCHRAMM, *Grand Valley State University*, JEFFREY M. ZACKS, *Washington University in St. Louis* — As people engage in activity they segment their moment-to-moment experience into events. Segmentation may serve, in part, as an attentional orienting mechanism, shifting attention away from old goals in pursuit of new ones. In spatial memory, navigators segment routes by landmarks or turns, and more segments relate to memory for longer spatial distance. In moment-to-moment processing, people segment and update their event representations when they experience shifts in space (e.g., walking through a doorway). In this experiment, we investigated whether event updating also distorts distance perception, perhaps by making previous events appear farther away than current ones. Participants followed a path marked by cones and made distance estimates to the previously visited cones. Distance estimates were longer when participants experienced a spatial shift than when they made estimates within a space. These data suggest that objects in old events may look farther away.
Email: Christopher A. Kurby, kurbyc@gvsu.edu

(4018)

Dancing With Words: The Acoustic Packaging of Events in Adult-Directed Speech. NATHAN R. GEORGE, *Adelphi University*, FEDERICA BULGARELLI, CARA THEORET and DANIEL J. WEISS, *The Pennsylvania State University* — Comprehending novel events requires learners to first segment them into discrete units. One support mechanism for this process is termed *acoustic packaging,* the alignment of action descriptions with event boundaries. While common in infant-directed speech, this cue is thought to become less reliable in adult-directed speech. However, adult-directed speech may continue to incorporate acoustic packaging under conditions of greater complexity. In this study, participants described two tasks (stacking rings and board game construction) and two videos (dishwashing and ballet). We asked if adults acoustically package events more when they are novel (game construction and ballet) or to compensate for lacking control over timing (i.e., in the videos). Participants demonstrated more reliable speech-action alignment when describing videos, as well as for the more novel task. These results suggest that adults continue to rely on acoustic packaging, challenging the notion that audiovisual synchrony becomes an irrelevant cue in adult-directed event descriptions.
Email: Nathan George, Nate.R.George@gmail.com

(4019)

The Norm Fluency Task: Unveiling the Properties of Norm Representation. YOED N. KENETT, M. MOWAFAK ALLAHAM, JOSEPH L. AUSTERWEIL and BERTRAM F. MALLE, *Brown University* — Norms are socially shared and socially enforced instructions to act in particular ways in particular contexts. Little is known about the cognitive structure of norms, so to examine this structure we developed a norm fluency task. In this task, participants are presented

with pictures of public visual scenes (e.g., *library, restaurant*) and are asked, for each scene, to generate norms of one of three types: prohibitions, prescriptions, or permissions ("What you are *allowed/not allowed/supposed* to do here"). We found high consensus for a small set of norms specific to each scene, supporting the idea that norms are socially shared and activated in a context-specific manner. In addition, we found that participants generated fewer prohibitions than permissions and prescriptions, and they also generated them more slowly and with lower consensus. Finally, prohibitions are more dispersed than permissions and prescriptions in a semantic network space, indicating differences in representational structure.
Email: Yoed Kenett, yoed_kenett@brown.edu

(4020)

Washing Clothes or the Meaning of Life? An Investigation of Context on Event Segmentation and Recall. KIMBERLY M. NEWBERRY and HEATHER R. BAILEY, *Kansas State University* — Context (prior knowledge) has been shown to benefit episodic memory, particularly when presented before encoding. Knowledge may improve memory through several encoding mechanisms, one of which may be event segmentation. Event segmentation is one's ability to chunk information into meaningful units as an activity unfolds. In the current experiment, we evaluated whether context influences the memory and segmentation of a text. Participants read ambiguous passages and then freely recalled as much information about each passage as possible. After recall, participants were asked to segment each passage. Consistent with Bransford and Johnson's (1972) findings, participants in the context condition recalled more information compared to those in the no context condition. Most importantly, participants in the context condition also segmented more normatively compared to those in the no context condition. The current results support Event Segmentation Theory by demonstrating that semantic knowledge guides event perception.
Email: Heather R. Bailey, hbailey@ksu.edu

(4021)

Predictive Looking in Everyday Event Comprehension. MICHELLE L. EISENBERG, JEFFREY M. ZACKS and SHANEY FLORES, *Washington University in St. Louis* — We propose that as people view ongoing activity they make predictions about what is going to happen next. When predictions fail, viewers experience a boundary between events. This mechanism entails that prediction performance is worse at event boundaries than in the middle of events. We tested this hypothesis by monitoring for predictive eye movements during ongoing comprehension of everyday events. Participants first watched movies while their eye movements were recorded, then segmented the movies into meaningful events. We hypothesized that participants would predictively look at objects the actor was about to touch before the actor contacted the objects. Moreover, we hypothesized that these predictive eye movements would be reduced near event boundaries. The results provided support for both hypotheses, supporting the proposal that prediction failures drive the subjective experience of an event boundary. These results also validate a novel naturalistic method for studying predictive processing during comprehension of ongoing activity.
Email: Michelle L. Eisenberg, mleisenb@wustl.edu

(4022)

Tuning Attention to What's Relevant in Dynamic Human Action. JESSICA E. KOSIE and DARE A. BALDWIN, *University of Oregon* — Fluent event processing critically involves selectively attending to information-rich junctures within unfolding sensory experience. Recent evidence points to rapid reorganization of attention as viewers gain familiarity with novel sequences of dynamic human action. For example, by just the second passive viewing of a novel activity, observers elevate attention to regions within motion indicative of the transition from one sub-event to the next. Using Hard, Recchia, & Tversky's "Dwell-time Paradigm," we investigated patterns of reorganization when viewers' goal is to learn to execute the novel activity sequence. Preliminary evidence indicates rapid tuning to causally relevant junctures within the activity stream. In particular, observers up-regulated attention to a specific region within action at which motion was critically related to goal attainment, while down-regulating attention to the rest of the sequence. These findings provide new information about how observers systematically direct attention to regions of novel activity that are important for learning.
Email: Jessica Kosie, jkosie@uoregon.edu

(4023)

The Amnesic Effects of Benzodiazepines, from Beneficial to Unbearable: A Science or a Media Concern? ELISABETH BACON, *Strasbourg University* — Benzodiazepines are the most prescribed drugs worldwide, thanks to their effects on anxiety and insomnia. But in some circumstances they trigger amnesic episodes (anterograde amnesia lasting a few hours). Almost 20 years elapsed between when these effects were discovered and when general practitioners and users (at least in France) were told about them. The written media are important for disseminating information about drugs. Unlike information about other fields of research, knowledge about drugs has many different written sources (research and medical journals, rules, regulations, magazines, lay media, etc.). This study highlights the history and logic of the discovery and study of the amnesic effect of benzodiazepines, and how information about it was relayed in different media, from research journals to the medical and lay media. It explored how firstly considered as beneficial by anaesthetists, it became an undesirable effect, partly due to media coverage of a trial, and why it took so long to reach those who prescribe or use them. The analysis in various printed media of narratives on the amnesic effects of benzodiazepines allows to put into light the links and the gaps between the producers of knowledge and mediators.
Email: elisabeth.bacon@unistra.fr

(4024)

Power Law Distributions of People Appearing in Dreams. RICHARD SCHWEICKERT, *Purdue University*, CHARLES VIAU-QUESNEL, *University of Quebec at Trois Rivieres*,

JOHANNA XI, *Bank of America*, HYE JOO HAN, *Washington State University Vancouver* — Frequencies of contact with people in daily life, face to face, though e-mail, and so on, follow power law distributions. Suppose the frequencies are represented in memory, and people in dreams are generated from the dreamer's memory. Then people would appear in dreams with frequencies following power laws. We found such power laws in dream reports from five dreamers. Further, from the dream reports of each dreamer we made a social network in which two people were joined by a line if they appeared in at least one dream together. We found power laws for parameters of the networks. The parameters included the number of people each person is joined to (the degree) and eigenvalues of the adjacency matrix. Lawful behavior indicates that dreams reflect systematic processing of some kind.
Email: Richard Schweickert, swike@psych.purdue.edu

SPATIAL COGNITION III

(4025)

Schematic Representations of Local Environmental Space Guide Goal-Directed Navigation. STEVEN A. MARCHETTE and JACK RYAN, LINDSAY K. VASS and RUSSELL A. EPSTEIN, *University of Pennsylvania* — To navigate to an object, one must remember which environment it is in (e.g. which room?) and where it is in that environment. Here we present behavioral and neuroimaging evidence that these two kinds of information are retrieved independently. First, we scanned subjects with fMRI while they recalled spatial information from a virtual setting containing several rectangular rooms. Multivoxel pattern analysis revealed a locus in the medial parietal lobe that coded locations and imagined headings in room-aligned coordinates. Notably, these codes generalized between rooms of the same shape, as if the same schematic blueprint was used for multiple rooms. Based on these results, we predicted that subjects might confuse analogous locations in different rooms if the rooms were geometrically equivalent. Indeed, additional experiments established that subjects do make such errors, indicating that they could recall the location within a room without recalling the room's identity. Together, our results demonstrate that humans encode schematic maps of local space that can be applied to multiple environments.
Email: Steven A. Marchette, stevenmarchette@gmail.com

(4026)

Unidirectional Influence of Vision on Locomotion in Multi-Modal Spatial Representations Acquired From Navigation. YU DU, LEI ZHANG and WEIMIN MOU, *University of Alberta* (Sponsored by Marcia Spetch) — Vision and locomotion are two sources for forming spatial representations during navigation. However, how vision and locomotion interact in forming spatial memory is not clear. In a virtual reality environment, participants actively rotated in place to face certain orientations to get adapted to a new gain coupling vision and locomotion in which their visual turning angle was equal to 0.7 times their physical turning angle. Later, the participants either physically walked a path in darkness (walking group) or watched a video showing the same path as the walking group (video group). After that, both groups were tested to point to the origin of the path. The pointing responses of the walking group showed an underestimation of the turning angle, indicating that the vision-locomotion coupling with a gain influenced the spatial representation. However, such gain effect was not found in the video group. These results suggest that vision can contribute to spatial representation directly, but locomotion information has to contribute indirectly via a vision-locomotion coupling. Our findings support the Perception-action coupling (PAC) theory proposed by John Rieser and his colleagues.
Email: Yu Du, du5@ualberta.ca

(4027)

Reaching to an Illusion Using Spatial Reference Frames. JENNIFER KOLESARI, DANIEL LYNCH, JAMES SCHMIEDELER and LAURA CARLSON, *University of Notre Dame* — Reaching for an object requires defining its location relative to one's body (egocentric reference frame) and/or other objects (allocentric reference frame). To investigate the relative contributions of these frames, participants used an unactuated robot arm to reach toward targets embedded within the Brentano visual illusion at various points on a computer screen. The strength of reliance on the allocentric frame was indicated by the magnitude of the illusion across all trials. We manipulated whether a cursor showing the movement path and the participant's hand were visible and whether the illusion and target on the screen were visible during reaching. Participants made less accurate reaching movements when their hands and the cursor were obscured, illustrating a stronger effect of the illusion and an increased reliance on the allocentric frame when the egocentric frame was unavailable. This research contributes to our understanding of how these frames are coordinated during reaching.
Email: Jennifer Kolesari, jkolesar@nd.edu

(4028)

The Later-Destination-Attractor Bias: Uncoupling Size of Environment and Visibility. EN FU and BEVERLY ROSKOS, *University of Alabama - Tuscaloosa* — When people choose between two equal routes to a destination, at least when standing in a room-sized environment, their choice is affected by the locations of later destinations. This effect, called the later-destination-attractor bias, presents as a preference to take the route that takes them in the direction of the later destination, even though the routes are of equivalent length. The effect decreases when the later destinations cannot be seen, at least in a room-sized environment. Does this hold true for large environments? Answering this question is tricky because the size of the environment is often confounded by the visibility of the later destinations. In small environments, all destinations typically can be seen, whereas in large environments, all destinations typically cannot be seen. Across two experiments, the size of the environment (room-sized vs. city-sized) and the visibility of the later destinations (visible vs. not visible) were manipulated factorially. The choice of routes to the first

destination was measured. Preliminary results suggest that both the size of the environment and the visibility of the later destinations independently affect route choice.
Email: En Fu, efu@crimson.ua.edu

(4029)

Approaching Behavior Reduces Gender Differences in the Mental Rotation Performance. PETRA JANSEN and SANDRA KALTNER, *University of Regensburg*, DANIEL MEMMERT, *German University of Sport Science, Cologne* — We investigated in the scope of gender if the enactment of an approaching or avoiding behavior influences the mental rotation performance. Thirty-five females and 30 males completed a chronometric mental rotation task either in an approaching or in an avoiding condition while manipulating their arm position. The results show a significant influence of this embodied behavior dependent on gender and task difficulty, $F(4, 240) = 5.26$, $p < .001$, partial $\eta^2 = .08$. There was no gender difference in the approaching but in the avoidance condition concerning reaction time. Concerning the accuracy rate the gender difference was reduced for the most difficult tasks in the approaching condition but not in the avoidance condition, $F(4, 244) = 2.61$, $p < .05$, partial $\eta^2 = .04$. Demonstrating that an approaching behavior reduces the performance difference between males and females gives a hint that the role of bodily-based motivation must be investigated in more detail.
Email: Petra Jansen, petra.jansen@ur.de

(4030)

Cognitive Strategies in the Mental Rotation Task Revealed by EEG Spectral Power. AARON L. GARDONY, *U.S. Army NSRDEC*, HOLLY A. TAYLOR, *Tufts University*, TAD T. BRUNYÉ and MARIANNA D. EDDY, *U.S. Army NSRDEC*, GEORGE L. WOLFORD, *Dartmouth College* — Does mental rotation (MR) involve covert simulation of motor rotation? Widespread use of the mental rotation task (MRT) has complicated investigations of this research question. We suggest that MR is covert motor rotation but that the MRT dynamically biases this strategy and distinct, analytic strategies that depend on working memory (WM) intensive visual comparisons. The present work examined the role of task difficulty on MRT strategies using EEG. We measured dynamic changes in EEG spectral power during MRT completion, focusing on sensorimotor mu suppression, an oscillation associated with motor imagery, frontal midline theta (fmθ) enhancement, associated with WM maintenance, and parietal alpha (pα) suppression, associated with visuospatial representation. As task difficulty (angular disparity) increased, mu suppression decreased. Simultaneously, fmθ enhancement and pα suppression increased. Together these findings suggest decreasing use of MR and increasing use of WM-intensive analytic strategies concomitant with increasing task difficulty.
Email: Aaron L. Gardony, aaron.gardony.civ@mail.mil

(4031)

Optimal Integration of Geometric and Optic Flow Cues to Navigation. LORI A. SJOLUND and JONATHAN W. KELLY, *Iowa State University* — Navigation is influenced by body-based self-motion cues that are integrated over time in a process known as path integration, and also by environmental cues such as room shape. Path integration consists of both allothetic (external to the navigator) and idiothetic (internal to the navigator) cues to navigation. Two experiments examined the conditions under which optic flow (an allothetic path integration cue) is combined with a geometric cue to optimally reduce response variability when returning to a previously visited target location. Participants virtually navigated an outbound path in a desktop virtual environment before attempting to return to the path origin. Optic flow and room shape (a geometric cue) were both available during the outbound path, but experimental manipulations created single and dual-cue conditions for the return path. Response variability in dual-cue conditions was consistent with predicted optimal variability given single-cue response precision. Results indicate that idiothetic cues are not necessary for the optimal combination of path integration and a geometric cue to navigation.
Email: Jonathan Kelly, jonkelly@iastate.edu

(4032)

The Effect of Sex and Parenthood on Perceived Distances to Objects. IAN T. RUGINSKI, DEVIN M. GILL, LACE M. PADILLA, JEANINE K. STEFANUCCI and ELIZABETH CASHDAN, *University of Utah* (Sponsored by Sarah Creem-Regehr) — We tested the merit of a popular internet meme related to sex differences in the perception of a child's safety in a dangerous situation. The meme suggested that mothers perceive a child thrown in the air as extremely high compared to the actual location, whereas fathers perceive the child as lower than mothers. Previous literature has shown an influence of stimulus category on remembered image location, thus we presented two stimuli: a baby and a ball (control). A sample of 50 individuals indicated where they last perceived the stimulus when three distances were presented in both the vertical and horizontal planes. Preliminary results suggest that, on average, women tended to place the stimulus lower than its actual vertical location. Contrary to the meme, parenthood makes men's judgments less accurate, but does not change women's judgments. Interestingly, fathers' judgments resembled women's judgments more so than male non-fathers.
Email: Jeanine Stefanucci, jeanine.stefanucci@psych.utah.edu

(4033)

Search Strategies During Small-Scale Spatial Layout Learning With Restricted Peripheral Field. PIPER MEISINGER, ERICA M. BARHORST-CATES and SARAH CREEM-REGEHR, *University of Utah* (Sponsored by William Thompson) — Peripheral field loss poses unique challenges for spatial learning of configurations of objects in room-sized spaces, likely related to the reduced information for global spatial relationships within the environment. We asked whether providing allocentric strategies for encoding new spaces would benefit those with simulated restricted peripheral field. We aimed, first, to measure spatial learning with a 10˚ field of view and second, to assess the effectiveness of two different explicit navigation strategies—object-to-object and homebase-to-object exploration (each compared to free exploration as

a baseline). Participants learned spatial layouts by walking to objects in a large room and then pointed to remembered target locations from different locations. Preliminary results show no overall differences in egocentric pointing error but suggest that higher self-reported sense of direction was related to improved pointing after using the homebase-to-object navigation strategy. Future work will test the effectiveness of the strategies at a more severe field restriction.
Email: Erica Barhorst-Cates, erica.barhorst@psych.utah.edu

(4034)

Impact of Environment Preview on Distance Perception in Virtual Reality. ZACHARY D. SIEGEL, JONATHAN W. KELLY, SETH GEORGE, JENNA HUNEY and BRENNA KLESEL, *Iowa State University* — Egocentric distance is commonly underperceived in virtual reality, sometimes by up to 50% of actual distance. Previous studies indicate that walked distance is more accurate within a virtual replica of the experimental space. This study experimentally evaluated the impact of previewing the real environment prior to experiencing a virtual replica, and compared the effect of preview to the effect of recalibration by walking through the virtual environment. Participants who previewed the environment performed more accurately on the blind walking task, but this advantage disappeared after both groups were allowed to walk through the virtual environment with continuous feedback. No difference was shown between groups for object size judgments.
Email: Zachary Siegel, zsiegel@iastate.edu

(4035)

Referential Indexing: The Role of Space in Reference. CAMERON M. SMITH and AMIT ALMOR, *University of South Carolina* — Two experiments tested the hypothesis that spatial representations are used for reference tracking during language comprehension. Participants listened to two characters introduce themselves from distinct spatial locations and responded to an auditory probe from one of the two spatial locations. In E1, probes were character names and participants indicated whetherthey were the correct answer to questions they read. In E2, probes were beeps that preceded or followed references to characters and participants responded with a button press. E1 showed a spatial direction compatibly effect indicating that referent representation include a spatial component. E2 only showed an effect of introduction order (right-to- left or left-to- right) that also interacted with the direction the beep was played from and whether it was played before or after the reference. Together, these results suggest that spatial representations are used for reference tracking but may not be automatically activated by repeated reference.
Email: Cameron M. Smith, cms21@email.sc.edu

RECALL III

(4036)

The Primary and Convergent Retrieval Model of Recall. WILLIAM J. HOPPER and DAVID E. HUBER, *University of Massachusetts, Amherst* — We present the 'Primary and Convergent Retrieval Model' (PCR), which explains the benefits of retrieval practice (a.k.a., the 'testing effect'). PCR assumes recall attempts proceed with an initial search process ('primary retrieval'), followed by a 'recovery' or 'pattern completion' process in which explicit details are extracted to support recall ('convergent retrieval'). We assume this gradual pattern completion process is the main source of variation in recall latencies, and that learning associations between features depends on the timing of feature activations. Because the convergent retrieval proceeds incrementally, this provides an additional opportunity for learning associations between features, predicting that successful recall, but not restudy, creates new learning in the convergent retrieval process. We confirmed this by comparing retrieval latencies between study and test practice conditions. Retrieval latencies were fastest following test practice, even when accuracy was unchanged and retrieval cues changed between the practice and final test.
Email: William Hopper, whopper@psych.umass.edu

(4037)

Intermediate Recall Interferes With Visual Memory for Photographs. DEBORAH H. TAN and YUHONG V. JIANG, *University of Minnesota* — People have an impressively detailed and accurate memory for photographs of objects, yet one's memory is also surprisingly coarse during eyewitness testimony or in change detection tasks. Here we test the possibility that intermediate recall of previously viewed objects interferes with subsequent recognition. Participants encoded 150 photographs presented at a rate of 1s/item. They were then cued to type out a description for a subset of the previously viewed photographs. We later tested their memory in a subsequent 4AFC recognition test including the old photograph, a within-category lure, and a pair of between-category lures. Participants committed fewer category errors, but more exemplar errors, for photographs they recalled earlier relative to the other photographs. Additional experiments ruled out verbal overshadowing as an explanation. Intermediate recall did not interfere with memory if testing included just the old photograph and a within-category lure. Intermediate recall may interact with decision factors to influence subsequent memory performance.
Email: Deborah Tan, tanxx541@umn.edu

(4038)

Not All Order Memory is Equal: Dissociations in Memory for Sequence and Temporal Information. TANYA R. JONKER, *University of California, Davis*, COLIN M. MACLEOD, *University of Waterloo* — Remembering the order of a sequence of events is a fundamental feature of episodic memory, yet the nature of the code(s) underlying sequence memory is still relatively unknown. We manipulated encoding and examined the influence of item-specific vs. relational encoding on novel tests of memory for sequence and temporal information. Our evidence is consistent with three dissociable facets of order memory: (1) inter-item associations, (2) the emphasized directionality of an association, and (3) an item's strength independent of other items. Memory for order is

more complicated than has been portrayed in the past, and its nuances need to be considered when designing tests and models of temporal and relational memory
Email: Tanya R. Jonker, tanyarjonker@gmail.com

(4039)

Directed Forgetting for Self-Generated Word Lis M. TSUBO MOTOYOSHI and HIROYUKI TSUBOMI, *Univ ity of Toyama* — Research on directed forgetting has shown that we can intentionally forget information p ed to us. We studied whether directed forgetting effective even for a self-generated event. Participants (N 0) were asked to tell the experimenter 10 unique three-letter nouns and remember them. After that, half of the participants were instructed to forget this first list, and the other half were again instructed to remember them. All participants created and remembered a second list of 10 unique three-letter nouns. During testing, participants that were told to forget the first list showed lower performance in a recall task for the first list than those that were instructed to remember it, although both groups had high performance in a recognition task. Both groups showed equivalent performance in recall and recognition tasks for the second list. These results suggest that the instruction to forget triggers retrieval inhibition even for self-generated items.
Email: Hiroyuki Tsubomi, htsubomi@hmt.u-toyama.ac.jp

(4040)

Modeling the Effects of Practice and Age-Related Change in a Longitudinal Study. ADAM W. BROITMAN, MICHAEL K. HEALEY and MICHAEL J. KAHANA, *University of Pennsylvania* — A key challenge facing cognitive science is the detection and remediation of age-related memory decline. Longitudinal studies are a useful tool for measuring cognitive changes over time, but they require multiple sessions within each time wave to ensure reliability. This introduces the possibility of practice effects, which can mask age-related changes. Indeed, ignoring practice in a 4-year longitudinal study of free recall and recognition in adults over 60, we found no significant annual performance decreases, but the application of models that account for practice revealed that over half of the study's participants showed some linear age-related decline. We evaluated two models, one based on Anderson et al.'s (1999) power law Strength Accumulation Equation, and the other adapted from Sliwinski et al.'s (2010) exponential Burst model. Our results indicate that an effective model of practice can allow for the detection of subtle, but important, changes in as little as four years.
Email: Adam Broitman, adamwb@sas.upenn.edu

(4041)

Item Differentiation and Competitive Context Sampling in Cued Recall. SHARON CHEN, JACK WILSON and AMY CRISS, *Syracuse University* — The list strength paradigm is used to evaluate whether memory for a given item is affected by the strength of the other studied items. The null to negative list strength effect in recognition has been attributed to differentiation of memory traces containing items. The positive list strength effect in free recall has been attributed to competitive sampling of memory traces containing context. Cued recall is an intermediate task relying on both factors and, accordingly, a null list strength effect has been observed. This accounting, thusfar, assigns context the role of competitive sampling and items the role of differentiation, but this need not be the case. In a series of experiments we evaluate the role of item and context information and the roles of differentiation and competitive sampling to better understand what produces the null list strength effect in cued recall.
Email: Sharon Chen, ychen117@syr.edu

(4042)

Does Prior Knowledge Influence the Fragility of Associations in Memory? KIMELE PERSAUD and PERNILLE HEMMER, *Rutgers University* — Long-term memory has been demonstrated to have an impressive storage capacity, in that, precise memories are quickly formed and retained over long periods of time (Brady et al, 2013). Despite such an impressive capacity, the system struggles to form and store associative information of to-be-remembered items, resulting in fragile associations (Lew, Pashler, & Vul, 2015). The difficulty in storing associative information may result from the unnatural state of the associations, and not as a reflection of limitations on memory storage. Importantly, this unnaturalness, relative to the natural environmental structure, may also hamper the employment of prior knowledge which has been demonstrated to improve performance in long-term memory (Hemmer & Steyvers, 2009; Persaud & Hemmer, 2016). In an effort to reconcile these findings, we present data from a series of experiments assessing memory for associations that vary in degree of meaningfulness. Models of long-term memory that support both accounts are discussed.
Email: Kimele Persaud, kimele.persaud@rutgers.edu

(4043)

Modeling Semantic Search for Healthy Adults and Patients With Schizophrenic and Bipolar Disorders Shows Differential Reliance on Global Versus Local Recall Cues. JANELLE K. SZARY, MICHAEL N. JONES and BRIAN F. O'DONNELL, *Indiana University* — Effective search through semantic memory requires an appropriate, dynamic balance between exploration and exploitation. Patients with executive function disorders may not appropriately regulate these strategies. Indeed, schizophrenic patients (SPs) are known to have diminished performance on semantic fluency tasks. To investigate differences in search strategies, 26 SPs, 18 patients with bipolar disorder (BPs), and 32 control subjects (Cs) were given a 60 second semantic fluency task. As in Hills, Jones and Todd (2012), fluency results were fit to computational models of memory which use either local (semantic) cues, global (frequency) cues, or both, in either a static or dynamically switching fashion. While the datasets of Cs and BPs are best fit by dynamic models, those of SPs are slightly better fit by static models. Although the pairwise transitions are similar across conditions, suggesting a non-impaired semantic memory structure, the parameters of models fit to SP datasets, compared to C datasets, show that the global cue is significantly more

salient for SPs. These results suggest that schizophrenic patients are using information sources in a different, perhaps less-strategic, way to complete the task.
Email: Janelle Szary, jszary@indiana.edu

(4044)

The Retro-Cue Benefit and its Influence on the Probability of Intrusions in a Cued-Recall Task. ANTONIA KREFELD-SCHWALB, *University of Geneva*, DAVID KELLEN, *University of Basel* — Most of the recently proposed explanations of the retro-cue benefit in working memory include hypotheses not only on the memory status of the stimulus at the cued position, but also at the non-cued positions. We have focused these latter hypotheses by investigating the probabilities of intrusions in a cued recall task for verbal material. The data of two experiments with 120 participants were analyzed with Bayesian hierarchical multinomial models. In both experiments, with different distractor task conditions and including probabilistic cues, retro-cueing was not decreasing the conditional probabilities of intrusions, but increasing it in two of the conditions. These findings support the explanation of the retro-cue benefit which assumes that cueing increases binding at the cued positions, without necessarily involving memory costs for the content at the non-cued positions. Although, the binding at the non-cued positions might sometimes be reduced due to retro-cueing.
Email: Antonia Krefeld-Schwalb, Antonia.Krefeld-Schwalb@unige.ch

(4045)

Effects of Handedness on Children's Recall of Dyadic Conversations. STEPHEN D. CHRISTMAN, MONICA LAWSON and KAMALA LONDON, *University of Toledo* — A growing body of evidence demonstrates a robust advantage in episodic recall in people with inconsistent hand preference, relative to those with consistent hand preference. However, all of this work has been conducted with adult subjects; the influence of handedness on memory in children remains unexplored. Eight year old children (n=90) engaged in a semi-structured dyadic conversation with an adult experimenter. After an interval of 1 versus 3 weeks, the children's memory for the conversation was tested. There was no effect of retention interval, so analyses collapsed across this variable. There was a significant interaction between handedness and sex, *partial* η^2 = 0.054. Among females, inconsistent-handedness was associated with nominally better free recall of the conversation, *partial* η^2 = 0.060. In contrast, among males, inconsistent-handedness was associated with nominally poorer recall, *partial* η^2 = 0.049. The prior literature on adults has typically found effects of handedness only, with no main effects or interactions involving sex. Perhaps the opposite than predicted effect of handedness in boys is related to boys' lagging verbal development in middle childhood.
Email: Stephen Christman, stephen.christman@utoledo.edu

(4046)

Hippocampus Is Not the Unique Seat of Patern Completion in Cued Recall. DAVID A. ROSS, D. MERIKA WILSON, PATRICK SADIL and ROSEMARY A. COWELL, *University of Massachusetts Amherst* — Episodic memory retrieval is thought to depend on hippocampal pattern completion, which triggers reinstatement of mnemonic details in neocortex. Such accounts suggest a domain-general role for hippocampus (HC) in recall, contrasting with Representational-Hierarchical accounts (RH) that predict HC involvement only when the to-be-recalled stimuli recruit hippocampal representations. Whereas previous fMRI studies measured recall for paired-associates – e.g., cuing a scene with a paired object - we used a within-domain, non-associative recall task, with single items (objects/scenes) studied in isolation and parts of the studied images used as cues at test. In support of RH accounts, functional activation in HC increased during scene recall but not object recall, whereas activation in neocortex, including lateral occipital complex (LO), increased during both object and scene recall. Moreover, effective connectivity analyses revealed increased forward connectivity from LO to HC during recall, suggesting that recall-related pattern completion spreads from neocortex to HC, rather than the reverse
Email: David Ross, davidross2409@gmail.com

(4047)

Analogous Serial Order Mechanisms in Serial Recall and Typing. DAKOTA R.B. LINDSEY and GORDON D. LOGAN, *Vanderbilt University* — There has been debate over whether serial order is achieved by cuing items with their position (position coding) or with the previously retrieved item (associative chaining). Theories of serial order in working memory typically assume position coding, while theories of serial order in skilled performance typically assume associative chaining. This discrepancy suggests different serial order mechanisms in working memory and the motor system and motivates a more direct comparison of the serial order mechanisms used by each. We compared serial order effects in recall and typing using a serial recall task in which subjects had to type their responses. Serial position curves and transposition gradients were similar for recall and typing, but their error rates differed. Additionally, serial order in typing and recall were independent when using a closed word list. Working memory and the motor system seem to solve the problem of serial order with separate, yet analogous, mechanisms.
Email: Dakota Lindsey, dakota.r.lindsey@vanderbilt.edu

(4048)

Episodic Memory Reconsolidation: A Meta-Analysis. IIONA D. SCULLY and ALMUT HUPBACH, *Lehigh University* — Reactivation returns memories to an active, labile state, allowing for updating and memory modification. These memories must then be re-stabilized through a process called reconsolidation. Although difficult to study in humans, researchers have provided evidence for reconsolidation effects in fear, reward, procedural, and episodic memories. However, reconsolidation effects, particularly in episodic memory, remain controversial. The present study used a meta-analytic approach to critically evaluate the evidence for episodic memory reconsolidation. Results indicated that reactivation of episodic memories made them vulnerable to a variety of post-reactivation treatments, ranging from physiological interventions to learning related

material. Contingent upon reactivation these treatments resulted in impaired delayed recall and impaired recognition of the original memory, as well as increased levels intrusions from related material. Overall, this meta-analysis provides supportive evidence for reconsolidation effects in episodic memory, and provides new insights into modulatory effects and boundary conditions.
Email: Iiona Scully, ids214@lehigh.edu

(4049)

The Differing Effects of Expertise on Serial Recall. TRAVIS R. RICKS, CODY LIESER and CHASE MEIDINGER, *Bemidji State University* — This experiment investigated how differing levels of expertise affects serial recall. Participants were presented lists from two different domains of expertise. One list was ten National Football League (NFL) teams paired with their host city/state and the other a list of ten states of the United States (US) paired with their capitals. A list from one of the domains of expertise was presented four times with participants recalling after each presentation. Participants were then similarly presented the other list four times. Following the second list the first list was presented again with a different serial order for its items. Participants also completed an assessment of their football and US capitals knowledge. Football and United States capitals knowledge predicted recall for the first presentation of the lists, but not when the list items were presented again in a different serial order.
Email: Travis R. Ricks, tricks@bemidjistate.edu

(4050)

Test Dynamics and Competition Dependence in the Study of Retrieval-Induced Forgetting. JULIA SOARES and BENJAMIN C. STORM, *University of California, Santa Cruz* — Retrieval practice for a subset of items can cause the forgetting of non-practiced items, an effect referred to as retrieval-induced forgetting. According to the inhibitory account of retrieval-induced forgetting, the effect is competition dependent such that only items that cause competition during retrieval practice should be targeted by inhibitory processes presumed to cause forgetting. In support of this hypothesis, Anderson, Bjork, and Bjork (1994) found that items of strong taxonomic strength (e.g., fruit-lemon) suffered more forgetting than items of weak taxonomic strength (e.g., fruit-guava), presumably because the strong items caused more competition during retrieval practice than the weak items. We sought to replicate and extend this finding by manipulating the nature of the final test for these items to examine the conditions under which forgetting is influenced by taxonomic strength. Preliminary results suggest important implications for interpreting evidence of competition dependence in the study of retrieval-induced forgetting.
Email: Julia Soares, jusoares@ucsc.edu

TESTING EFFECTS

(4051)

Test-Enhanced Transfer of Learning With Authentic Materials: The Role of Encoding Variability. KHUYEN NGUYEN and MARK A. MCDANIEL, *Washington University in St. Louis* — Several studies have reported test-enhanced transfer, however, the tasks and materials (free-recall tests and short texts) may limit generalization of these findings to authentic educational settings. Further, no study has attempted to evaluate potential mechanisms underlying test-enhanced transfer. In the present study, we examined whether testing can enhance transfer of concepts presented in textbook chapters (Experiment 1) and evaluated potential underlying mechanisms of test-enhanced transfer (Experiment 2). Our results indicated that multiple-choice testing can enhance performance for transfer application questions (relative to a highlighting strategy) using authentic materials and tests. Additionally, our results suggest that it is the encoding variability associated with testing, and not the retrieval practice component, that was producing the obtained test-enhanced transfer. These findings suggest that testing may be a potent tool for enhancing learning of authentic text materials when the tests introduce encoding variability.
Email: Khuyen Nguyen, k.nguyen@wustl.edu

(4052)

How Does Errorful Generation Versus Errorful Study Affect Subsequent Learning? COURTNEY M. CLARK, ELIZABETH L. BJORK and ROBERT A. BJORK, *University of California, Los Angeles* — Having to guess (even when incorrect) what target you will be asked to remember for a given cue-target pair of associated words results in better cued recall of the correct target versus being allowed to study the correct pair for the whole time (e.g., Kornell, Hays, & Bjork, 2009). Would this result also hold when an incorrect target (another associate of the cue) is presented rather than generated? We compared the impact of generating incorrect targets versus being presented with incorrect targets versus simply studying intact pairs. After 8 s during which participants carried out one of those activities, they then could decide how long to study a given cue-target pair. Pairs in the guessing condition were remembered better on the final test than were pairs in the study-an-error condition, even though participants chose to study the correct pairing longer after studying an error than after generating an incorrect guess.
Email: Courtney Clark, courtneyclark@ucla.edu

(4053)

The Negative Testing Effect Does Not Extend to Educationally Relevant Materials. DANIEL J. PETERSON, *Skidmore College* — While tests are thought to typically improve long-term retention, recent research has suggested that certain types of tests may disrupt memory, a phenomenon known as the negative testing effect. According to one explanatory framework, this is thought to be because tests may disrupt organizational processing by hindering one's ability to make associations between items on a list. Such findings are concerning because they suggest there may be educational contexts in which a student taking a test might impair subsequent retention of the material. However, it is unclear whether the negative effects of testing will extend to more educationally appropriate designs and materials. In two experiments, participants learned a sequence of steps involved in drawing blood (phlebotomy). After this initial exposure, participants either studied the steps

again or were given a cued-recall test on the steps. Later, during a final recall test, participants either attempted to reconstruct the order of the steps (a test highly reliant upon organizational processing), or were given a cued-recall test. While the intermediary test facilitated final cued-recall performance, there was no detrimental effect on the test of order reconstruction; that is, no negative testing effect. The results suggest there unlikely to be educational contexts in which one should be concerned that testing might actually disrupt memory.
Email: Daniel Peterson, dpeters2@skidmore.edu

(4054)

The Testing Effect and Potential Moderating Variables. CHRIS KOCH and EMMA DENNIE, *George Fox University* — The testing effect was examined throughout a semester. Daily quizzes were given in a Sensation and Perception course. For the first exam, covering the chemical senses, both quiz scores (r = .39) and number of quizzes taken (r = .40) significantly correlated with exam scores. However, quizzes were not correlated with scores on the second exam covering low-level vision. Only the number of quizzes taken (r = .33) was correlated with scores on the third exam covering high-level vision. Potential mediating factors were also examined. Methodicalness was significantly related to exam 2 scores (r = .43). A potential explanation for these findings is that repeated testing is beneficial in the beginning of a course. Once students develop an understanding of the types of questions asked on exams, they are able to develop a strategy for studying. That strategy may be most important when the content area changes but repeated testing continues to be useful when the content area remains consistent.
Email: Chris Koch, ckoch@georgefox.edu

(4055)

Testing Potentiates New Learning When Retrieval or Encoding Is Delayed. KRISTA D. MANLEY, SARA D. DAVIS and JASON C.K CHAN, *Iowa State University*, KARL K. SZPUNAR, *University of Illinois - Chicago* — Testing can potentiate learning of new material, but whether this benefit persists over a delay is unclear. In three experiments, test-potentiated learning was examined through the manipulation of either a 25-minute retention interval separating the learning phase and test phase, or a 25-minute encoding delay of the final list. Subjects studied four lists of words, and they either restudied the words, completed math problems, or received an immediate test following Lists 1-3. All subjects received a test for List 4. Interpolated testing enhanced List 4 correct recall and reduced intrusions regardless of whether the test occurred immediately or 25 min later. When List 4 encoding was delayed by 25 min, interpolated testing enhanced List 4 correct recall but did not reduce intrusions. The results show that testing can enhance new learning across delays and retention intervals.
Email: Krista Manley, kmanley@iastate.edu

(4056)

The Testing Effect and the Test Question Effect Are Both Beneficial. KEVIN M. BARNES and GARY L. BRADSHAW, *Mississippi State University* — The testing effect has repeatedly been shown to produce superior recall when compared to rereading. Two studies present evidence for a test question effect that benefits recall of information participants encounter when reading the test. Participants either reread two 1,300-word prose passages or took fill-in-the-blank practice tests that contained additional to-be-tested information within the test questions themselves. A large and unexpected benefit for information read on practice tests was observed. Recall on the 48-hour final test did not differ significantly for information reread on practice tests (M = .60; SE = 0.02) and tested information (M = .55; SE = 0.02), both of which showed superior recall compared to rereading the entire prose passages (M = 0.31; SE = 0.02). A further analysis, where final recall was conditionalized on practice recall, showed an advantage over the test question benefit. This test question effect is not predicted by theories of the testing effect, such as desirable difficulties or transfer-appropriate processing.
Email: Kevin M. Barnes, kmb245@msstate.edu

(4057)

Investigating Transfer-Appropriate Processing as a Theoretical Account for the Testing Effect. LISI WANG, NATHANIEL D. RALEY and ANDREW C. BUTLER, *University of Texas at Austin* (Sponsored by Alan Brown) — Numerous theories have been put forth to explain the mnemonic benefits of retrieval practice relative to restudying (the testing effect). Among these accounts is the concept of transfer-appropriate processing, which is commonly invoked but rarely directly tested. Following up on research by Peterson and Mulligan (2013), we manipulated the type of learning activity (restudy vs. test) and the type of processing (item-specific vs. relational) during learning and the criterial test in a 2x2x2 between-subject design. Participants studied cue-target word pairs, and then either restudied the pairs or took a test on the target words. In these learning activities, stimuli were either randomly presented (item-specific) or grouped by semantic categories (relational). In a delayed criterial test, participants were assessed by cued recall (item-specific) or free recall (relational). The pattern of results supported transfer-appropriate processing when the criterial test was free recall, but the opposite pattern was observed in cued recall.
Email: Lisi Wang, lisi.wang@utexas.edu

(4058)

Variation in Initial Test Performance Does Not Affect the Benefit of Testing in Cued Recall. SARA D. DAVIS (Graduate Travel Award Recipient), SARAH J. MYERS and JASON C.K. CHAN, *Iowa State University* — Testing can be a powerful memory enhancer, but some research has suggested that lower initial test performance may lead to a reduced benefit of testing (Rowland, 2014). In an educational context this is an important factor, as frequent testing may not be an ideal technique to enhance learning if performance is likely to be low. However, no studies have experimentally manipulated initial test performance to examine the impact on later retention. The present series of studies manipulated initial test performance by varying response deadlines (Experiments 1 and 2) as well as the number of encoding presentations (Experiment 3) in

the presence or absence of feedback. In each experiment, our manipulations led to variation in performance during initial testing, but they did not influence performance on the final test or the magnitude of the testing effect. These findings suggest that testing can enhance learning regardless of initial test performance.
Email: Sara D. Davis, sddavis@iastate.edu

(4059)

Scaffolded Retrieval in Verbal Learning: Diminishing Practice Cues Works When Testing Won't. JOSHUA L. FIECHTER and AARON S. BENJAMIN, *University of Illinois at Urbana-Champaign* — Retrieval practice has been shown to be a highly effective tool for enhancing memory, a fact that has led to major changes to educational practice and technology. However, the benefits of retrieval are limited under conditions in which retrieval is not likely to be successful. These circumstances are more likely to arise when initial learning is weak, when materials are highly complex, and for learners who are making slow progress. Here we investigate the benefit of a study technique in which learners are provided progressively less informative cues over retrieval attempts—a technique called *diminishing cues* (Finley et al., 2011). Over ten experiments, we compared diminishing practice cues, retrieval practice, and a restudy control condition. Under learning conditions in which a testing effect was ample, diminishing cues provided approximately the same benefit as standard retrieval practice. More importantly, under conditions in which testing was not highly beneficial, diminishing cues led to enhanced performance compared to standard retrieval practice. The use of diminishing practice cues provides a way to extend the benefits of testing to circumstances in which it is normally ineffective.
Email: Josh Fiechter, fiechte2@illinois.edu

(4060)

Experience With Confidence-Weighted Multiple-Choice Testing Improves Later Recall of Related Information. ERIN M. SPARCK, ELIZABETH L. BJORK and ROBERT A. BJORK, *University of California, Los Angeles* — Multiple-choice practice tests with competitive alternatives can facilitate the recall of related information on later tests (Little, Bjork, Bjork, & Angello, 2012). Using confidence-weighted multiple-choice tests in which individuals must make relational judgments of confidence when selecting answers can increase this benefit relative to using standard multiple-choice practice tests (Sparck, Bjork, & Bjork, submitted). We examined whether participants, after experiencing confidence-weighted multiple-choice practice tests, could then create a similar increase in recall for related questions when taking a standard multiple-choice practice test. We found that taking a confidence-weighted multiple-choice practice test followed by a standard multiple-choice practice test resulted in significant improvements in answering related questions compared to taking two standard multiple-choice practice tests. Confidence-weighted multiple-choice testing appears to trigger more effectively the retrieval of why wrong answers are wrong as well as well as why correct answers are correct than do conventional multiple-choice tests.
Email: Erin Sparck, emsparck@ucla.edu

(4061)

Effects of Retrieval Cues on Episodic and Semantic Retrieval Practice. MIN KYUNG HONG, SEAN M. POLYN and LISA K. FAZIO, *Vanderbilt University* — In two experiments, we investigated how retrieval practice difficulty modulates the effects of testing (episodic memory retrieval) and generation (semantic memory retrieval) on memory. In Experiment 1, participants studied a list of categorized cue-target pairs (Occupations – Athlete), then either restudied the pair, retrieved the target using a 2-letter cue (Occupations – At_____) or retrieved the target using a 4-letter cue (Occupations – Athl___). Experiment 2 examined the effects of generation on memory by eliminating the initial study phase. In both experiments, items practiced or generated with 2-letter cues were best remembered on a final free recall test, followed by 4-letter cue items and then restudied pairs. These results replicate previous findings that both the testing and generation effects benefit from sparser retrieval cues, and serve as a reminder that the effects of episodic memory retrieval can often be confounded by semantic memory retrieval.
Email: Clair (Min Kyung) Hong, min.kyung.hong@vanderbilt.edu

(4062)

The Pre-Testing Effect: A Limited Efficacy Learning Technique? KYLE J. ST. HILAIRE, SARAH A. BLUMENTHAL, NATASHA M. BUTKEVITS, SARAH E. FISENNE, DARREN O. J. GEIGER and JANINE M. JENNINGS, *Wake Forest University* — Recent research has expanded on the testing effect (Roediger & Karpicke, 2006) by showing that administering a test prior to presenting information (pretesting) can produce similar benefits (Richland et al., 2009). The current study further explores this "pre-testing effect" to determine 1) if it can be seen with open-ended short answer questions, rather than just closed-ended (i.e., fill-in-the-blank) questions, and 2) whether benefits extend to novel questions not administered at pretest. Participants first either took a pretest then studied a prose passage or simply studied the passage, after which a post-test was administered. Question type and novelty were manipulated. The results showed that pre-testing only enhanced post-test performance relative to the study condition for previously seen, close-ended questions. Further work is needed to determine if the limited nature of the pretesting effect is ubiquitous, or if broader effects can be found with more complex learning materials and longer retention intervals.
Email: Kyle St. Hilaire, sthikj15@wfu.edu

(4063)

The Benefits of All-of-the-Above Question on Multiple-Choice Test. BAVANI PANEERSELVAM and AIMEE CALLENDER, *Auburn University* — Existing testing effect research on intervening questions containing all-of-the-above (AOTA) options suggests benefits of this type of question on a final MCQ test that also contains questions with the AOTA format. However its effectiveness on a final MCQ test in a standard format is not clear. In two experiments, participants read a set of passages and took an intervening MCQ test in an inclusive format (AOTA questions) for half of the passages

without feedback and reread half of the passages prior to taking a final MCQ test in a standard format either immediately or after a delay (48 hours). Results revealed that previous testing with the correct-AOTA (Experiment 1 and 2) and wrong-AOTA (Experiment 2) options promoted the testing effect both immediately and after a delay. Experiment 3 demonstrates that these results is influenced by the number of responses (single vs multiple) presented in the passages.
Email: Bavani Paneerselvam, bzp0012@auburn.edu

(4064)

Retrieval Enhanced Suggestibility (RES) Effects After Text Encoding: The Impact of Perceptual Distinctiveness. VICTORIA A. BARTEK, *Seton Hall University*, LEAMARIE T. GORDON, *Assumption College*, MARIANNE E. LLOYD, *Seton Hall University* — After answering questions about a witnessed event, eyewitnesses are more susceptible to misleading post-event information. The present study examined whether this *retrieval enhanced suggestibility (RES)* effect occurs because the similarities between the two narratives (i.e., original event and post-event misinformation) make it difficult for participants to distinguish between accurate and inaccurate event information. From the perspective of the source monitoring framework, we predicted that if source memory was supported through the addition of distinctive perceptual cues, RES would be reduced. Source cues were manipulated by presenting original event and misleading post-event information in different-color fonts. These narratives were segmented by a test on the original event and followed by an identical final test. Contrary to our hypothesis, even when source memory was supported, RES was observed. This suggests that cognitive factors other than source memory errors, such as enhanced fluency of misinformation, may be more directly implicated in RES.
Email: Marianne Lloyd, marianne.lloyd@shu.edu

(4065)

The Effects of Testing When Competing Information Is Studied Later. MARISA E. CRISOSTOMO and DANIEL R. KIMBALL, *University of Oklahoma* — Initial testing of memory for a previously studied cue-target word pair (a paired associate) typically enhances subsequent memory for the target when the cue is later presented during testing; this is an instance of the testing effect. However, results are less clear when a second target is paired with the same cue—as in the AB-AD paradigm—after the AB pair has already been tested initially. Some research shows that initial testing of the AB pair enhances subsequent memory for both the first and second targets. One account explains this result in terms of list segregation that reduces proactive interference of the second target while leaving the testing effect for the first target unimpaired. Another account suggests that the initial testing of the AB pair results in an integrated trace comprising both the AB and AD pairs. Other research—for example, using the misinformation paradigm—has found that initial testing of the AB pair enhances second target memory but impairs first target memory, counter to the predicted testing effect—a result termed the retrieval-enhanced suggestibility effect. We attempt to reconcile these disparate results and theoretical accounts using a combination of free recall and source recognition tests.
Email: Marisa Crisostomo, mcrisostomo@ou.edu

IMPLICIT MEMORY

(4066)

Cognitive Ageing and Cultures: Distractor Memory Happened Only When Overall Stimuli Were Restored, by Japanese Older Adults. ETSUKO T. HARADA, *University of Tsukuba*, AKIHIRO ASANO, *Idealab Inc.*, JOAN NGO and LYNN HASHER, *University of Toronto* — Distractor memory was observed by only older adults, showing priming effects with the word fragment completion task when a word was presented on a line drawing picture (Rowe, et al., 2006). Previously we tried to replicate this phenomenon with Japanese samples, and found that only younger adults showed priming effects. This time we did the same experiment but with a change that WFC items were presented on the same drawings as the study phase, and results showed that only older adults exhibited the distractor memory. Those different results in English and Japanese samples implied that Japanese older adults are processing a picture subsuming a word as a unitary one, not processing a word automatically independently, as English speakers were doing; in contrast, Japanese younger adults might try to process a word in a picture as some additional processes, maybe as holistic mode of thought, which produced distractor memories.
Email: Harada, E.T., etharada@human.tsukuba.ac.jp

(4067)

Implicit Preferences and Memory for Web-Based Advertisements in Low but not High Load Conditions. KATHERINE M. MATHIS, EDUARDA SOUTO MAIOR OSTHOFF and DANIELLE PIERCE, *Bates College* (Sponsored by Todd Kahan) — The current study investigated how our preferences and recognition of advertisements relate to the mere exposure effect and the load theory of attention. Participants read articles displayed in the layout of a webpage, surrounded by ads and other distractors in either low load or high load conditions. They then rated old and new ads on different likeability dimensions and finally completed a recognition test. Participants preferred the ads that were presented in a low load environment more than the ads in a high load environment or ads that were not studied, which weren't different from each other. Moreover, memory for advertisements was above chance when presented in a low load environment; however, this was not the case for the high load condition. If advertisers are concerned with whether advertisements affect preferences and memory, then they might consider displaying their ads in a low load environment.
Email: Katherine Mathis, kmathis@bates.edu

(4068)

Contribution of Semantic Activation to Fast Mapping. HILLARY F. ABEL, ANNA B. DRUMMEY, KATHELEEN O'HORA, KATHRYN CUSHING and IRENE P. KAN, *Villanova University* — In the word learning literature, the term

"fast mapping" (FM) describes the rapid acquisition of novel label-object pairings. It has been suggested that when a novel item is presented alongside a known item and a novel label, the active rejection of the known item may mediate such learning (e.g., "I know this is a pineapple, so 'talmac' can't be referring to that; it must refer to the unknown item."). This process is known as disjunctive syllogism (DS). In a recent study, we found that DS is not necessary for FM to occur. However, the extent to which DS may further enhance FM remains unclear. In this study, we found that DS is the most beneficial to FM when the accompanying known item is from the same semantic category as the novel item. These findings are discussed in terms of semantic activation and its influence on new learning.
Email: Irene Kan, irene.kan@villanvoa.edu

(4069)

A Continuous Flash Suppression Study of Implicit Visual Recollection. PATRICK S. SADIL, DAVID E. HUBER and ROSEMARY A. COWELL, *University of Massachusetts Amherst* — Graf, Shimamura, and Squire (1985) famously discovered that amnesic patients fail to recall previously studied words, but nonetheless complete word-stems with those studied words. In the current experiment, healthy volunteers studied visual images of everyday objects under continuous flash suppression (CFS), effectively studying without awareness. After learning, visual recollection was tested by showing participants two small, unrecognizable patches of the studied objects in an intact-rearranged forced choice (2AFC) test: participants were required to choose a pair of patches A1 and A2, which came from a single studied object, over a pair of patches A1 and B2, which came from two different studied objects. After the forced choice, subjects were asked to name the object from which patch A1 was drawn. Compared to no prior study, learning under CFS boosted 2AFC performance, but did not increase naming. In contrast to this implicit learning, prior study without CFS (i.e., with awareness) boosted both 2AFC and naming. Performance under CFS resembles amnesic patients' performance with words, and suggests that visual pattern completion of objects can be learned independently of visual object identification.
Email: Patrick Sadil, psadil@umass.edu

(4070)

Episodic and Procedural Memory Before and After Sleep in Precocious Intellectual Children. AMANDINE E. REY, *University Lyon 2*, JEAN-BAPTISTE SAUZEAU, ANNE GUIGNARD-PERRET and PATRICIA FRANCO, *University Lyon 1,* STÉPHANIE MAZZA, *University Lyon 2* — Sleep plays an important role in memory consolidation, here we investigated whether precocious intellectual children showed higher sleep memory consolidation than control children. 10 precocious intellectual children (PI, QIT = 137 ± 2.5 SEM) and 17 control children (CONT, total IQ = 110 ± 2.7), aged 6-14, performed a 2D object-location episodic learning task and a procedural mirror-tracing task, before and after a night of sleep. There was no difference in sleep parameters (total sleep time, S1, S2, S3, PS) and all children performed the learning session with the same efficiency. Twelve hours later, after a night of sleep, the CONT group showed higher performance (episodic: M = 2.5 ± 3.03%, procedural: M = 47.3 ± 10.44%) than the PI group (episodic: M = -7.7% ± 5.16, procedural: M = 19.5 ± 13.17%). Despite enhanced learning abilities, PI children have not benefited from sleep consolidation for episodic and procedural memory whereas control children did.
Email: Amandine E. Rey, amandine.e.rey@gmail.com

(4071)

Dissociation of Declarative and Procedural Memory. DALE A. HIRSCH and CHRISTOPHER A. WAS, *Kent State University* — Models of cognition posit that procedural and declarative memories are distinct, yet interdependent. Previous research has demonstrated that the specific cognitive operations (i.e., procedural memories) being performed during experimental tasks are facilitated for later use. However, previous studies have not tested whether active maintenance of declarative memory is necessary for the facilitation of cognitive operations. In the current study, we used the cognitive operation of category identification. The experimental task presented a memory set containing exemplars from two conceptual categories. Following instructions to remember one category and forget the other, facilitation was assessed with category comparisons of exemplar pairs. Both memory set categories were facilitated compared to a neutral unpresented category. However, recognition of previously processed exemplars from the remember category was significantly greater than those from the forget category, suggesting that the facilitation of cognitive operations is not dependent upon the maintenance of relevant declarative memories.
Email: Dale A. Hirsch, dhirsch1@kent.edu

(4072)

A Conceptually-Driven Oppositional Indirect Memory Test. ALAN HERNANDEZ and STEVEN SMITH, *Texas A&M University* — Oppositional indirect memory tests include those in which automatic retrieval impedes test performance, rather than enhancing it. A data-driven oppositional memory measure was introduced by Smith & Tindell (1997) in which word fragments (e.g., F_I_URE) that are orthographically similar to encoded words (e.g., FIXTURE) are tested. Now, we introduce a conceptually-driven version of this oppositional indirect memory measure, using a category production task in which responses are constrained by word stems. After primed words (e.g., DAFFODIL) are encoded, participants see, at test, a category name along with a word stem (e.g., Flowers – D_ _ _ _); for each test item, they must generate the single correct response that fits the category, the 1st-letter of the stem, and the number of blanks provided (DAISY). Conceptually-driven automatic retrieval was evidenced by poorer performance for items associated with negative primes than for unprimed items.
Email: Alan Hernandez, alan_hdz3@tamu.edu

(4073)

Looking for Liking: In Search of the Mere Exposure Effect. HENRY GORMAN and ZIXIAN CHAI, *Austin College* — The increased liking for material following repeated exposure, dubbed *the mere exposure* effect, is thought to be more likely to occur with complex materials and with heterogeneous (other

materials interpolated) increasing with up to 5 presentations (Bornstein, 1989). Many regard liking, as a measure of implicit memory, to be more sensitive than explicit measures such as recognition or recall. It is known that recognition of material increases non-linearly with practice with material over increased spacing (lag) between presentations (e.g. Ciccone & Brelsford, 1974). The present study, using Haiku-like poems varied within subjects, lag (with four levels of intervening poems—0, 1, 2, or 3) orthogonally with frequency (2 ,3, or 4 presentations) with 5-s exposures per presentation. Following all presentations, 49 student completed test booklets on recognition (forced choice), liking, and familiarity. ANOVA and multiple regression showed the expected effects of frequency and lag on recognition and subjective familiarity but yielded no evidence for an effect on liking.
Email: Henry Gorman, hgorman@austincollege.edu

(4074)

Telling In-Tune From Out-of-Tune: Widespread Evidence for Implicit Absolute Intonation. STEPHEN C. VAN HEDGER, SHANNON LM. HEALD, ALEX HUANG, BROOKE RUTSTEIN and HOWARD C. NUSBAUM, *The University of Chicago* — Absolute pitch (AP) is the ability to name an isolated musical note without the aid of a reference note. One skill thought to be unique to AP possessors is the ability to classify an isolated note as "in-tune" or "out-of-tune." Recent work has suggested that intonation perception among AP possessors is maintained by the listening environment, in which the vast majority of Western music is tuned to a cultural standard. Given that *all* listeners of Western music are exposed to this cultural tuning standard, we test whether absolute intonation perception extends beyond AP possessors. We demonstrate that non-AP listeners are able to accurately judge the intonation of isolated notes. Both musicians and non-musicians showed evidence for absolute intonation recognition when judging familiar timbres, though performance was not distinguishable from chance when judging unfamiliar timbres. Overall, these results highlight a previously unknown similarity between AP and non-AP possessors' long-term note representations.
Email: Stephen Van Hedger, shedger@uchicago.edu

RECOGNITION III

(4075)

Generation Increases Item but not Associative Recognition. JASON PHILLIPS and ANGELA KILB, *Plymouth State University* — Older adults' associative deficit is characterized by low performance in associative recognition despite relatively high performance in item memory. The purpose of this project was to determine whether word generation could simulate older adults' associative deficits in a group of younger participants. The generation effect (Slamecka & Graf, 1978) is the finding that information is better remembered if it is produced by the participant during study rather than passively perceived. While positive effects of generation are typically found for item memory, negative effects of generation have been observed in cued recall (Begg & Snider, 1987) and context memory (Nieznanski, 2011; 2012; 2013). Therefore, we predicted that generated word pairs would increase item memory and decrease associative memory, thereby mimicking the pattern typically seen in older adults. In the current study, a group of younger participants were asked to learn unrelated pairs of either fragmented or whole words and later took item and associative recognition tests. Results show a positive effect of generation in item memory but no effect of generation in associative memory, which were only partially in line with our predictions. These findings will be discussed with respect to the item-context tradeoff hypothesis (Jurica & Shimamura, 1999) and Mulligan's processing hypothesis (Mulligan, 2011).
Email: Angela Kilb, akilb@plymouth.edu

(4076)

Observing Testing Effects on Children's Word Learning Through Storybook Reading. CATHERINE A. DEBROCK and HALEY A. VLACH, *University of Wisconsin-Madison* — This ongoing study examines the testing effect in children's word learning via storybook reading. Although the benefits of testing for memory have been observed in adult participants, it is unclear whether young children will show a similar testing effect. In this study, children learned new word-object mappings during storybook reading. The storybook consisted of 2D line drawings to introduce children to novel labels for novel objects. Across two conditions, children encountered novel labels by ostensive naming, in which the object was re-labeled during learning, or by testing, in which they were asked to select and point to the label's referent in the storybook. Children's memory for newly learned object-word pairings was assessed by performance in a delayed retention test. Although data collection is still ongoing, we hypothesize that children's memory will benefit from the inclusion of testing within the structure of the storybook.
Email: Catherine DeBrock, debrock@wisc.edu

(4077)

Has the Source Memory Advantage for Cheaters a Positive Influence on our Later Actions? MEIKE KRONEISEN, *University of Koblenz-Landau* — Evolutionary psychologists often claim that memory functions can only be understood through an analysis of the specific selection pressures that have shaped the cognitive system during human evolution. In line with this framework, a number of studies have shown a source memory advantage for faces of cheaters over faces of non-cheaters. This can be beneficial for cooperative individuals because remembering that a face belongs to a cheater can help to avoid being exploited by this person in future encounters. In our study, we were interested in whether our student participants were able to remember cheating game partners in a later game with old and new opponents. In addition, we manipulated if the game partners looked trustworthy or not. Participants spend more money when their opponent showed trustworthy behavior in the game bevor than when the game partner showed negative behavior. However, they spent most of their money when their opponent was new and trustworthy looking.
Email: Meike Kroneisen, kroneisen@uni-landau.de

(4078)

Separating Stimulus and Task Effects Influencing Encoding Success, a Subsequent Memory ERP Study. COLIN M. NOE and SIMON J. FISCHER-BAUM, *Rice University* — Thirty years of back-sorting studies have shown ERP differences at encoding that distinguish between remembered and forgotten items. These differences due to memory (Dm) are sensitive to encoding task, for example to depth of processing manipulations. The Dm may also reflect variation in how individual stimuli are processed. The current project investigates the contributions of both stimulus-specific and task-related processes to the Dm. In previous back-sorting studies, the stimulus and task have been simultaneously presented, preventing the separation of the contributions of stimulus and task. In a novel ERP design, we present a target word 1s prior to the presentation of a shallow or deep processing task. An interaction between the Dm and the level of processing task emerges prior to the presentation of the task, indicating that there are initial processing variations for individual stimuli which affect memory encoding success in a manner dependent upon subsequent task.
Email: Colin Noe, cmn2@rice.edu

(4079)

The Action-Sentence Compatibility Effect (ACE) and its Consequences for Long-Term Memory: A Replication and Extension Study. ANTONIO M. DÍEZ-ÁLAMO and EMILIANO DÍEZ, *University of Salamanca*, MARÍA A. ALONSO, *University of La Laguna*, ANGEL FERNANDEZ, *University of Salamanca* — Recent studies suggest that language comprehension implies constructing sensorimotor simulations of the events described in sentences. Glenberg and Kaschak (2002) found that comprehending a sentence that implies action away or towards the body interferes with making a sensibility judgment that requires responding with an action in the opposite direction (the action-sentence compatibility effect: ACE). Three 2-phase experiments were conducted to further examine the ACE and its implications for long-term memory. Phase I was a replication of the ACE paradigm. Phase II was a subsequent unexpected memory test, either a recognition, free recall or cued recall task aimed at analyzing potential effects of action-affected comprehension on long-term memory for the sentences. It was predicted that sentences in a mismatch condition between sentence and response directions would produce longer reaction times in Phase I and worse retention in Phase II, as impaired initial comprehension is likely to result in poorer memory representations.
Email: Antonio M. Díez-Álamo, antonio_diez_alamo@usal.es

(4080)

Source Retrieval Under Cueing: Effects of Recollection. ANTONIO JAEGER, MARIUCHE R. A. GOMIDES, VICTOR GARCIA and GABRIEL GOMIDE, *Federal University of Minas Gerais*, IAN G. DOBBINS, *Washington University in St. Louis* — Recognition accuracy declines when probes are preceded by misleading information about their study status (i.e., invalid cueing). Invalid cueing also decreases confidence, but only for correct rejections, not hits. We hypothesized that the preserved confidence of hits (and not correct rejections) in the face of invalid memory cueing stems from recollection. To test this, we conducted a source-memory experiment manipulating encoding location (left or right side). At test the studied objects were presented centrally, preceded by predictive arrow cues (75% valid / 25% invalid) indicating the prior location, and subjects reported prior location and confidence. Cue validity prominently affected accuracy (valid > invalid) and reaction time (invalid > valid), and confidence was markedly higher for correct versus incorrect source judgments. Nonetheless, as with hits during recognition, confidence for correct source judgments was unaffected by cue validity. Since source memory is heavily based on recollection, we interpret this novel accuracy vs. confidence dissociation in light of dual process models of recognition.
Email: Antonio Jaeger, antonio.jaeger@gmail.com

(4081)

Effects of Task-Relevance of Self-Relevant Information on Incidental Self-Reference Effect in Item and Source Memory. KYUNGMI KIM, JENNE JOHNSON, *Wesleyan University*, MARCIA K. JOHNSON, *Yale University* — Pairing a target stimulus with self- vs. other-relevant information produces a memory advantage, even without any explicit task demand to evaluate self-relevance. We explored how task-relevance of the dimension in which self-relevant information is presented, a factor shown to affect self-priority effects in attention, affects the magnitude of this "incidental" self-reference effect (SRE). During incidental encoding, participants were presented with words in two different colors either above or below a name (the participant's own or another person's name). Participants performed either a name-relevant task ("Is the word above or below the name?") or a name-irrelevant task ("Is the word in red or green?"). Memory for each item and its associated source features (name, location, color) was subsequently tested. There was a SRE for item memory only when the task was name-relevant. The SRE for source memory did not significantly interact with encoding task, but appeared to be primarily due to the name-relevant encoding condition. These findings indicate that greater attention to self- vs. other-relevant information at encoding contributes to the incidental SRE for item memory and, perhaps, to incidental SRE for source memory as well.
Email: Kyungmi Kim, kkim01@wesleyan.edu

(4082)

A Registered Replication of the Negation Effect: Is There a Consequence to Saying "No"? RACHEL E. DIANISKA and CHRISTIAN A. MEISSNER, *Iowa State University* — The negation effect refers to the cognitive detriment associated with correctly saying "no" (a negation), compared to correctly saying "yes" (an affirmation). A recent study has shown this detriment for item memory following negation of a feature of an item (Mayo, Schul, & Rosenthal, 2014). However, previous attempts to conceptually replicate this finding in a list-learning paradigm have failed. To assess the replicability of the negation effect, we conducted a registered replication of the Mayo et al. (2014) study using the original stimulus materials and test items. Subjects watched an 8-minute video of a tour of an apartment and answered 16 questions about features of objects

seen in the apartment. After a 20-minute filler task, subjects completed a final recognition test about the presence of objects in the apartment. We replicated the negation effect using the original materials, but the effect size was smaller in magnitude, d = 0.34 [0.09, 0.56], compared to the original work by Mayo et al. (2014), d = 0.70 [0.34, 1.06].
Email: Rachel Dianiska, dianiska@iastate.edu

(4083)

Word Frequency Effects in Recognition Memory. KERRY A. CHALMERS, *University of Newcastle* — Recognition memory for familiar (low, medium and high frequency) and novel words (defined here as very low-frequency words that are not in participants' vocabulary) was examined in two experiments. Orthographic distinctiveness and encoding instructions were also manipulated, in Experiments 1 and 2, respectively. In both experiments, mirror effects were observed when low-, medium-, and high-frequency words were compared. When novel (very low-frequency) and familiar words (collapsed over low, medium, high) were compared, in Experiment 1 the hit rate was higher for novel than familiar words, with no difference in false alarm rates. This finding is consistent with a pseudoword effect, at least in the hit rate data. In Experiment 2, under two different encoding tasks (lexical decision and meaning rating), the hit rate was lower for novel than familiar words, with no difference in false alarm rates, consistent with a reverse pseudoword effect. Implications for models of memory are considered.
Email: Kerry Chalmers, Kerry.Chalmers@newcastle.edu.au

(4084)

The Pseudoword Effect: A Matter of Bias. EMILY E. FREEMAN and SINEAD SMITH, *The University of Newcastle* — The pseudoword effect is the finding that in a recognition memory experiment, pseudowords have higher hit and false alarm rates than words. It is considered important as it contrasts with the mirror effect, which is thought to be a regularity of recognition memory. Recently, Hilford, Maloney, Glanzer and Kim (2015) suggested that bias may mask underlying mirror effects. However, their study only looked at memory for words. We conducted a series of experiments examining memory for words and pseudowords. Experiment 1 replicated the previously reported pseudoword effect. In Experiments 2 and 3, manipulations proposed by Hilford et al. to reduce bias were introduced. In these experiments a mirror pattern emerged, with words having higher hit and lower false alarm rates than pseudowords. These studies suggest that the mirror effect is indeed a regularity of recognition memory even when words and nonwords are compared, so long as bias is controlled for.
Email: Emily Freeman, emily.e.freeman@gmail.com

(4085)

Long-Term Memory Specificity Depends on Detailed Memory for Specific Items and Inhibition of Related Items. BRITTANY M. JEYE and SCOTT D. SLOTNICK, *Boston College* — We are capable of remembering an incredible amount of information, which suggests a high degree of specificity for each memory representation. In the current study, we evaluated the specificity of abstract shape long-term memory representations. During the study phase, participants were presented with abstract shapes. During the test phase, old shapes, related shapes, and new shapes were presented and participants made "old"-"new" recognition judgments. Related shapes were constructed by morphing old shapes between 50-200% (independent ratings indicated that 100% morphs were perceptually "different" from corresponding old shapes). Preliminary analyses revealed that memory representations were very specific as the "old" response rate differed between old shapes and 50% morphs. Unexpectedly, the "old" response rate was lower for 200% morphs than for new shapes, which likely reflects memory inhibition of related items. These results suggest that long-term memory specificity depends on detailed memory for specific items and inhibition of related items.
Email: Brittany M. Jeye, jeye@bc.edu

(4086)

The Impact of Isolation on the Attentional Boost Effect. SAMUEL A. SMITH and NEIL W. MULLIGAN, *The University of North Carolina at Chapel Hill* — The typical pattern of results in divided attention experiments is that subjects in a full attention (FA) condition perform markedly better on tests of memory than subjects in a divided attention (DA) condition which forces subjects to split their attention between studying to-be-remembered stimuli and completing some peripheral task. Nevertheless, recent research has revealed an exception wherein stimuli presented concurrently with targets in a detection task are better remembered than stimuli which co-occur with distractors. Research on this phenomenon – the Attentional Boost Effect (ABE) – has demonstrated that the ABE is reduced or eliminated for words made distinct by their word frequency or orthographic properties – forms of *secondary* distinctiveness. However, it is unclear how *primary* distinctiveness effects may interact with the ABE. The current study observed how perceptual and semantic manipulations of primary distinctiveness interact with the ABE, and revealed these interactions to be fundamentally different than those of secondary distinctiveness.
Email: S. Adam Smith, s.adam.smith0@gmail.com

(4087)

The Impact of Context Availability on Concreteness and Frequency Effects in Recognition Memory. RANDOLPH S. TAYLOR and WENDY S. FRANCIS, *University of Texas at El Paso* — Across a variety of lexical processing and memory tasks, concrete words are associated with better performance than abstract words. One explanation is the *context availability framework,* which posits that it is easier to access associated contextual information for concrete words than for abstract words. The *memory-based explanation* for why concrete words are better recognized than abstract words does not address the potential impact of context availability. Similarly, the source-of-activation-confusion theory for why low-frequency words are better recognized than high-frequency words does not address context availability. We examined whether context availability mediates the effects of concreteness and word frequency in recognition memory. Participants studied words in isolation or in the context of high- or low-constraint sentences and then

completed a yes-no recognition task. Results will be discussed in relation to theoretical approaches to concreteness and frequency effects in recognition memory.
Email: Randolph S. Taylor, rstaylor@utep.edu

(4088)

The Effects of Divided Attention at Encoding on Value Directed Recognition Memory. BLAKE L. ELLIOTT, HOLLY O'ROURKE and GENE A. BREWER, *Arizona State University* — The present research examined the effect of value on recognition memory, and how various divided attention tasks at encoding alter value-directed encoding. In the first experiment, participants encoded words in multiple study phases that were assigned either high or low point values and were instructed that it was more important to remember the higher value words in order to increase their score on a subsequent word recognition test. The second experiment was modified such that while studying the words subjects simultaneously completed articulatory suppression or random number generation divided attention tasks. Subjective states of recollection (i.e., "Remember") and familiarity (i.e., "Know") were assessed at retrieval in both experiments. In experiment one, high value words were discriminated more effectively than low value words and this difference was primarily driven by increases in "Remember" responses with no difference in "Know" responses. In experiment two, the pattern of results from the articulatory suppression condition replicated experiment one. In the random number generation condition, the effect of value on recognition memory was lost. The data suggest that executive resources are used when encoding valuable information and that value-directed improvements to memory are not merely the result of differential rehearsal.
Email: Blake Elliott, blake.elliott@asu.edu

MEMORY AND REWARD, MOTIVATION, AND EMOTION

(4089)

How Do You Play the Game? Effects of Gain Versus Loss Outcomes on Learning. ZIYONG LIN and PATRICIA A. REUTER-LORENZ, *University of Michigan* — We examined the role of outcome valence and motivational salience in learning using a two-alternative forced choice task. Three pairs of scenes were designated as win, loss, or no change pairs. Scenes in win and loss pairs were associated with outcome probabilities of either 80% or 20% (i.e., motivational salience) versus no-change. Participants earned 5 points for win outcomes, lost 5 points for lose outcomes and learned to select scenes that maximized gains or minimized losses on each trial. Two types of learners emerged: for *Equal learners* learning functions for win and loss pairs were indistinguishable, whereas *Unequal learners* learned win pairs significantly faster and better than loss pairs. Subsequent explicit knowledge testing indicated scene-outcome associations were more accurate for win than loss pairs even for *Equal learners*, suggesting a different representational basis for performance on trials resulting in gain vs. loss outcomes. Implications for reinforcement learning theory are discussed
Email: Ziyong Lin, ziyong@umich.edu

(4090)

The Role of Emotional Words in Learning Statistically Dense and Statistically Sparse Categories. ALEXEY A. KOTOV, *Higher School of Economics*, SVETLANA N. POKIDYSHEVA, *Peoples' Friendship University of Russia*, TATYANA N. KOTOVA, *Russian Academy of National Economy and Public Administration* — The goal of the present study was to assess the influence of the emotional words on the learning different types of categories. Subjects were given classic category formation tasks with feedback. We used two types of categories - statistically dense and statistically sparse. After feedback participants were given emotional words from two semantic groups, happiness or sadness. Those words were related to feedback directly (e.g., happy word after positive feedback), or inversely (e.g., sad word after positive feedback), or randomly. We found that in the case of dense categories formation, the relation between feedback and an emotional word had no impact on the learning. In the case of sparse categories formation, performance was much better in direct relation condition than in the inverse or random relation conditions. The results of the experiment will be discussed in the framework of the COVIS model of multiple systems of categorization.
Email: Alexey A. Kotov, al.kotov@gmail.com

(4091)

The Influence of Regulatory Fit on Memory Confidence. ROSS DE FORREST and LISA GERACI, *Texas A&M University* — According to the regulatory fit framework (Cesario, Higgins, & Scholer, 2008), individuals experience regulatory fit when their chosen means of goal pursuit (eager vs. vigilant) matches their current regulatory focus (promotion vs. prevention). This match between focus and means of goal pursuit influences cognitive performance. It also influences subjective experience. For example, research shows that when people are under regulatory fit, they find messages to be more persuasive than when they are not under fit. This finding has led some to suggest that regulatory fit makes messages persuasive by engendering a feeling of rightness or by increasing confidence. We tested this hypothesis by examining the effect of regulatory fit and non-fit on memory predictions and memory confidence. Results are discussed in terms of the regulatory fit framework.
Email: Ross De Forrest, ross.deforrest@tamu.edu

(4092)

The Effect of Reward Prospect on a Personalized Fact-Learning System. FLORIAN SENSE, BERRY VAN DEN BERG, DON VAN RAVENZWAAIJ and HEDDERIK VAN RIJN, *University of Groningen* (Sponsored by Niels Taatgen) — Monetary reward-prospect can potentially accelerate learning by biasing attention towards and improving the encoding of the reward-associated item or feature. To investigate the effect of reward-prospect on fact learning we pre-registered an experiment from which the results are presented here (details: https://osf.io/fxs54/). Participants will study Swahili-English word pairs associated with either high- or low-reward-prospect. Additionally, word pairs are studied using a personalized, adaptive learning system. The system estimates how quickly someone forgets a word to ensure repetition before words are

forgotten. We will test to what extent reward-prospect can accelerate learning and subsequently improve delayed recall scores. High-reward-prospect items are expected to be learned faster, but the system's adaptive scheduling will emphasize those items that are learned less well, possibly prioritizing low-reward-prospect items. The proposed experiment would elucidate whether reward-prospect could accelerate item encoding and whether adaptive learning can prioritize those items that are associated with low-reward.
Email: Florian Sense, f.sense@rug.nl

(4093)

Effects of Encoding by Rating of Arousal for Emotional Stimuli: Comparing With Self-Referent and Physical Processing. TETSUYA FUJITA and MIZUKI KATO, *Hosei University* — In the present study, we investigated that not only arousal as attributes of emotional stimuli but also the effects of encoding, if any, on ratings of arousal. We studied that how the rating of arousal by emotional stimuli has the effect of encoding relative to self-referent processing and physical processing (rating of brightness) condition. We presented the emotional stimuli and asked for rating of arousal, brightness, or self-referent processing, then tested free recall performance for participants. Results showed that difference between the rating of arousal and self-referent processing conditions was not significant in memory for recall. On the other hand, there was higher memory for recall after the rating of arousal condition than physical processing condition. Thus, we found that rating of arousal and self-referent processing had equivalent effects on memory performance.
Email: Tetsuya Fujita, fujita009@nifty.ne.jp

(4094)

Achievement Goals and Memory Encoding. KENJI IKEDA, *Japan Society for the Promotion of Science, Doshisha University*, JUMING JIANG, RYOSUKE KAKINUMA and AYUMI TANAKA, *Doshisha University* — The present study examined how achievement goals affect memory encoding, such as item-specific and relational processes. We conducted three experiments, manipulating the instructions of achievement goals. In each experiment, participants were instructed toward mastery-approach goals (i.e., develop their own mental ability) or performance-approach goals (i.e., demonstrate their strong memory ability in relation to others). Participants in the control condition were not given any goals. Results showed that recognition performance (i.e., *d*'), which reflects the amount of item-specific process, in the mastery-approach goal condition was significantly lower than that in the control condition, whereas the ARC score, which reflects the amount of relational process, did not differ between the two conditions. In contrast, the ARC score in the performance-approach goal condition was significantly lower than that in the control condition, whereas *d*' did not differ between the two conditions. These findings suggest that achievement goals may discourage the specific learning process.
Email: Kenji Ikeda, kenikeda@mail.doshisha.ac.jp

(4095)

Does Emotional Arousal Influence Between-Object Binding in Memory? KACIE MENNIE and SEAN M. LANE, *Louisiana State University* — Memories of complex events involve multiple components such as objects that were used, people who were involved or actions that were performed. Researchers have argued whether these memory components are independent or structured, and there is evidence for both views. Furthermore, it has been argued that emotional arousal might further potentiate binding between components if the association between them is prioritized at encoding. In this experiment, we had participants study face-object pairs and manipulated encoding by instructing them to either imagine the face and object interacting in a single visual image (integration), or to imagine them separately. Furthermore, the pairs were preceded by emotional or neutral sounds. On a final associative recognition test, we found that encoding strategy influenced subsequent memory accuracy, but emotional arousal did not moderate this effect. We discuss the implications of our findings for theoretical views concerning the impact of emotional arousal on associative memory.
Email: Kacie Mennie, kmenni1@lsu.edu

(4096)

Where Are My Glasses? Age-Related Differences on a Visuospatial Value-Directed Remembering Task. ALEXANDER L.M. SIEGEL and ALAN D. CASTEL, *University of California, Los Angeles* (Sponsored by Nick Soderstrom) — Older adults usually experience memory impairments for verbal and visuospatial episodic information. However, research on value-directed remembering has shown that older adults are able to compensate for age-related verbal memory deficits by selectively focusing on high-value information at the expense of competing, low-value information. In two experiments, we examined whether age-related impairment in visuospatial memory could be alleviated by strategic focus on important information and whether varying presentation types would affect such selectivity. Younger and older adults were presented with objects worth different point values in a visuospatial display, either sequentially (Experiment 1) or simultaneously (Experiment 2). In addition to remembering less information overall than younger adults, older adults were unable to study selectively when the information was presented sequentially. However, older adults were significantly *more* selective than younger adults when the information was presented simultaneously. We connect these findings to literature on attention, value-directed remembering, and aging.
Email: Alex Siegel, alexsiegel93@ucla.edu

(4097)

Value Influences Immediate Recall of Sub-Span and Supra-Span Memory Loads. TIFFANY K. JANTZ and PATRICIA A. REUTER-LORENZ, *University of Michigan* — Due to capacity limitations, memory performance may benefit from the ability to encode, promote, and retrieve memoranda selectively based on item value and future goals. Optimal memory control may rely on selective processing that operates in working memory and may be mediated by individual differences in working memory capacity (WMC). To test these hypotheses, we

examined how varying value of memoranda in randomized sub-span and supra-span lists influenced immediate free recall. Extending previous evidence for value-based memory effects participants recalled fewer low-value items, even from lists of only 3 items, with value becoming increasingly predictive of recall as list length increased. Low WMC participants recalled fewer low-value items at all list lengths, compared to high WMC participants. These results indicate that value-directed control processes can modulate memory within seconds for sub- and supra-span lists and are influenced by WMC. Effects of value-directed memory on long-term retention will also be discussed.
Email: Tiffany K. Jantz, tkjantz@umich.edu

(4098)

Memories of Object Size Change in Accordance With Value Assigned. CHAIPAT CHUNHARAS and VILAYANUR S. RAMACHANDRAN, *University of California, San Diego* — 33 subjects were shown pictures of a 1$, 5$, 10$, 20$ bill along with distractors on a computer and asked to adjust the size of each from memory till it was life-size. Surprisingly, despite having seen bills all their lives and despite knowing intellectually that they were the same size, subjects' memory for size varied with dollar value - as if the mnemonic system was metaphorically translating 'value' into 'size'. We are exploring the same effect on small sculptures. Subjects had to remember attributes including price. Subjects were tested either 5 minutes, 30 minutes or 24 hours later to see if the size change is amplified during consolidation period. We suggest that memories undergo progressive "Caricaturization" during different stages of formation.
Email: Chaipat Chunharas, cchunharas@gmail.com

(4099)

Cash or Credit? Compensation in Psychology Studies: Motivation Matters. HOLLY J. BOWEN and ELIZABETH A. KENSINGER, *Boston College* — It is common practice for psychology researchers to recruit their sample of participants from the undergraduate student population. Participants are typically compensated with partial course credit or a monetary payment. The aim of the current study was to examine whether the motivation to participate in a study influences performance on a behavioral task. Undergraduate participants were recruited and compensated for their time with either partial course credit or cash. Potential performance-based rewards were earned during a rewarded memory task, where correct recognition of half the stimuli was worth a high reward and the other half a low reward. Memory for high reward items was better than low reward items, but only for the cash group. The credit group did not modulate their performance based on the value of the stimuli. The results suggest that recruiting and compensating participants with cash versus course credit can influence the results on a rewarded memory task.
Email: Holly J. Bowen, holly.bowen@bc.edu

AUTOBIOGRAPHICAL MEMORY II

(4100)

Effects of Odor, Picture, and Verbal Cues on Retrieval of Autobiographical Memories. MONICA NELSON, *University of North Carolina - Charlotte*, KRISTI S. MULTHAUP, *Davidson College* — Two experiments investigated whether odor-cued memories' reported uniqueness extends to retrieval processes. Experiments were identical except for how cues were equated across modality (odor, picture). In Phase 1, undergraduates (N = 32, N = 30) recorded as many memories as possible in 90 s in response to verbal cues (e.g., *coffee*). Before moving to the next cue, participants rated each memory from 1 (*popped into mind*; direct retrieval) to 7 (*took work to recall*; generative retrieval). Phase 2 repeated Phase 1 with sensory-cue trials adding an odor or picture. Both experiments revealed significant phase x trial type interactions for both dependent measures: mean number recorded declined across phase for control trials (no sensory cue in Phase 2) but remained stable for the sensory-cue trials; retrieval ratings increased across phase for control trials, but remained stable for the sensory-cue trials. There was no hint of any three-way interaction with cue modality (odor, picture).
Email: Kristi Multhaup, krmulthaup@davidson.edu

(4101)

The Relationship Between the Characteristics of Biased Retelling and Reinterpretation of Autobiographical Memory. KAZUHIRO IKEDA, *Shokei Gakuin University* — This study examined how the biased retelling strategy implicate the autobiographical memory. Two hundred nine undergraduate students were asked to rate memory characteristics questionnaire about their harsh memories: (1) 7 items for Centrality of Event Scale, (2) 6 items for Meaning making in memory, (3) 10 Intrusive items for Event Related Rumination Inventory (ERRI), to rate the post traumatic growth questionnaire: (1) 10 Deliberate items for ERRI, (2) 9 items for Core Beliefs Inventory, and to rate the type of recollection scale: (1) 8items for TALE-J, (2)28items for Re-TALE. The result revealed that the participants used evenly some types of retelling strategy facilitated the meaning making for their memory.
Email: Kazuhiro IKEDA, hiro272003@gmail.com

(4102)

Recall of Events: Memory for Real and Virtual Experiences of a Museum Exhibit. ELAINE H. NIVEN, *University of Dundee*, ROBERT H. LOGIE, *University of Edinburgh* — Memory for personally experienced events has frequently been assessed via volume and consistency of reported detail across two different time points (initial and subsequent review). We investigated an alternative means for studying event memory – whether a virtual, recordable environment can provide episodic-rich memories. Recall of participants who spent 15 minutes actively navigating a real-world museum exhibit was compared with that of participants who experienced a detailed, virtual reality replica exhibit. Coders' ratings of recall, and number and type of details provided indicated equally episodically rich recall of environments using the Autobiographical Interview scoring technique and rating scales (Levine et al., 2002). Virtual

environment exploration appears to be a potentially fruitful means by which to move beyond consistency-focused analyses in testing event-based memory.
Email: Elaine Niven, e.niven@dundee.ac.uk

(4103)

Does Memory Bias for Painful Experiences Influence Children's Pain Coping Ability? JENNIFER L. BRIERE, TAMMY A. MARCHE and CARL L. VON BAEYER, *University of Saskatchewan* — Do children who recall more negative aspects of prior pain-related experiences have a more difficult time coping with subsequent pain-related experiences? 86 children aged 7 to 15 years (M = 9.85 years, SD = 2.02 years) recalled their most physically painful experience using the *comprehensive narrative elaboration technique*. Their reports were examined in terms of valence and type of detail (i.e., sensory, contextual, affective, procedural, behavioural, cognitive). Children reported significantly more negative than positive information (a negative memory bias) for all types of details, with the exception of contextual details which were significantly more positive than negative (a positive memory bias). Children who reported remembering more negative feelings and who were older at the time of the event had a larger negative memory bias. Being younger when the event occurred and remembering fewer negative feelings was related to a larger positive memory bias. During an experimental pain task, greater negative memory bias was associated with higher state anxiety, but a stronger belief in pain coping ability. Understanding children's ability to cope with negative experiences may help improve their psychological well-being.
Email: Jennifer L. Briere, jbriere@stmcollege.ca

(4104)

Examining the Phenomenology and Functions of Episodic Memories, Counterfactual Thoughts and Future Simulations. MÜGE ÖZBEK, ANNETTE BOHN and DORTHE BERNTSEN, *Aarhus University* — Recent research examined similarities and differences between mental time travel into the past and future. Episodic counterfactuals have been understudied compared to episodic memories and future simulations. Here, phenomenology as well as functions (Harris, Rasmussen, & Berntsen, 2013) of the most important episodic memory, counterfactual thought, and future simulation were compared in 60 undergraduates (48 women and 12 men; M_{age} = 21.10, SD_{age} = 1.51). Results showed that people remember past events with clarity, imagine alternatives to past events (counterfactual thoughts) with lower emotional intensity, and imagine the future most positively. Moreover, a heightened ruminative use of counterfactuals is evident, although reflective and social uses are prominent for all events. The ability to imagine alternatives to past events seems to some extent similar to both remembering the past and imagining the future, although there are slightly different general uses.
Email: Müge Özbek, muge@psy.au.dk

(4105)

Retrieval of Autobiographical Memories and the Efficacy of Cues. JACQUELYN B. PALMER, KENNETH MALMBERG, SALWA MANSOUR and KERI ERB, *University of South Florida* — Recalling past events is a hallmark of human cognition. At present, there is abundant literature which explores list-learning memory; however, few studies examine the retrieval of everyday memory, particularly related to the effect of cues on the generation of event details. We asked participants to recall events that occurred on a particular weekend while using the Think Aloud Method. Participants' verbal recall was scored and categorized in order to differentiate between internally generated cues and event retrieval. Results suggest that external cues (e.g. specific vs. vague question) largely affect the amount of information retrieved between conditions. Furthermore, internally generated cues (i.e. general knowledge used by the participant to aid in retrieval) differ depending on the external cue given, and Routine (e.g. general knowledge of daily/weekly occurrences) is heavily relied upon in order to retrieve details of events.
Email: Jacquelyn Palmer, jacquelynp@mail.usf.edu

(4106)

Highly Superior Autobiographical Memory (HSAM). ADRIANA DE BARTOLO, ZACHARIA NAHOULI, CHIARA GUERRINI and GIULIANA MAZZONI, *University of Hull* — Highly Superior Autobiographical Memory (HSAM) is a condition characterised by the ability to remember almost every day of life in response to dates. We report data testing whether HSAM is linked to a greater ability to inhibit irrelevant information at retrieval and/or to superior visual memory. Three individuals with a pure HSAM condition (no cognitive impairment, no OCD, no autism) were compared to a control group. The results show that the exceptional ability to retrieve personal information from memory is not linked to superior inhibitory skills, but to a highly superior visual memory.
Email: Adriana De Bartolo, adriana.debartolo@yahoo.it

(4107)

An Examination of Cue Word Effects in Overgeneral Memory. BURCU KAYA KIZILÖZ, ALI I. TEKCAN and AYSECAN BODUROGLU, *Bogazici University, Istanbul* — In studies addressing overgeneral autobiographical memory (OGM) in depression, memories are typically elicited in response to positive and negative cue words. These studies tended to find no effect of cue valence on OGM (i.e. positive or negative). However, very little data exist for characterization of these cue words in terms of valence. We asked young adult participants to evaluate 68 cue words used in previous OGM studies through Self Assessment Mannequin. Depression scores were also obtained using the Beck Depression Inventory (BDI). Results revealed inconsistencies with differences in how cue words were categorized into emotional valence categories in the OGM literature. "Surprise", considered positive in OGM literature, was rated as negative. BDI scores were also correlated with ratings assigned to some cues; "happy", "alone" and "fault"

were rated as less positive and the cue "relaxed" as more positive as the BDI score got higher. Together, these results imply a need for norming studies to examine emotional cue words.
Email: Burcu Kaya Kızılöz, burcukaya@gmail.com

(4108)

Consistency of Digital Photo Classification Over Time. MARIA K. WOLTERS, *University of Edinburgh*, ELAINE H. NIVEN, *University of Dundee*, ZEYU WANG, *Peking University*, ROBERT H. LOGIE, *University of Edinburgh* — In this study, we examined whether people group self-produced digital artefacts, such as photos, consistently over time and the extent to which such groups can be related to specific events or other underlying concepts. We analysed data from two studies (Study 1: n=72, Study 2: n=21) where participants used smartphone cameras to document their experiences of a major international arts festival, and grouped the photos according to self-defined categories (Study 1 and 2) or events (Study 2). Participants grouped their photos between 1 and 3 times with varying time delays. While we found evidence that people have a preferred way of sorting their digital photos into groups, these preferences can change over time. Rehearsal patterns do not affect preference stability in the short to medium term (delay of up to a month), but pilot data suggests that they may become relevant in the long term (delay of a year).
Email: Maria Wolters, maria.wolters@ed.ac.uk

(4109)

Memory Properties and Retrieval Goals Predict Reality Monitoring for Autobiographical Events. KYLE R. KRAEMER and IAN M. MCDONOUGH, *University of Alabama - Tuscaloosa*, DAVID A. GALLO, *University of Chicago* (Sponsored by Edward Merrill) — Reality monitoring refers to the ability to distinguish between memories that stem from external sources versus those from internal sources. The source monitoring framework proposes that certain properties of memories, such as perceptual detail and associated cognitive operations, are important for reality monitoring. However, the current study is the first to investigate how such details may interact to distinguish autobiographical events. Forty-eight participants were presented with a series of words, asked to either recall a prior memory or imagine a future event cued by the word, and then rated their experience on several properties. The next day, source memory was tested with two different tests: past test and future test. We used multi-level modeling to predict source memory on the trial level. Encoding detail and difficulty interacted to predict "imagined" attributions, whereas only encoding detail predicted "past" attributions. Thus, how properties predicted source memory attribution depended upon retrieval goals.
Email: Kyle R. Kraemer, krkraemer@crimson.ua.edu

(4110)

Can Sharing Life Narrative With Others Be Preventive From Cognitive Impairment? Recollection of Autobiographical Memory and Aging Mind. AYA HOSOKAWA, *National Center for Geriatrics and Gerontology* and TOSHIAKI MURAMOTO, *Tohoku University* — Cognitive aging is hinged on multiple factors. From the perspective of multidimensionality and multidirectionality in human development, we are to maintain or improve our cognitive abilities with sufficient exposure to environments rich in intellectual and social stimuli. The current study investigated effects of recollecting autobiographical memory to share life narrative with others in group session under the natural setting condition on quality of life, cognition, and memory in later life to test the hypothesis whether participation in cognitive exercise and socializing could ward off the symptoms of the secondary aging or not. Twenty community dwellers in the northeastern Japan participated in a group session for recollection of autobiographical narrative for 10 weeks. There were no any significant differences in quality of life compared to the control group. The experimental group performed better in paired associates and recalled them lesser trial in the memory test after the session than before, however.
Email: Aya Hosokawa, hosokawa@ncgg.go.jp

CONSCIOUSNESS

(4111)

Mind-Wandering About Stimuli Past: Assessing the Characteristics of Recent and Remote Stimulus-Dependent Thoughts. DAVID MAILLET, PAUL SELI and DANIEL L. SCHACTER, *Harvard University* — Previous research supports a distinction between ongoing thoughts that are stimulus-dependent (SDT; triggered by task stimuli) and stimulus-independent (SIT; not triggered by and unrelated to task stimuli). One of our previous experiments indicated that participants frequently exhibit SDTs that, instead of being triggered by the directly preceding stimulus (1-back SDT), were triggered by stimuli that occurred 2 or more stimuli ago (n-back SDT). It is an open question whether n-back SDTs are more similar to 1-back SDTs (because both are triggered by task stimuli) or to SITs (because both are unrelated to current or very recent environmental input). We measured the characteristics of these thought types during a go/no-go task involving word stimuli. Preliminary results (n=37) indicate that n-back SDTs and SITs are both more future-oriented compared to 1-back SDTs. SITs were also rated as more relevant to everyday concerns compared to 1-back SDTs, whereas n-back SDTs had intermediate values.
Email: David Maillet, davidmaillet@gmail.com

(4112)

Introspective Evidence for Mind Wandering. JAMES FARLEY and PETER DIXON, *University of Alberta* — Mind wandering research relies extensively on introspective judgements of one's mental state, yet there is little evidence for how such judgements are made. We developed a paradigm to collect descriptive data related to how these judgements are produced. Subjects performed a dual-task which involved reading stories for comprehension while simultaneously engaging in a letter-detection task. They were interrupted periodically to report their level of task focus. After each report, subjects also used an inventory to identify the sources of information they considered in making their judgement. Analyses indicated two distinct groups of subjects, each using different sources of information, only one of which showed a clear relationship

between reported mental state and task performance. This variability has implications for the reliability and validity of self report as a tool for studying mind wandering.
Email: James Farley, jamesdfarley@gmail.com

(4113)

Implicit Learning of Locations and Identities in Repeated Visual Search - A Developmental Study. YINGYING YANG, XUYAN TANG, YINGNAN XIANG and XIAOQI MA, *Sun Yat-sen University* — We investigated age-related differences in the incidental learning of location and identity information in a repeated search paradigm. In the learning phase, the locations of the targets were consistently associated with both the identities and the locations of the distracters. In the test phase, the mapping between the distracters and the target was altered. All age groups: 6-7 year olds, 9-10 year olds, and adults showed significant learning to the displays where both the identities and locations of the distracters predicted the target. When only the locations of the distracters were predictive, adults showed significant learning, 9-10 year olds showed marginally significant learning and 6-7 year olds showed no learning effects. When only the identities of the distracters were predictive, none of the groups showed significant learning. This study suggested that the ability to implicitly extract location information from the context increases from childhood through early adulthood.
Email: Yingying Yang, yangyy35@mail.sysu.edu.cn

(4114)

Narrowing the Wandering Mind: The Impact of an Affect Manipulation on Working Memory Task Performance and Number of Mind Wandering Topics. MATTHEW S. WELHAF, AUDREY V.B. HOOD and JONATHAN B. BANKS, *Nova Southeastern University* — Prior research has consistently demonstrated a negative impact of negative affect on working memory (WM; Brose, Schmiedek, Lövdén, & Lindenberger, 2012). The impact of positive affect on WM has been less consistent (Dreisbach & Goschke, 2004; Mitchell & Phillips, 2007). The current study examined the impact of a writing task, designed to induce positive or negative affect, on WM task performance and mind wandering. Decreases in positive affect over the session predicted decreased WM task performance. Further, changes in positive affect were negatively related to changes in the number of mind wandering topics experienced during the WM task, but not overall rates of mind wandering. The frequency of positive emotion words in the writing task differentially predicted WM task performance, by condition. These findings suggest that positive affect is related to increases in WM performance and decreases in the number of mind wandering topics individuals' experience.
Email: Jonathan B Banks, jonathan.banks@nova.edu

(4115)

Generating Predictions Non-Consciously: Evidence From Invisible Motion With and Without Obstacles. ARIEL GOLDSTEIN, IDO RIVLIN and RAN HASSIN, *Hebrew University* (Sponsored by Ram Frost) — Predicting the future is essential for organisms like *Homo sapiens*, who live in a dynamic and ever-changing world. Previous research has established that conscious stimuli can lead to non-conscious predictions. Yet, it also suggests that conscious awareness of stimuli is a necessary condition for using them in predictions. We use subliminal movement – with and without obstacles – to examine predictions from subliminal stimuli. In four experiments, a moving object was masked with continuous flash suppression. 250 milliseconds after the object had disappeared, a conscious probe appeared in a location that was either consistent with the subliminal movement or not. In the first three experiments the movement was linear, and non-conscious predictions were based on both direction and speed of movement. In Experiment 4, we presented a complicated environment, the moving object collided with an obstacle. According to the defection rule the consistent prediction is orthogonal to the direction of the moving object. Response times revealed predictions on the deflection route. We thus conclude that humans can use dynamic subliminal information to generate active predictions about the future.
Email: Ariel Goldstein, ariel.goldstien@gmail.com

COGNITIVE CONTROL III

(4116)

Dynamic Adjustments of Attentional Control in Healthy Aging. ANDREW J. ASCHENBRENNER and DAVID A. BALOTA, *Washington University in St. Louis* — Interference effects in standard attentional control tasks are smaller when the previous trial was incongruent relative to when it was congruent, a phenomenon known as the congruency sequence effect (CSE). This is interpreted as reflecting a dynamic adjustment in attentional control processes. Surprisingly, this effect increases with healthy aging in standard Stroop paradigms, which is inconsistent with the notion of age-related declines in flexible adjustments of control. The generality of this finding was examined by measuring the CSE in younger and older adults in 3 distinct attentional control tasks. Results showed larger CSEs with age in the Stroop task but smaller in Simon and flanker paradigms. This pattern was replicated when participants were placed under a speeded response deadline. A final experiment indicated the CSE was additive with other processes known to modulate control, namely the item-specific proportion congruency effect, suggesting that the CSE is independent of item-specific congruency effects.
Email: Andrew Aschenbrenner, a.aschenbrenner@wustl.edu

(4117)

Transfer of Incompatible Spatial Mapping to Vertical Simon Task Is Not Enhanced by Orientation of Response Keys in the Frontal Plane. QI ZHONG, AIPING XIONG and ROBERT W. PROCTOR, *Purdue University*, KIM-PHUONG L. VU, *California State University Long Beach* — Conde et al. (2015) reported that the vertical Simon effect can be modulated by 100 prior practice-trials with an incompatible mapping of vertical-oriented stimuli and responses, contrary to a study by Vu (2007). They proposed that this difference was due to their response device being oriented in the frontal plane compared to Vu's device being oriented in the transverse plane. We conducted two experiments, one between-subjects and one within-subjects,

in which participants performed with a numeric keypad held upright in the frontal plane or horizontally in the transverse plane. In a practice session top and bottom stimulus locations were mapped incompatibly to top and bottom responses on the keypad ("2" and "8" keys, pressed with the thumbs). The same keypad orientation was used for a subsequent Simon task. The Simon effect was small for both keypad orientations, tending to be larger when the keypad was oriented in the frontal plane.
Email: Kim-Phuong Vu, kvu8@csulb.edu

(4118)

Coordinating Temporal Deadlines Takes "Space": On the Selective Effects of Metric Spatial Processing on Multitasking. VEIT KUBIK, *Stockholm University*, FABIO DEL MISSIER, *University of Trieste*, IVO TODOROV and TIMO MÄNTYLÄ, *Stockholm University* — Monitoring and coordinating multiple deadlines is ubiquitous in everyday life. One way to offload these temporal demands might be to represent future deadlines as a pattern of spatial relations. To test this spatiotemporal hypothesis, we investigated whether multitasking reflects also coordinate (vs. categorical) relational processing. Participants underwent two multitasking sessions (primary task), with concurrent demands of coordinate versus categorical spatial processing (secondary task). We observed that multitasking impairs concurrent coordinate, rather than categorical, spatial processing. In Experiment 1, coordinate-task performance was selectively impaired, while multitasking performance was equal under both spatial load conditions. When emphasizing equal (primary/secondary) task-importance in Experiment 2, multitasking performance was selectively decreased in the coordinate-load condition. Thus, the results of this study suggest that effective multitasking may partly reflect coordinate-relational processing.
Email: veit.kubik@psychology.su.se, veit.kubik@psychology.su.se

(4119)

Neural Mechanisms of Bilingual and Monolingual Cognitive Control: Evidence From the Shape-Color and Simon Tasks. KELLY A. VAUGHN, BRANDIN A. MUNSON and ARTURO E. HERNANDEZ, *University of Houston* — Does the bilingual brain handle executive function tasks differently than the monolingual brain? In the current study, 48 Spanish-English bilingual and 40 English monolingual young adults completed the shape-color switching task and the Simon task in the fMRI scanner. Cross-group differences in neural activity were computed while controlling for SES and English proficiency. In both the shape-color task and the Simon task, there was an interaction between language group and condition. For the shape-color task, more activity was observed for the switch compared to non-switch condition in the monolingual group only. For the Simon task, bilinguals demonstrate more activity for the congruent and neutral condition than the incongruent condition, and no differences across conditions were observed for the monolinguals. Behaviorally, the bilinguals responded more slowly to each task than monolinguals. Together, these results suggest that bilingualism may be associated with different neural and cognitive mechanisms involved in executive function tasks.
Email: Kelly Vaughn, kavaughn3@uh.edu

(4120)

Contributions of Selection & Executive Function to Semantic Verbal Fluency. HILARY J. TRAUT, MARIE T. BANICH and YUKO MUNAKATA, *University of Colorado, Boulder* — During semantic verbal fluency (SVF) tasks, participants are instructed to name as many exemplars as possible from a category prompt (e.g., animals) within 60 seconds. While this task predicts multiple real-world and clinical outcomes, the processes that contribute to successful SVF performance are not well understood. Prior studies suggest a relationship between SVF and working memory capacity but have not tested relationships between SVF and selection abilities or other potentially relevant executive functions. We utilized an individual differences approach to investigate contributions of selection and established executive function components (switching, updating, & inhibition) to SVF performance. We hypothesized that SVF taps both selection abilities, as individuals must activate multiple responses and resolve competition among them to efficiently name items, as well as executive function abilities, as individuals must balance multiple sub-task goals to maximize performance. We found that performance on SVF correlated with better selection abilities but not with executive functions.
Email: Hilary J. Traut, Hilary.Traut@colorado.edu

(4121)

High-Definition Brain Stimulation Influences Comprehension and Production Abilities in the Same Individuals. ERIKA K. HUSSEY, *University of Illinois at Urbana-Champaign*, NINA S. HSU, *University of Maryland*, NATHAN WARD, *Tufts University*, ARTHUR F. KRAMER and KIEL CHRISTIANSON, *University of Illinois at Urbana-Champaign* — Domain-general cognitive control procedures may facilitate the resolution of conflicting information on distinct language processes (e.g., revising initial parsing commitments during comprehension, word selection during production). Separate work suggests that anodal transcranial direct current stimulation (tDCS) over left lateral prefrontal regions (PFC) temporarily boosts these cognitive control abilities. We tested whether high-definition (4x1) tDCS over left lateral PFC had discriminate effects on eye-movements during picture naming and sentence comprehension when cognitive control demands were elevated. Compared to the sham group, the anodal group (1) launched fewer fixations on low-agreement pictures, and (2) spent more time reading and launched more fixations on ambiguous sentences. Interestingly, the anodal group showed a strong positive relationship between ambiguous sentence reading time and naming time on low-agreement pictures. This profile of results suggests that targeting cognitive control with brain stimulation may selectively improve performance within the same individuals across language measures with elevated conflict-control demands.
Email: Erika Hussey, erikahussey@gmail.com

(4122)

Consolidation and Refreshing in Working Memory. SÉBASTIEN DE SCHRIJVER and PIERRE BARROUILLET, *University of Geneva* — A recent study showed that the time available to consolidate working memory traces before concurrent processing has a beneficial effect on recall performance (Bayliss, Bogdanovs, and Jarrold, 2015). The present study compared the relative benefit of free time available either before or after concurrent activities. Participants studied lists of consonants for further serial recall, each consonant being followed by 4 digits successively displayed on screen for 800 ms for parity judgment. In each inter-letter interval, a total free time of 3000 ms was given either before the first digit (consolidation), distributed after the digits (i.e., 4 periods of 750 ms each – distributed refreshing), or massed after the last digit (massed refreshing). Results revealed that consolidation was more beneficial than both refreshing conditions, even under articulatory suppression or when the number of distractors is increased (8 instead of 4), providing strong evidence for a consolidation process in working memory.
Email: Sebastien.DeSchrijver@unige.ch

(4123)

Theta-Event Related Synchrony (ERS) as an Index of Outer-Loop Control During Typing: Neural Evidence Supporting the Two-Loop Theory of Typing. LAWRENCE P. BEHMER JR. and MATTHEW J. C. CRUMP, *Brooklyn College of the City University of New York* — Skilled typists accurately type 4-5 letters per second, yet have poor declarative memory of key locations. This suggests typing may be controlled by two hierarchically nested control loops that are informationally encapsulated from one another. We present behavioral and EEG [frontal midline theta-event related synchrony (ERS)] evidence that examines the development of hierarchical control across trials. Participants typed a series of 7-letter words, ten times in a row, on a QWERTY keyboard and a keyboard where letter mappings had been jumbled. We found that typists were slower and showed increased theta-ERS for jumbled early compared to jumbled late, QWERTY early, and QWERTY late trials. Although typing speeds improved for jumbled late trials, theta-ERS was still greater than baseline. These findings suggest that theta-ERS may index levels of outer-loop control during typing, and even though inner loop control was rapidly established when typing on the jumbled keyboard, outer-loop engagement remained robust.
Email: Lawrence Behmer Jr., lawrencebehmer@gmail.com

(4124)

Effects of Practice on the Temporal Distribution of Visual Attention in a Rapid Serial Visual Presentation Task. BO YOUN PARK, *Korea University*, MATTHEW JUNKER, *Indiana State University*, YANG SEOK CHO, *Korea University*, JACQUELINE C. SHIN, *Indiana State University* — How does exposure to temporal patterns influence the way attention is distributed over time? In a single target rapid serial visual presentation (RSVP) task, the target was presented consistently at two RSVP positions during training blocks and at two additional positions during transfer blocks. The amount of training with the two consistent positions was also varied; participants practiced the RSVP task over 1, 2, or 3 consecutive days before starting the transfer blocks. Finally, explicit knowledge for the target positions presented during the training and transfer phases was assessed through a questionnaire that followed the transfer phase. The results will be described with respect to the shape of the attentional distribution over the course of an RSVP trial as indicated by target identification rates at different positions during transfer. We will also discuss how this distribution changed depending on the amount of training and degree of explicit temporal knowledge.
Email: Jacqueline Shin, jacqueline.shin@indstate.edu

(4125)

The Role of Individual Differences in the Experience of Subjective Workload During Multitasking. KYLE BERNHARDT, AUSTIN JANZEN, TAYLOR BAUMLER, KATHERINE MOFFETT and RIC FERRARO, *University of North Dakota* — The evaluation of subjective cognitive workload during operational settings, such as those experienced by pilots and air traffic controllers, provides useful insight to human performance and ergonomic design. The current study examined relationships between subjective workload, multitasking performance, and individual differences (IDs) in cognitive abilities. Participants (N=74) were administered a neuropsychological battery to measure IDs in cognitive abilities and then performed the Multi-Attribute Task Battery-II (MATB) at varying workload conditions. Subjective workload was measured with the NASA-TLX after the MATB test. Results indicated the frustration subscale of the NASA-TLX negatively correlated with MATB performance (r=-.24 to -.29, p<.05). Furthermore, those that scored higher on measures of delayed memory and global neuropsychological functioning (r=-.29 and r=-.23 respectively, p<.05) generally experienced less frustration. Certain IDs may act as a buffer against the experience of subjective workload. Therefore, it is important to consider IDs when designing complex operational systems.
Email: Kyle Bernhardt, kyle.bernhardt@und.edu

(4126)

Individual Differences in Fidgeting and the Link Between State Boredom and Spontaneous Movement During Lectures. BLAIRE DUBE and ANGELA CHEN, *University of Guelph*, JOHN D. EASTWOOD, *York University*, MARK J. FENSKE, *University of Guelph* — Anecdotal reports suggest that some people tend to fidget more than others, especially when they're bored. Although fidgeting and boredom have been shown to be related to inattention in the context of University lectures, for example, it is unclear the extent to which boredom itself contributes to such spontaneous movements. Here we used lecture videos in a boredom-induction procedure while participants sat on a Wii balance board that measured the frequency and intensity of participants' spontaneous movements. Our results confirmed that there are indeed large individual differences in fidgeting and lecture retention, and that there is a clear relation between boredom and fidgeting in individuals with large overall fidget scores. Interestingly, increases in state boredom predicted movement intensity in

these individuals, but not movement frequency. These results highlight the necessity of examining different fidget *types* to uncover circumstances under which movement may be functionally related to boredom and learning.
Email: Blaire Dube, bdube@uoguelph.ca

(4127)

Probing the Stimulus and Response Specificity of Inhibition Induced Forgetting. KALEB KINDER, CAGLAR TAS and AARON T. BUSS, *University of Tennessee - Knoxville* — The ability to remember, inhibit, and switch tasks are closely-related cognitive processes, but the interactions between them are largely uncovered. One such interaction in the context of a go/no-go task has been termed inhibition-induced forgetting: Participants remember items to which they execute a response better than stimuli to which they inhibit the execution of a response. This effect has been explained through competition for common neural resources between memory encoding and response inhibition (Chiu & Egner, 2015). Alternatively, this effect could be driven at the level of stimulus categories: Participants may implicitly bias encoding of stimulus categories followed by a response and inhibit those associated without a response. To compare these two hypotheses, we first replicated (Experiment 1), then modified the original design by swapping the category of stimuli associated with go and no-go responses halfway through the task (Experiment 2). Memory was better for go stimuli in both the pre and post-switch phase. This suggests that the influence of inhibition on memory is highly specific to the response being made and not the result of categorical suppression or interference.
Email: Kaleb Kinder, kkinder5@vols.utk.edu

WORKING MEMORY III

(4128)

Attention Control Is Necessary but Insufficient for Insight. CHARLES A. VAN STOCKUM, JR. and MARCI S. DECARO, *University of Louisville* — Insight problems trigger a faulty initial problem representation, based on prior experience with similar problems. Previous research has demonstrated that different working memory capacity (WMC) mechanisms predict insight problem-solving accuracy in opposite directions. Secondary memory hinders insight, likely by facilitating retrieval of information consistent with the initial representation. Primary memory improves insight, likely by facilitating disengagement from no-longer-relevant information. We investigated whether attention control, important for initial problem representation, moderates these effects. Participants completed matchstick arithmetic insight problems and three component measures of WMC. For individuals with higher attention control, primary memory positively predicted, and secondary memory negatively predicted, insight problem-solving accuracy. For individuals with lower attention control, the relation between primary memory and insight was reversed, and secondary memory no longer predicted insight. These findings suggest that attention control acts in concert with primary and secondary memory to influence the tendency to "think outside the box".
Email: Charles A. Van Stockum, Jr., charles.vanstockum@louisville.edu

(4129)

Fluid Intelligence as a Predictor of Memory Updating. ASHLEY NESPODZANY, *Arizona State University* and ZACH SHIPSTEAD — Shipstead, Harrison, and Engle (2016) recently proposed that working memory capacity is defined by the ability to maintain relevant information, while fluid intelligence is defined by the ability to disengage from outdated information. We tested this theory using an AX CPT task in which participants either maintained task instructions (maintenance trials) or changed task instruction (updating trials) on a trial-by-trial basis. Consistent with the predictions of Shipstead et al., it was found that working memory capacity was the strongest predictor of accuracy on maintenance trials. Conversely, fluid intelligence predicted accuracy on trials which required updating of instructions. That is, fluid intelligence predicted the extent of interruptions in accuracy on trials that required updating of task instructions. We argue that this ability to disengage from outdated information accounts for the ability of high fluid intelligence individuals to find solutions to novel problems.
Email: Zach Shipstead, zshipstead@gmail.com

(4130)

Affective Valence and the Manipulation of Information in Working Memory. ALESSANDRA SOLBERG, CORY POTTS, LISA M. STEVENSON, ALYSSA KUSTENBAUDER and RICHARD CARLSON, *Pennsylvania State University* — Does affective valence influence the manipulation of information in working memory? Little is known about this question, though much research addresses the effect of valence on attention and cognitive control. We adapted the working memory updating paradigm developed by Ecker, Lewandowsky, and Oberauer (2014) to examine this question. Participants in several experiments retained and updating working memory loads consisting of words varying in affective valence. When valence was consistently associated with particular serial positions, we found no influence of affective valence on either removal or encoding of words. However, when the valence associated with a serial position could vary from one updating step to the next, we found effects of valence that interacted with serial position and with the interval between an updating cue and the appearance of an encoding target. We discuss the relation of these results to recent findings on the role of affect in attention and control.
Email: Lisa Stevenson, lms152@psu.edu

(4131)

Normal Aging Affects Sub-Process Dominance in VSWM. RUIZHI DAI, AYANNA K. THOMAS and HOLLY A. TAYLOR, *Tufts University* — Research suggests that parallel processing of spatial and identity information in visuo-spatial working memory (VSWM) may differ with age. Although processed in

parallel, age may be related to the dominance of one process over the other. The present study examined the relationship between age and process dominance. In two experiments, younger and older adults learned 5x5 grids containing five objects. Spatial and semantic relationships were manipulated within grids; grids were spatially organized or unorganized, and semantically associated or unassociated. Tests then assessed identity, spatial, or combined identity and spatial memory. In Experiment 1, trials types (identity, spatial, or combined) were randomized. In Experiment 2, trials were blocked by question type. We found that younger and older adults benefited from grid and block organization. However, contrary to predictions, these organizations facilitated age-related dominant as opposed to non-dominant processes.
Email: Ruizhi Dai, ruizhi.dai@tufts.edu

(4132)

Neural Response to Varying Working Memory Demand in Young and Older Adults: Evidence for CRUNCH. KATHERINE A. COOKE, ALEXANDRU D. IORDAN, KYLE D. MOORED and BENJAMIN KATZ, *University of Michigan*, MARTIN BUSCHKUEHL, *MIND Research Institute*, SUSANNE M. JAEGGI, *University of California - Irvine*, THAD A. POLK, SCOTT J. PELTIER, JOHN JONIDES and PATRICIA A. REUTER-LORENZ, *University of Michigan* — The Compensation Related Utilization of Neural Circuits Hypothesis (CRUNCH) assumes that both young and older adults can recruit additional neural resources in response to increasing task demands, and that such recruitment declines once demands exceed capacity. It also assumes that older adults exhibit neural recruitment at lower working memory (WM) loads than younger adults. The present study used a verbal WM task with span and supraspan loads to test these hypotheses. As predicted, both young and older adults engaged additional prefrontal regions with increased task demand, but older adults did so at lower WM loads, whether load was defined absolutely or scaled based on hypothesized age-related differences in WM performance. These results confirm earlier engagement of compensatory neural mechanisms in older adults and may provide a target for cognitive interventions aimed at improving neural efficiency throughout the lifespan.
Email: Katherine A. Cooke, kacooke@umich.edu

(4133)

Investigating the Relationship Between Musical Working Memory and Musical Sophistication in Non-Musicians. JUAN A. VENTURA, EMILY M. ELLIOTT, DAVID J. BAKER and DANIEL T. SHANAHAN, *Louisiana State University* — The underlying structure of working memory (WM) has been heavily debated, and some suggest a separate tonal or musical WM component (e.g., Schulze et al., 2011). We assessed musical WM in non-musicians with commonly utilized complex span tasks (Operation and Symmetry) and a novel tonal complex span task, as well as a fluid intelligence measure (Raven's). As research has indicated that long-term memory strategies for musical information might be informed by musical training (e.g. Stoffer, 1985), we used the Goldsmith's Musical Sophistication Index (Gold-MSI) to measure musicality (Müllensiefen et al., 2014). The results suggest that aspects of musicality relate to musical WM based upon positive correlations between performance on the tonal complex span task and subscales of the Gold-MSI, thus implicating an advantage for musically sophisticated non-musicians. Furthermore, all complex span measures correlated to each other and fluid intelligence, providing evidence for a domain-general WM system.
Email: Juan Ventura, jventu4@lsu.edu

(4134)

Replicating the Use of SIMON® as a Working Memory Measure Across Multiple Experimental Contexts. ELISABETH PLORAN, ONDREA CAMPAGNOLO, LIZBETH RAMIREZ and SAMIHA AZGAR, *Hofstra University* — Measuring working memory (WM) as a potential indicator for overall processing ability continues to be a popular, though controversial, method in cognitive psychology. One potential roadblock to widespread replication and expansion of understanding on the role of WM in a variety of tasks and age spans is the fact that many of the WM paradigms are housed in either copyrighted software with high license fees or lab-specific idiosyncratic tasks, limiting adoption and use by a broad audience of researchers. The current study sought to replicate previous findings on the use of the commercially available game SIMON® as a legitimate way to test basic spatial WM skills without the need for specialized software or licenses. The findings suggest that the use of SIMON® as a WM measure is possible and replicable over multiple samples and embedded into different experimental contexts, with significant correlations to more traditional WM paradigms.
Email: Elisabeth Ploran, psyejp@hofstra.edu

(4135)

Individual Differences in the Memory Benefit Associated With Environmental Support for Visuospatial Rehearsal. LINDSEY LILIENTHAL, *Pennsylvania State University, Altoona* — Past research has shown that when participants are given time to rehearse locations, their memory is better when environmental support is present (i.e., when the array of possible locations remains visible). Although this pattern has been replicated numerous times, possible individual differences in the benefit observed with support previously had not been investigated. If support encourages low-span individuals to engage in rehearsal strategies that high-span individuals use naturally, support may benefit low-spans' memory more. Alternatively, if low-spans are less likely to rehearse (or rehearse effectively) even with support present, support may benefit high-spans' memory more. Participants in the present study performed a visuospatial complex span task, as well as four conditions of a visuospatial simple span task, across which both the presence of environmental support and duration of inter-item intervals were manipulated. The results suggest that high-spans benefit more from the presence of support than low-spans, supporting the latter hypothesis.
Email: Lindsey Lilienthal, lcl5115@psu.edu

(4136)

Fractionating Working Memory. DAVID P. KATZ and LEE A. THOMPSON, *Case Western Reserve University* — Widely different tasks have been used interchangeably to measure working memory (WM), yet it remains unclear whether these tasks measure a singular construct (Redick & Lindsey, 2013). Research regarding this issue hasprovided mixed findings. The purpose of this report is to determine if a broad battery of WM tasks reflect a single WM factor. Nine measures reflecting3 common WM paradigms: maintenance & interference (i.e. operation span), maintenance & manipulation (i.e. backwards alphabet span), and updating (i.e. *n*-back) were administered on computers to undergraduate student participants. Some of the measures were created for this study and some were adapted from the literature. Also, 1 out of the 3 WM tasks within each paradigm used spatial stimuli (symmetry span, spatial *n*-back, backwards dot span)Results addressing the reliability and convergent/discriminant validity of these tasks within and across paradigm as well as between spatial and verbal content will be presented.

Email: David Katz, dpk44@case.edu

(4137)

The Interplay of Language and Visual Perception in Working Memory. ALESSANDRA S. SOUZA, *University of Zurich,* ZUZANNA SKÓRA, *Jagiellonian University* — How do perception and language interact to form the representations retained in working memory (WM)? We examined this question by investigating the role of verbal labels in visual WM. Across four experiments, participants retained in memory the continuous color of a set of dots, and later reproduced these colors using a color wheel. During stimulus presentation participants were required to either label the colors (color labeling, CL) or to repeat "bababa" aloud (articulatory suppression, AS), hence prompting or preventing verbal labeling, respectively. We tested four competing hypotheses of the labeling effect: (1) labeling overshadows the visual representation; (2) labeling adds a verbal representation to the visual one; (3) the labels function as a retrieval cue; and (4) labels activate conceptual long-term memory. Collectively, our experiments show that labeling does not overshadow the visual input; it augments it. Our findings are consistent with the hypothesis that labeling activates conceptual representations of the statistics of the labeled category, which jointly with the analogical visual input contribute to performance when visual WM is overtaxed.

Email: Dr. Alessandra Souza, a.souza@psychologie.uzh.ch

(4138)

Retrieval Induced Forgetting Is Only Disrupted by Secondary Tasks Demanding Executive Control. ALMUDENA ORTEGA, PATRICIA E. ROMÁN, CARLOS J. GÓMEZ-ARIZA, and M. TERESA BAJO, *University of Granada* — Neurocognitive and dual-task findings support the view that retrieval-induced forgetting (RIF), the negative aftereffect of selective retrieval, is reliant on executive control capacity. Even though normal RIF is observed in people with deficits in executive control (i.e., elderly) the effect is more easily disrupted by a secondary task in this population rather than in healthy young adults (Ortega et al., 2012), which reinforces the idea that the ability to inhibit interfering memories depends upon availability of cognitive control resources. In the present work we further study this issue by examining the role of the specific nature of the secondary task performed during selective retrieval in overloading memory control in young adults. Specifically, we compared the RIF effect in a control (single-task) group with those found in dual-task groups that varied regarding the nature of the secondary task (working memory updating vs. working memory maintenance) during selective retrieval. Our results showed that dual tasking eliminates RIF only if the secondary task poses demands on executive control (working memory updating), indicating that it is not the mere presence of a secondary task which makes forgetting vanish, but rather the competing demands for executive control.

Email: Almudena Ortega Segura, almudenaortega@ugr.es

(4139)

Mild to Moderate Alcohol Consumption as a Protective Factor Against the Detrimental Effects of Stress on Working Memory Performance. HALEY PRITCHARD and JENNIFER K. ROTH, *Carlow University* — To examine the impact of lifestyle factors on working memory, 32 participants performed a 40 minute computer-based memory task then a lifestyle factor questionnaire. Each participant was asked to report the number of drinks consumed within the week prior to the experiment, and the high stressors in their lives. Drinkers and abstainers were compared to see if current alcohol consumption modulated the relationship between working memory maintenance performance and life stressors. Correlations were calculated between the number of high stressors and performance on the working memory task at 13.5-second working memory delays. Results showed a significant, positive correlation between number of stressors and errors on a working memory task for abstainers ($r = .492$, $n = 15$, $p<.05$) for long working memory delays while drinkers showed no significant correlation ($r = .096$, $n = 17$, $p = .36$). Results show that moderate alcohol consumption may have protective factors on working memory maintenance.

Email: Jennifer Roth, jkroth@carlow.edu

(4140)

Working Memory Spatial Span Tests and Phonological Similarity Effects. NICOLE J. BIES-HERNANDEZ, *Northern Arizona University*, DAVID E. COPELAND and KATHLEEN G. LARSON, *University of Nevada, Las Vegas* — A classic working memory finding is that target items that are phonologically similar tend to produce worse recall performance than dissimilar words (Conrad & Hull, 1964). However, the phonological similarity decrement can be eliminated using articulatory suppression (e.g., Camos, Mora, & Barrouillet, 2013), and phonological similarity facilitation can occur when a meaningful context is used (e.g., Copeland & Radvansky, 2001). Furthermore, Copeland, Bies-Hernandez, & Larson (2014) recently demonstrated phonological enhancement with the operation span and when the reading span consisted of non-words. The present study investigated phonological similarity using span tasks with a different processing component than

previously used (i.e., not mathematics nor words). This was conducted using modified symmetry and picture span tasks based on Foster et al. (2014). As expected, phonological similarity decrement was observed with both of these span tasks. The findings of this study will be discussed in terms of theoretical explanations for phonological similarity effects.
Email: David E. Copeland, Ph.D., David.Copeland@unlv.edu

(4141)

Non-Converging Evidence for a Single-Item Focus of Attention in Working Memory. MARCEL NIKLAUS, LAURA RERKO and KLAUS OBERAUER, *University of Zurich* (Sponsored by Vanessa Loaiza) — The focus of attention can privilege a single representation in working memory. This privilege is thought to result in greater accessibility of the most recently presented item in a Sternberg recognition task as well as improved recognition performance when an item held in memory is retro-cued for an upcoming recognition task. Here we investigated whether these empirical phenomena result from the effects of a single-item focus of attention. We report several experiments that merged the two procedures: We applied the deadline procedure to recognition tasks in which items were presented serially and in some trials a memory item was retro-cued during the retention interval. We found additional accessibility benefits of retro-cueing the most recently presented item, despite the fact that this item should be in the focus of attention already. These findings suggest that recency and retro-cue effects are driven by different mechanisms.
Email: Marcel Niklaus, marcel.niklaus@psychologie.uzh.ch

(4142)

Evidence for an Amodal Separate Order Store in Visual Working Memory: An Update to Baddeley's Working Memory Model. SHRIRADHA GEIGERMAN, ALEJANDRA C. MONTOYA and PAUL VERHAEGHEN, *Georgia Institute of Technology* — Two dominant views address storage of serial order information in visual working memory (VWM). According to the inner scribe view, order information is stored in the spatial store of VWM (Logie & Marchetti, 1991). As per the amodal separate order store view, order information for both verbal and visual stimuli is maintained in an independent order store (Depoorter & Vanderendonck, 2009). In our study, we examined whether the inner scribe view or the amodal separate order store view is supported when college-aged participants are asked to remember object- serial order bindings within a change detection paradigm. Results of our first two experiments supported the independence of object (colored shapes) and location memory (Treisman & Zhang, 2006) within VWM. Building on the results of the first two experiments, the last two experiments examining memory of object-order bindings showed that order memory was independent of both location and object memory in VWM. Our results add further evidence to the amodal separate order store view in working memory. In light of these results, and extant evidence of similar memory effects in visual and verbal order memory (Hurlstone, Hitch, & Baddeley, 2014) as well as susceptibility of order memory to modality-independent secondary tasks (Vandierendonck & Szmalec, 2011), we present a revised version of Baddeley's working memory model (Baddeley, 2000).
Email: Shriradha Geigerman, shriradha@gatech.edu

(4143)

The Genetic Influence on Latent Cognitive Traits of Memory Performance. NATHAN J. EVANS, *University of Newcastle*, MARK STEYVERS, *University of California - Irvine*, SCOTT D. BROWN, *University of Newcastle* — The study of trait heritability has provided a way to understand the contribution of genetics to different parts of the human phenotype. However, research into traits that govern cognition has been limited, with previous research focusing on only directly observable, surface, variables such as reaction time. These analyses are limited in what they can reveal about underlying cognitive traits. Our study aims to better assess the heritability of memory performance, looking at the performance differences between 173 pairs of monozygotic and dizygotic twins on a 2-back task. To improve upon previous methods we used a mathematical model of decision-making, the linear ballistic accumulator, which allows differential investigation of heritability in terms of latent cognitive processes, such as processing speed, motor speed, and caution. Our findings provide a more in-depth understanding of the heritability of cognitive traits.
Email: Nathan Evans, nathan.j.evans@uon.edu.au

(4144)

Preference for Chinese Object Relative Clause Processing in Self-Paced Reading. KUN-YU XU and DENISE WU, *National Central University* — Although most of previous research has indicated that subject relative clauses (SRCs) are easier to process than object relative clauses (ORCs), whether SRC preference is universal is still under debate. Several reports from Chinese have also provided conflicting results. We conducted self-paced reading experiments with natural and easy-to-comprehend sentences to investigate this issue further. Participants' working memory (WM) indexed by digit span and symmetry span was also measured. Data from 30 college students who were native Mandarin speakers clearly demonstrated an ORC preference both in online reading time across different frames of sentences and in comprehension of the sentences. Such results were consistent with the theories that postulate contribution of WM to sentence comprehension. However, independent measurements of participants' WM general to the verbal and non-verbal domains did not correlate with the ORC advantage. Specific WM mechanisms for syntax was hypothesized to account for the present findings.
Email: Kun-Yu, Xu, kunyu.xu@gmail.com

PSYCHOLINGUISTICS III

(4145)

Do Morpho-Semantic Effects Depend on the Task Demands? Evidence From Different Tasks and Different Speakers. KARLA ORIHUELA and HÉLÈNE GIRAUDO, *University of Toulouse* — According to the supralexical hypothesis (Giraudo & Voga, 2014) words are accessed via the activation

of their whole word forms; while for the decompositional approach, morphologically complex words are systematically decomposed and accessed through their stem (Taft, 1994). The later hypothesis is mainly based on studies that showed 'surface' morphological priming effects (i.e., corner-corn priming). However, recent data suggest that this effect could strongly depend on the task demands (e.g., Duñabeitia, Kinoshita, Carreiras, & Norris, 2011) and the measured depend variable (e.g., Marelli, Amenta, Morone, & Crepaldi, 2013). A series of masked priming experiments were carried out (in L1 English and L2 English with L1 Spanish) comparing two different tasks - lexical decision task (LDT) and semantic judgment - using the following prime-target conditions: 1) Morphologically related (e.g., *hunter-hunt*), 2) Pseudo-derived (e.g., *corner-corn*), 3) Orthographically related (e.g., *brothel-broth*) 4) Unrelated controls. Results aim to differentiate task form lexical effects.
Email: Karla Orihuela, karla.orihuela@univ-tlse2.fr

(4146)

A Beneficial Effect of Orthography on Native Spanish Speakers' Ability to Distinguish Non-Native Phonemic Contrasts. KATHARINE P. MILES, *Brooklyn College*, EVE HIGBY, *Univeristy of California, Riverside*, SEAMUS DONNELLY, *The Australian National University*, ANDREA MONGE and DESIRET NUESI, *Queens College* — This study investigated native Spanish speakers' ability to use orthographic information to distinguish non-native phonemic contrasts and the effects of individual differences in English decoding ability and English proficiency. Twenty native Spanish speakers who learned English after age 12 completed an AXB task, first without orthography presented and then with orthography. Four English contrasts (/v/-/b/, /ð/-/d/, /□/-/i/, /□/-/a/) were placed in different positions (3 for consonants, 2 for vowels) within CVCVC pseudo-word minimal pairs. Results indicate that when the contrast is in the middle position, the presence of orthography has a significant effect for the /ð/-/d/ contrast (p = .02). Also, participants with better English decoding skills (p = .01) and those with lower English proficiency (p = .02) showed a greater benefit of orthography for the /ð/-/d/ contrast.
Email: Katharine Pace Miles, PhD, katiepacemiles@gmail.com

(4147)

The Impact of Perceptual Fluency on the Gender and Sexuality IAT Effect: An ERP Investigation. JOËL D. DICKINSON, JUSTIN A. CHAMBERLAND, PAIGE SMITH, BREEANNA STREICH, JENNIFER GALLANT, and MICHELLE GRAHAM, *Laurentian University* — The impact of perceptual fluency was examined in relation to schema violations during an Implicit Association Test (IAT). More specifically, the current study explored both gender role and sexuality schemas while manipulating fluency with either a white background or a grey background. Response time results indicated that these background manipulations could eliminate the congruency effect typically observed during an IAT. Event-related potential (ERP) activity was also measured during the IAT. As expected, the background manipulations were found to impact earlier ERP components, which are often associated with featural processing. In addition, results suggested that the perceptual fluency manipulation had an impact on later components, such as the N4 and LPP. These findings will be discussed in relation to both perceptual fluency and schema literature.
Email: Joël Dickinson, jdickinson@laurentian.ca

(4148)

The Influence of Orthographic Clustering Coefficient on Visual Word Recognition. CYNTHIA S. Q. SIEW and MICHAEL S. VITEVITCH, *University of Kansas* — The organization of phonological word-forms in the mental lexicon has been shown to influence spoken word recognition (Chan & Vitevitch, 2010). Here the tools of Network Science are used to study the organization of *orthographic* word-forms in the mental lexicon. The influence of clustering coefficient—a Network Science metric that measures the extent to which orthographic neighbors of a word are also neighbors of each other—on visual word processing was investigated. In both speeded naming and visual lexical decision tasks, words with high clustering coefficient were responded to more quickly than words with low clustering coefficient. The results indicate that visual word recognition is influenced by the amount of *connectivity* among *orthographic* neighbors of the target word; a finding that current models of visual word recognition are unable to accommodate. These findings suggest that the structure of the mental lexicon influences lexical access in visual word recognition.
Email: Cynthia S. Q. Siew, cynsiewsq@gmail.com

(4149)

From the Ground Up: Interactions of Visual Word Recognition and Semantic Constraint During Comprehension. NYSSA BULKES and DARREN TANNER, *University of Illinois at Urbana-Champaign* — Reading requires integration of bottom-up (i.e. visual) and top-down (i.e. semantic constraint) information. The more informative a context, the more specific predictions readers make during processing (e.g. Luke & Christianson, 2012). Further, ERP research has shown the sensitivity of the visual system to semantics, where pseudowords supported by context ("ceke", expected "cake") elicit qualitatively different ERPs than pseudowords unsupported by context (e.g. Kim & Lai, 2012). In two ERP studies, we investigated the role of semantic constraint in visual processing, comparing modulations of early visual components (i.e. N170) to targets embedded in strong and neutral semantic constraints. Additionally, we investigated early neural responses to letter position ("ckae") and identity ("cehe") manipulations to study how visual anomalies of varying degrees of mismatch to a target impact predictions. Results importantly extend behavioral work, where we investigate how the level of semantic informativity interacts with the degree to which readers predict visual information.
Email: Nyssa Bulkes, bulkes2@illinois.edu

(4150)

Oh, That's How You Say It! The Competing Roles of Orthography and Others' Utterances. DARCY WHITE, DREW WEATHERHEAD, DEREK BESNER and KATHERINE S. WHITE, *University of Waterloo* — We examined the influence of the orthography, as well as another individual's

pronunciation, of a novel word on performance in an object identification task. Participants were trained on pairings of written novel words and novel objects, and were later presented with the same objects and heard another individual label them (with a regular or irregular pronunciation). At test, each object was paired with both pronunciations of its label (regular and irregular), and with a third unrelated word. Participants had to indicate if the word was the correct label for the object. Participants were faster to accept the regular pronunciation than the irregular pronunciation, if they had previously heard it labelled with the regular pronunciation. However, when it was previously labelled with an irregular pronunciation, there were no significant RT differences. This finding suggests that certain types of information are weighed more strongly when determining the correct pronunciation of a word.
Email: Darcy White, d4white@uwaterloo.ca

(4151)

Dissociating the Effects of Phonemic Decoding Ability and Reading Skill on the Time Course of Phonological Coding During Reading. MALLORIE LEINENGER, *Denison University* (Sponsored by Elizabeth Schotter) — There is considerable evidence that readers generate phonological codes during silent reading, however whether this code generation varies as a function of reading skill has been debated. The current study collected language assessment data and recorded eye movements of subjects reading sentences containing correct (i.e., sensible) target words or anomalous words (either phonologically related to the target or orthographically matched controls). Survival analyses of first fixation durations on the phonologically related and orthographic control words were conducted to determine how early each individual reader generated phonological codes. Results revealed that the rapidity with which readers generated phonological codes was not related to general reading skill, but rather to phonemic decoding ability specifically. Furthermore, the rapidity with which a given reader generated phonological codes was more predictive of word identification speed among highly skilled phonemic decoders and readers with lower general reading skill, suggesting that the processes associated with word identification can be adjusted to a given reader's individual set of language skills to maximize the efficiency of word recognition during reading.
Email: Mallorie Leinenger, mal.leinenger@gmail.com

(4152)

Face Cues to Speaker Identity Affect the Neural Correlates of Native- and Foreign-Accented Sentence Comprehension. SARAH GREY, *Fordham University*, ABIGAIL L. COSGROVE and JANET G. VAN HELL, *Pennsylvania State University* — Spoken language provides listeners with information about a speaker's identity (e.g., age, sex, accentedness). In spoken language, foreign-accented speech often constitutes a challenge for language comprehension, especially for listeners with limited experience with the accent (Witteman, Weber, & McQueen, 2013) or who cannot identify it (Grey & Van Hell, under revision). Faces may serve as a visual cue in foreign-accented speech contexts (e.g., McGowan, 2015) to aid comprehension. In an ERP study, we tested monolinguals listening to foreign-accented and native-accented speakers who made semantic or grammatical errors in sentences or produced correct sentences. Critically, we provided listeners with face cues to speaker identity to test the effects of this cue on comprehension. The results show that face cues have different impacts on native and foreign-accented speech processing, particularly for grammar, and they clarify the effects of extra-linguistic information about speaker identity on the neural correlates of sentence comprehension.
Email: Sarah Grey, sgrey4@fordham.edu

(4153)

Orthographic Intrusion During Spoken Word Recognition: Evidence From ERPs. AMY S. DESROCHES, *The University of Winnipeg*, JANE M. LAWRENCE-DEWAR, *Thunder Bay Regional Research Institute*, KIERA O'NEIL, *Dalhousie University* — We used event related potentials [ERPs] to investigate orthographic intrusion during spoken word recognition. Participants performed a picture-word matching task where they saw a picture and then heard a spoken word that matched (e.g., BALL-"ball") or mismatched the picture in one of three ways (e.g., orthographically similar (O+) rhyme: BALL-"wall", orthographically dissimilar (O-) rhyme: BALL-"doll", or unrelated: BALL-"suit"). As we have seen in our previous research, N400 responses were larger to unrelated mismatch conditions compared to match, and they were reduced for both rhyme mismatches compared to match. Critically, this component also differed between the rhyme mismatch conditions, such that O+ rhymes showed a greater reduction in the N400. This finding indicates that orthographic similarity influences spoken word recognition, even when explicit judgments about phonology, orthography or semantics are not required. Our results have implications for understanding the interactions between representational systems during language processing.
Email: Amy S. Desroches, a.desroches@uwinnipeg.ca

(4154)

Lexical Access of Words That Cross Speech Streams. ROCHELLE S. NEWMAN, *University of Maryland* — We recently found that listeners' lexical access "crossed" talker boundaries (Newman, 2016): after hearing a male talker say "my" and a female say "great", participants showed a speeded lexical-decision response to the visual item "geese" (related to "migrate"). This effect was equally large when the two monosyllabic words were spoken by different-gendered talkers as when produced by a single talker, suggesting both that acoustic cues indicating multiple talkers are insufficient to disrupt lexical access, and that activation of lexical representations is not limited to those occurring within a single-talker stream. At Psychonomics, we will discuss these findings, and in-progress follow-up work looking at whether this cross-talker word activation is limited to a single continuing stream of speech: in this new study, listeners hear simultaneously 2 different 2-word sequences, e.g., Male: My – Floor; Female: Bag – Great. We again explore cross-talker activation for geese/migrate, which crosses two established streams.
Email: Rochelle Newman, rnewman1@umd.edu

(4155)

Individual Differences in Signed Word Learning Among Hearing Adults. DAVID MARTINEZ, *Georgia Institute of Technology* (Sponsored by Paul Verhaeghen) — Tasks of short-term memory (STM)—such as digit span and non-word repetition—are positively correlated with word learning in foreign languages. The primary aim of the present study was to identify analogous predictors of word learning for signed languages. A secondary aim was to develop and validate an automated movement-based STM task. Hearing, non-signing adults completed visual-, spatial-, and movement-based STM tasks, as well as a sign-word paired associate learning task. Pearson and semi-partial correlations were derived and a hierarchical regression analysis was conducted with the paired-associate task as the outcome variable. The final regression model consisted of two tasks: one visual and the other, developed in-house, movement based. Including a spatial task did not significantly improve model fit. These results have both practical and theoretical implications for language aptitude and STM testing and research.
Email: David Martinez, DMartinez35@gatech.edu

(4156)

The Role of In-the-Moment Processing in Cross-Situational Word Learning. TANJA C. ROEMBKE and BOB MCMURRAY, *University of Iowa* (Sponsored by Teresa Treat) — People are highly skilled at learning the meaning of words, using statistical co-occurrence across situations (Yu & Smith, 2007). However, word learning may also be influenced by a number of in-the-moment factors like inference, strategies and working memory (e.g. Dautriche & Chemla, 2014; Roembke & McMurray, 2016; Trueswell et al., 2013). This is consistent with a hybrid account in which associative mechanisms track long-term statistics, but interact with real-time processes on any given trial (McMurray, Horst, & Samuelson, 2012). Experiment 1 (N=87) tests this hybrid model by employing a dual-task paradigm to reduce resources for in-the-moment processing during learning. Dual-task conditions reduced the influence of inferential processes (p<.001), but did not influence the accumulation of long-term statistics (p=0.152), supporting a hybrid account. Experiment 2 (N=95) investigated individual differences in statistical word learning, showing relationships to measures of inhibition, working memory, as well as lexical competition.
Email: Tanja C Roembke, tanja-roembke@uiowa.edu

(4157)

Linguistic Learning and Metacognition: Do We Learn Differently, and Do We Know It? REBECCA E. KNOPH, ERIN M. BUCHANAN and BOGDAN KOSTIC, *Missouri State University* — Learning a language distinct from one's native language may be perceived as an easier task due to less interference from one's native language. However, prior research shows that people begin learning a second language with the same linguistic parameters at the first language (White, 2007), which could potentially cause interference with a dissimilar language. Therefore, English-speakers may be able to use positive transfer to their advantage to learn a more closely-related language (such as Swedish) compared to a more distantly-related language (such as Italian). In the current experiment English-speaking participants received 20-minute lessons on both Swedish and Italian and also rated their judgments of learning (JOLs) throughout the study. Results showed that participants scored significantly better in Swedish, but also had a complex interaction between the difficulty of question, language, and their JOLs, in which JOLs were more accurate for more difficult items.
Email: Rebecca Knoph, allinder115@live.missouristate.edu

(4158)

Effects of Different Formats of Multimedia Design on Second Language Vocabulary Acquisition as Moderated by Individual Differences. MICHAL BALASS and CATHERINE ANTALEK, *Towson University* — Cognitive load theory asserts that successful learning occurs when the required cognitive load does not exceed available mental resources (Sweller, 1994). Adult learners, unfamiliar with the Spanish language, learned 90 Spanish words and their translations in three conditions differing in multimedia presentation and cognitive load; verbal (information presented auditorily), visual (information presented in text), iconic (information presented in text along with an image). Learners' scores on a Spanish to English translation task indicated poorest recall for words learned in the verbal condition, and no significant differences between visual and iconic conditions. Correlations with individual differences measures showed that individuals with higher working memory performed better on learning conditions with higher cognitive load than individuals with low working memory capacity. Results suggest second language vocabulary learning may be better facilitated using visual formats of multimedia presentation, and that working memory may play a role in learning conditions requiring higher cognitive load.
Email: Michal Balass, mbalass@towson.edu

(4159)

The Role of Age of Acquisition and List Type on Free Recall. ILHAN RAMAN, *Middlesex University*, SIMAY IKIER, *Yeditepe University*, EVREN RAMAN, *Brunel University* — While the effect of Age of Acquisition (AoA) in chronometric lexical tasks is well documented with consistent evidence indicating that early acquired words are processed faster and more accurately than late acquired words, evidence is nevertheless inconsistent where AoA and memory are concerned (see Johnston & Barry, 2006). In free recall tasks late items are overall better remembered than early items (Dewhurst, Hitch & Barry, 1998). Additionally, word frequency and list type have been reported to influence memory where the advantage of recall reported for high frequency words in pure lists disappears when the same items are presented in mixed lists in English (Dewhurst, Brandt & Sharp, 2004). The objective was to partially replicate Dewhurst and colleagues' work in Turkish to shed light on this phenomenon especially from an orthographic transparency perspective. Previously list type was also found to influence word naming in Turkish (Raman, Baluch & Besner, 2004). In the first phase of the study, participants were assigned to either a picture (N=40) or a word condition (N=40) in which stimuli were presented in either a mixed or a pure list. Following a distracter

task, participants were asked to recall as many pictures or words as they could remember from the first phase. The findings lend partial support to those in English and the implications are discussed within the context of current theoretical frameworks.
Email: Ilhan Raman, i.raman@mdx.ac.uk

(4160)

More Moses Illusion in Foreign Language Context. ECE YALLAK, *Boğaziçi University*, ÜMIT AKIRMAK, *İstanbul Bilgi University*, ELENA GUERZONI and ESRA MUNGAN, *Boğaziçi University* — Previous research on the "Moses Illusion" has shown that people sometimes fail to detect the distortion in a question such as "How many animals of each kind did Moses take on the ark?" and respond as if "Noah" was not replaced by "Moses". The present study aimed to examine the effect of processing fluency on this illusion. There are conflicting findings as to whether processing disfluency increases (e.g., Geipel, Hadjichristidis, & Surian, 2015) or decreases (e.g., Song & Schwarz, 2008) the illusion rate. We attempted to resolve this inconsistency by using a within-subjects design and by increasing the number of questions in the illusion task. Our results showed that distorted questions led to higher illusion rates in the foreign language compared to the native language, supporting Geipel et al.'s finding. Additionally, the rate of correct responses in undistorted questions was higher in the native than in the foreign language, supporting Song and Schwarz's finding. Taken together, these results suggest that disfluency impairs performance in both distorted and undistorted questions. We did not observe any shifts in response bias between questions in either language.
Email: Ece Yallak, eceyallak@gmail.com

SPEECH PERCEPTION II

(4161)

Age, Hearing and the Perceptual Learning of Time-Compressed Speech. MAAYAN MANHEIM, LIMOR LAVIE and KAREN BANAI, *University of Haifa* — Speech perception improves substantially with practice, but the role of perceptual learning (PL) in speech processing remains debated. One hypothesis is that PL serves to rapidly normalize the perception of non-optimal (e.g., accented, rapid) speech. This study was designed to test a facet of this hypothesis, that rapid perceptual learning of degraded speech is weaker in populations with difficulties in speech perception, in this case older adults. Rapid PL was observed in older adults with normal hearing (NH, n=36) and in those with hearing loss (HL, n=18). However, learning was substantially weaker in HL than in NH older adults, and both learned less than normal-hearing young adults (YA, n=49) even when starting performance was equated across groups (Cohen's d = 1.5, 0.7 and 0.4 in the YA, NH and HL groups respectively). Additional training yielded learning in all three groups. Nevertheless, like rapid learning, practice-induced learning and its generalization to untrained tokens were weaker in the two groups of older adults than in the young adults. We suggest that both aging and hearing loss contribute to declines in perceptual adjustments to distorted speech. Further training is not sufficient to offset this decline.
Email: Karen Banai, kbanai@research.haifa.ac.il

(4162)

The Effect of Context Rate and Rhythm on Non-Native Perception. MELISSA M. BAESE-BERK, *University of Oregon*, TUULI H. MORRILL, *George Mason University* — Native listeners use both context speaking rate and rhythm to make predictions about upcoming speech material (Morrill et al., 2014). However, it is unclear whether non-native listeners are also able to leverage these properties of speech in their own perception. Some previous research suggests that non-native listeners are able to use context speaking rate in spoken word segmentation under some conditions (Baese-Berk et al., 2016); however, it is unclear whether they are also able to leverage rhythmic properties of the signal in the same way. This is particularly of interest because rhythmic properties of a language are typically among the most difficult for non-native speakers to acquire in their own productions. In the present study, we ask whether non-native listeners are able to utilize rate and rhythm information in spoken word segmentation, and specifically examine possible interactions between rate and rhythm in non-native perception.
Email: Melissa Baese-Berk, mbaesebe@uoregon.edu

(4163)

Interaction of Cognitive Load, Sentence Predictability, and Speech Degradation in Spoken Word Recognition and Memory. CYNTHIA R. HUNTER, CAYLEE ADAMS and DAVID B. PISONI, *Indiana University* — Whether cognitive load and/or listening effort needed to understand degraded speech differentially affect bottom-up and top-down processes is not well understood. The current project examined effects of sentence context, speech degradation, and cognitive load on the recognition of sentence-final words and on the recall of short (low-load) or long (high-load) sequences of visual digits presented prior to each spoken sentence. In addition to main effects of sentence predictability and spectral degradation, word recognition in both high- and low-predictability sentences was modulated by cognitive load when accuracy was between 35 and 80 percent. Words were identified more accurately under low load than high load. Digit recall was affected by load, speech degradation and sentence predictability. Results indicate that cognitive load affects processes used to identify words in both low- and high-predictability sentences, and that listening effort affects memory for visual digits.
Email: Cynthia R. Hunter, cynthunt@indiana.edu

(4164)

Recognizing Sounds in Sentence Context. SOPHIA UDDIN, SHANNON L.M. HEALD, STEPHEN C. VAN HEDGER, SERENA KLOS and HOWARD C. NUSBAUM, *University of Chicago* — From one theoretic perspective, word recognition is facilitated by sentence context only after initial sound processing occurs. If the mechanisms that mediate the interaction of sentence context and lexical processing are specialized for

language understanding, it could be predicted that the influence of sentence context on word recognition might be different from a more general cognitive system serving to use this contextual information. Stimuli such as environmental sounds can convey clear meaning, yet are not linguistic. We compared the effect of spoken sentence context on word and nonspeech sound recognition. In Experiment 1, sentence context significantly decreased recognition time for nonspeech sounds and spoken words, with a similar effect for both. In Experiment 2, sentence meaning decisions were significantly faster for high-constraint contexts for both nonspeech and speech. These results suggest that linguistic context may aid recognition for nonspeech sounds the same way as it does for words.
Email: Sophia Uddin, sophiauddin@uchicago.edu

(4165)

Learning to Identify Speakers From Kinematic Information. ALEXANDRA JESSE and MICHAEL BARTOLI, *University of Massachusetts Amherst* — Listeners can identify speakers from hearing their voices. Here, we examined whether listeners can also identify speakers from seeing their voices, that is, from seeing the idiosyncratic motion speakers produce during talking. Speakers were video recorded with reflective dots placed on the lower half of their faces. The motion of these dots was tracked to create point-light displays that only showed these moving dots and no longer the speakers' faces. Participants were asked to identify speakers from these sentences. Two or four speakers were presented. Feedback was given during training but not during a subsequent test. Sentences presented at test were either new recordings of the training sentences or entirely new sentences. Participants were able to learn to identify the speakers from kinematic information alone, and were even able to recognize them from new sentences that they had not previously seen them produce. A benefit for old over new materials was only found when learning to recognize two speakers. Listeners establish a representation of the visual voice of speakers.
Email: Alexandra Jesse, ajesse@psych.umass.edu

(4166)

The Learning Signal in Phonetic Category Tuning: Bottom-Up vs. Top-Down Cues. XUJIN ZHANG and LORI L. HOLT, *Carnegie Mellon University* — Listeners use both acoustic and lexical information to inform phonetic categorization. For example, an English stop consonant tends to be perceived as /b/ if it has a shorter VOT, but as /p/ if it has a longer VOT. An acoustically-ambiguous consonant between /b/ and /p/ is perceived more as /b/ before "eef", but more as /p/ before "eace". Both types of cues can be used to flexibly adapt and retune phonetic categorization in response to short-term deviations in the speech signal. This study investigated the effect of acoustic and lexical information on phonetic category tuning by examining adaptation of listeners' reliance on F0 in /b/-/p/ categorization across exposure to an artificial accent involving consonant categories signaled by unambiguous VOT, lexical context, or both. Results across these conditions provide insights into the nature of the learning signal involved in speech category tuning and the relationship of acoustically-driven and lexically-driven phonetic recalibration.
Email: Lori L. Holt, loriholt@cmu.edu

(4167)

The Influence of Vowel Category Distribution on the Perception of Foreign Accent. KIT YING CHAN and MICHAEL D. HALL, *James Madison University* — This study evaluated how perception of foreign accent is influenced by deviation in vowel formant frequencies and the proximity of produced values to adjacent categories. Tokens for each stimulus word (/æ, □, □, □, □/ embedded in /b_d/) were synthesized by altering the mean F1 and F2 based upon native norms in 30-Mel step increments toward the closest and the next-closest vowels until intruding on those categories. If there was not a secondary adjacent vowel, tokens were synthesized in the opposite direction of the primary interfering vowel to test the impact of (lack of) proximity to other vowels. Native English listeners rated stimuli on degree of accentedness and, in a separate task, identified the word. Changes in formant frequencies differentially influenced accentedness ratings across vowels, depending on their proximity to adjacent categories. For /□, □, and □/, accentedness increased only as F1 and F2 values approached the next category. The /□/ tokens in the extreme region of the vowel space were also rated as accented and were often misperceived as other non-proximal vowels. Perceived accentedness increases for unusual vowel productions, and might reflect the fact that those productions intrude on adjacent categories.
Email: Kit Ying Chan, chanky@jmu.edu

(4168)

Does Seeing an Asian Face Make Speech Sound More Accented? YI ZHENG and ARTHUR G. SAMUEL, *Stony Brook University* — We examined whether seeing an Asian face makes speech sound more accented, from two perspectives: interpretation and perception. Consistent with prior work, showing static Asian and Caucasian faces significantly biased people's accentedness judgments. Changing to dubbed videos reduced the demand characteristics and largely eliminated the bias in reported accentedness. When we introduced unambiguous stimuli, we found a standard contrast effect, consistent with a decision-level locus. Shifting to a mixed rather than blocked design led to essentially no bias from the faces. Thus, the decision level interpretation of accentedness was shifted by experimental manipulations. Participants' perception of accented speech was then tested using the selective adaptation paradigm. Auditory-only accented adaptors produced adaptation, but visually different adaptors (i.e., with ambiguous sounds dubbed onto Asian or Caucasian videos) failed to shift the perception of audio stimuli. Collectively, the results indicate that visual information affects the interpretation, but not the perception, of accented speech.
Email: Arthur G Samuel, arthur.samuel@stonybrook.edu

(4169)

Lexical Knowledge Is Available, But Not Always Used, Very Early. AMANDA RYSLING, JOHN KINGSTON, ADRIAN STAUB, ANDREW COHEN and JEFFREY STARNS, *University of Massachusetts Amherst* — Two response-signal studies investigated when lexical knowledge influences phonetic categorization of a word-initial /s-f/ continuum, in lexical contexts that biased response toward /s/ (-ide), /f/ (-ile), or neither (-ime). In Exp. 1, participants responded within 300ms starting at 375, 675, 975, or 1350ms after stimulus onset. They responded "f" more often in the /f/-biasing context at all delays, more at 675 than 375ms, but no more at 975 or 1350ms. In Exp. 2, participants responded at 175 and 375ms. No lexical bias appeared at 175ms, when listeners responded before hearing enough of the stimulus, nor until the second half of the 375ms response interval. At 375ms, responses in Exp. 1 clustered in the second half of the response interval, while responses in Exp. 2 were distributed throughout. These experiments demonstrate that lexical knowledge is available, but not always used, to inform responses very early.

Email: Amanda Rysling, arysling@umass.edu

(4170)

Audio-Haptic Speech Can Be Used to Train Better Perception of Degraded Auditory Speech. LAWRENCE D. ROSENBLUM, JOSH DORSI, JAMES W. DIAS, DANA ASHKAR and DEANNA SUN, *University of California, Riverside* — Audio-visual training is more effective than audio-alone training in improving perception of degraded auditory speech (e.g. Bernstein, et al., 2013). This could be due to perceivers exploiting learned bimodal associations and/or attuning to amodal regularities available in both modalities. To investigate this question, we trained listeners using a modality with which they had little prior experience:, tactile—or Tadoma—speech. The Tadoma technique involves perceivers placing a hand on a speaker's lips, jaw, and neck. Prior work shows that, even without training, Tadoma can enhance perception of degraded auditory speech (e.g. Trielle, Vilain, & Sato, 2014). The present study extended these findings, showing that training with audio-Tadoma speech improves subsequent performance with degraded audio-alone speech. These data challenge learned associations accounts. Current experiments examine how long this improved performance is sustained.

Email: Lawrence Rosenblum, lawrence.rosenblum@ucr.edu

(4171)

Influence of Visual Informativeness on Audiovisual Speech Integration. HANNAH E. SHATZER, *The Ohio State University*, ANTOINE J. SHAHIN, *University of California - Davis*, MARK A. PITT, *The Ohio State University* (Sponsored by Richard Jagacinski) — When watching a video of a person speaking, humans are tolerant of asynchronies between the auditory and visual signals exceeding 250 ms. Bhat et al. (2015) posit that this tolerance occurs because of a neural reweighting mechanism that shifts processing to higher-level auditory networks when the signal is informative, thereby reducing sensitivity to asynchrony. The current study tested this prediction by manipulating the informativeness of visual speech via salience of consonant visemes and by blurring the mouth movements, then estimating asynchrony tolerance thresholds between visual and auditory speech across these manipulations. Results revealed that more visually informative speech yielded lower thresholds than less informative speech, suggesting that visual information increases sensitivity to asynchrony, counter to the model. Findings indicate that informative visual speech may instead reweight auditory processing to low-level networks, thus heightening sensitivity to acoustic onsets and decreasing robustness of AV integration.

Email: Hannah Shatzer, shatzer.5@osu.edu

BILINGUALISM III

(4172)

Early Impact of Second Language Proficiency on Native Language Word Recognition Reveals Distinct Patterns in Auditory and Visual Domains. MONA R. BOTEZATU, *University of Missouri, Columbia*, JUDITH F. KROLL, *University of California, Riverside* — We evaluated the impact of second language (L2-Spanish) proficiency on spoken and visual word recognition in the first language (L1-English). English learners of Spanish (N=24) who were immersed in an English-speaking environment and varied on multiple indices of Spanish proficiency identified spoken English words presented in noise that varied in phonological neighborhood density: high-density words (e.g., BAG) and low-density words (e.g., BALL). Separately, learners also named regular/consistent (e.g., PEACH) and irregular/inconsistent (e.g., PINT) English words. Participants exhibited the standard inhibitory effects of phonological neighborhood density on response latencies in spoken word recognition and of irregularity/inconsistency on response times and accuracy rates in word naming. Critically, learners with lower Spanish proficiency showed a larger cost of dense neighborhoods in the auditory domain, but a reduced cost of irregularity/inconsistency in the visual domain. Our results indicate that early stages of L2 learning change native language performance, differentially impacting word production and comprehension.

Email: Mona Roxana Botezatu, botezatum@health.missouri.edu

(4173)

Face Cues Prime Bilingual Lexical Access Differently When Masked. CHUCHU LI and TAMAR H. GOLLAN, *University of California, San Diego* — Two experiments investigated how nonlinguistic cues modulate lexical access in bilinguals, particularly when they switch languages. In each experiment, 32 Mandarin-English bilinguals repeatedly named a set of 9 pictures in Mandarin or English, depending on the language cue above the picture. An Asian face, or a Caucasian face, or no face was presented as a prime. The faces were visible in Experiment 1 but were masked in Experiment 2. Face cues had significantly different effects when clearly visible vs. masked. Clearly visible faces reduced switch costs when race matched the intended language. However, these effects are not significant when masked, suggesting a top-down mechanism for face-race priming effects (people consciously associate

race with language). In contrast, masked faces elicited overall slowed responses when primes differed from speaker race, suggesting the presence of bottom-up influence of face-cues on language control that are driven by a different mechanism at the subconscious level.
Email: Chuchu Li, chl441@ucsd.edu

(4174)

Hand Trajectories Reveal the Transposed-Letter Effects in Monolingual and Bilingual Visual Word Recognition. YU-CHENG LIN, *University of Texas - Rio Grande Valley*, PEI-YING LIN, *University of Saskatchewan* — Previous monolingual studies have consistently suggested that there was flexibility of letter position encoding in different alphabetic writing systems. However, to date whether the orthographic neighborhood and cross-language script similarity would modulate the magnitude of the transposed-letter effect during the second-language word recognition in bilingual minds was unknown. We address this question using a mouse-tracking experimental paradigm to trace the internal lexical matching processes underlying the lexical access. Our linear mixed effects models and growth curve analyses revealed that a low orthographic neighborhood can trigger a larger magnitude of the transposed-letter effect for monolinguals and bilinguals on their hand trajectories. We also found that different-script bilinguals (Chinese-English bilinguals) exhibited a larger transposed-letter effect than similar-script bilinguals (Spanish-English bilinguals) and English monolinguals. The findings offer compelling evidence that a human lexical match criterion of recognition system can be modified by neighborhood density and cross-language script similarity of readers.
Email: Yu-Cheng Lin, yucheng.lin@utrgv.edu

(4175)

Monolingual Language Control Mechanisms. IVA IVANOVA, *University of Texas at El Paso* — How specific are language-control mechanisms to bilinguals? Language control seems necessary even within a single language: Speakers need to use different words with their bosses and their friends. Forty-eight monolinguals switched between naming pictures with a basic-level (simpler and more frequent) name (*dog*), and a subordinate (harder and less frequent) name (*Dalmatian*). Sessions began with two single naming blocks (either only basic-level or only subordinate names), followed by three mixed blocks, followed by two further single blocks. Results showed significant switching and mixing costs, equivalent for the two word types. Interestingly, there was a reverse-dominance effect: subordinate names were produced overall faster than basic-level names (cf. Costa & Santesteban, 2004). However, basic-level names were slower in the first single block (and showed larger mixing costs) *only* when produced after the subordinate names. These results evidence language-control mechanisms in monolinguals, which might be qualitatively similar to those employed by bilinguals.
Email: Iva Ivanova, iva.m.ivanova@gmail.com

(4176)

Bilingual Recognition Memory and Confidence Judgments in a Cross-Language Levels-of-Processing Task. ILEANA RATIU, *Midwestern University*, TAMIKO AZUMA, *Arizona State University* — This study examined the encoding of Spanish and English lexical items using a cross-language levels-of-processing task. Additionally, we examined participants' confidence in their old/new responses. Thirty-nine Spanish-English bilingual speakers studied words under Deep Processing conditions (e.g., Is this word a noun?) and Shallow Processing conditions (e.g., Does this word begin and end with a vowel?) in Spanish, English, and Mixed Language conditions. Later, they received a surprise recognition test in which they reported if an item was old or new and their confidence rating for the response. Overall, Deeply processed items were recognized better than Shallow processed items. Interestingly, Shallow items resulted in lower false recognition rates than Deep items, but this pattern differed across language conditions. Overall, participants were more confident when they correctly recognized items, relative to false alarms, but confidence ratings differed across language conditions. The results indicate that task demands and individual language proficiency affect the encoding and retrieval confidence of specific language information.
Email: Ileana Ratiu, iratiu@midwestern.edu

(4177)

Priming and Memory Recall in Spanish–English Bilinguals. KARENNA F. MALAVANTI and THERESA A. ANDERSON, *Carson-Newman University*, COURTNEY A. KURINEC, *Baylor University* — Experts have reached a common consensus that the bilingual is not merely the sum of two monolinguals. We examined the effect that encoding in one language and retrieval in a second has on the speed and accuracy of the memories retrieved in a 3 (language proficiency) X 2 (language of narrative) X 2 (language of recall questions) design. Three groups of Spanish–English bilinguals (balanced, unbalanced Spanish–English, and unbalanced English–Spanish) read a unique narrative in Spanish or English. Afterwards, subjects answered recall questions in Spanish and English. Answering the questions in the same language as the narrative increased accuracy and response time than when the questions were in a different language than the narrative. Additionally, unbalanced bilinguals were more accurate in their L1. The results of this study have larger implications, as bilingual eyewitnesses are often questioned in English regardless if it is their L1.
Email: Karenna Malavanti, kmalavanti@cn.edu

(4178)

Effects of Bilingualism on Audio-Visual Speech Perception in Noise. TUAN Q. LAM, *Loyola University New Orleans*, SCOTT R. SCHROEDER, *Hofstra University*, VIORICA MARIAN, *Northwestern University* — Bilinguals have more difficulty than monolinguals understanding spoken words in noisy environments, but the sources of this deficit remain unclear. We examined whether bilinguals' difficulty is due to weaker speech-sound recognition and whether bilinguals make extra use of visual cues to compensate. Korean-English bilinguals were compared to English monolinguals on speech-

sound recognition (e.g., /ba/) in noisy or quiet listening conditions and with congruent or incongruent visual cues (i.e., matching or mismatching lip-movements). Analyses revealed lower speech-sound-in-noise recognition accuracy in late bilinguals, indicating that speech-sound perception may be a source of late bilinguals' deficits (despite often being attributed to a word-level process). Analyses also showed that both early and late bilinguals produced more McGurk-type responses (in which lip-movements were integrated with the auditory input), suggesting that bilinguals make increased use of visual cues. These findings clarify bilinguals' comprehension difficulties and advance our understanding of the perceptual aspects of language processing.
Email: Scott R. Schroeder, scott.ryan.schroeder@gmail.com

(4179)

Different Sentence Memory Representation by the Differently Proficient Korean-English Bilinguals When Trying to Memorize English Sentences. SANGYUB KIM, YEONJOO LEE, YONGWOO KIM, JEAHONG KIM and KICHUN NAM, *Korea University of South Korea* — The purpose of this study was to see whether the foreign language sentence representation is changed from the surface structure representation to the semantic and propositional representation as learning those sentences repetitively and to see whether the sentence representation transition is different among differently proficient bilinguals. In Experiment 1, mother language, the results showed the semantic propositional representation and the accuracy for this representation type improved when trying to memorize the mother language sentences in repetition. In Experiment 2, foreign language, each group divided by language proficiency show a different propositional representation. And each group who has better language proficiency show improvement of the propositional memory as more learning proceeds. Thus, the present study suggest that the change of propositional representation of sentences depends on the language proficiency.
Email: Sangyub Kim, sangyub0310@hanmail.net

(4180)

Phonologically-Mediated Meaning Activation During Bilingual Sentence Processing. DEANNA C. FRIESEN, DEBRA JARED and VERONICA WHITFORD, *University of Western Ontario*, DEBRA TITONE, *McGill University* — Word recognition studies demonstrate that bilinguals activate shared phonology between-languages, and consequently, non-target language meanings. For example, chou (cabbage in French), which overlaps phonologically with shoe, activates "footwear". Here, we examined whether this effect would occur in sentential contexts using eye movement measures of reading. English-French bilinguals, varying in French proficiency, read English sentences that contained either a correct English homophone (shoe), its French homophone mate (chou), or a French control word (cloche). Although the French homophones had longer total reading times than English homophones, they had shorter reading times than control words, suggesting that their meanings were integrated with the sentence contexts. However, French homophone facilitation varied according to French proficiency and word frequency. For minimally-proficient bilinguals, word frequency did not modulate French homophone facilitation. For high-proficient bilinguals, this facilitation was greatest for low-frequency words. Thus, shared phonology facilitates the activation of non-target language meanings, even within sentential contexts.
Email: Deanna Friesen, Deanna.Friesen@uwo.ca

(4181)

The Influence of Bilingualism on Executive Functions Among Turkish-English, Turkish-Kurdish Bilinguals. ESRA DOGRUEL and SUMEYRA TOSUN, *Suleyman Sah University* — During bilingual speech production, the competition occurs between two languages. In this process, executive control that is required to direct attention on wanted language develops. Thus, it is assumed that other functions using executive control improves in bilingual speakers that is also known as bilingual advantage in the executive control system. The aim of the current study was to examine whether bilingual advantages in variety aspects of executive control such as cognitive control, verbal and visual working memory could be extended to an understudied bilingual group (Turkish-Kurdish bilingual) along with Turkish-English bilingual and Turkish monolingual speakers. Six tasks were administered to assess different parts of executive function including cognitive control (Simon and Flanker test), visuo-spatial (matrix rotation task) and verbal working memory (digit span task) on 45 young adults in the three language groups: Turkish- Kurdish bilinguals (n=15), Turkish-English bilinguals (n=15) and Turkish monolinguals (n=15). The results demonstrated that bilingual advantage appeared in verbal working memory. However, bilingual advantages in visuo-spatial working memory and cognitive control were not found. Further, Turkish-Kurdish and Turkish-English bilingual speakers revealed varied results.
Email: Sumeyra Tosun, stosun@ssu.edu.tr

(4182)

Lexical Stress Assignment for Visually Presented Words Across Languages: Evidence From Bilinguals and Monolinguals. JOSHUA BUFFINGTON, *University of Illinois at Chicago*, JYOTSNA VAID, *Texas A&M University*, BELEM LOPEZ, *University of Texas at Austin*, SUMEYRA TOSUN, *Suleyman Sah University* — Studies of visual word recognition have largely focused on monosyllabic words. As a result, psycholinguistic research on lexical stress assignment for polysyllabic words has been limited. In a recent study we found that, for English monolinguals and Spanish-English bilinguals alike, certain word endings in English reliably cued judgments of syntactic class (noun vs. verb) for novel words in English, and also cued stress assignment, consistent with a strong-weak stress pattern for nouns in English. In the present study, we presented English monolinguals and Spanish-English proficient bilinguals with a list of pseudowords in English and in Spanish. For each item participants were to indicate where stress would be placed. Confidence ratings were also obtained. The findings are discussed with respect to whether stress patterns associated

with a particular language (English) are influenced by cues for word class endings in that language and whether stress assignment patterns for Spanish will be distinct.
Email: Joshua Buffington, bffngtn2@uic.edu

(4183)

Re-Examining the Role of Local Language Context on Cross-Language Activation: An ERP Study With Catalan-Spanish Bilinguals. MONTSERRAT COMESAÑA, *University of Minho,* JOSEPH DEMESTRE, *Rovira i Virgili University,* DANIELA VALENTE, *University of Minho*, ANA M. GONÇALVES, *University of Minho and University of Oxford,* ANA PAULA SOARES, *University of Minho*, WALTER J. B. VAN HEUVEN, *University of Nottingham*, and PILAR FERRÉ, *Rovira i Virgili University* — Recent research has shown that cognate processing is affected not only by cross-language similarities but also by stimuli list composition (Comesaña et al. 2015, JEP: LMC). Specifically, Comesaña et al. observed that the time it tooks to recognize non-identical Catalan-Spanish cognates (e.g., ducha-dutxa [shower]) and noncognates (e.g., arena-sorra [sand]) varied as a function of the presence or absence of identical cognates (e.g., carta-carta [letter]) in the list. These findings highlight the importance of local language context on the level of cross-language activation and beg the question of whether there are or not top-down influences on lexical activation. The aim of the present research was to address this question by collecting behavioral and event-related potentials (ERPs) data. Results showed modulations on cognate processing as a function of stimuli list composition both on behavioral and ERP data which cannot be explained by adaptations in the criteria used by the participants.
Email: Montserrat Comesaña, mvila@psi.uminho.pt

(4184)

Is There a Bidialectal Advantage? Executive Control Processing in Bidialectal Speakers. JUSTIN SARKIS and JULIE BOLAND, *University of Michigan - Ann Arbor* — This study investigated a possible bidialectal advantage in executive functioning (EF). Recent empirical data has provided evidence that bilingual speakers enjoy an increase in EF compared to monolingual speakers. Very few studies, however, have investigated whether the same mechanism that gives rise to the bilingual advantage also provides benefits to bidialectal speakers. Eighty-four college-aged University of Michigan students (28 monolingual, 28 bidialectal, 28 bilingual) completed various tasks to measure both EF and working memory. There were no group differences consistent with either a bilingual or bidialectal advantage hypothesis. These results fail to replicate previous bilingual advantage studies and subsequently fail to generalize a bidialectal advantage. Because I found strong congruency effects but no group differences, the results of this study add to the growing evidence that a bilingual advantage either does not exist or such an advantage is more nuanced than originally/currently presented in the literature.
Email: Justin Sarkis, jsarkis@umich.edu

(4185)

Perception of Phonological Variants by Non-Native Listeners. HAYK ABRAHAMYAN and PAUL LUCE, *University at Buffalo* — Recent research has demonstrated that listeners process carefully pronounced words (canonical forms) more quickly and accurately than casually produced words (non-canonical, reduced forms), despite the fact that casually produced word forms are more frequent in everyday language use. To date, research on the perception of phonological variants in casually produced speech has focused, with a few exceptions, on monolingual listeners. The current research examined non-native English speakers' processing of canonical and non-canonical word-forms in an attempt to more fully understand how non-native speakers of English cope with phonological variants in American English. Monolingual American English speakers and non-native American English speakers completed a cross-modal identity priming task with canonical, non-canonical, and unrelated auditory primes and visual targets. Overall, the non-native speakers were significantly slower than native speakers at recognizing both canonical and non-canonical forms, although our data suggest that non-native speakers may encounter more specific difficulties than native speakers when processing phonological variants.
Email: Hayk Abrahamyan, hayk@buffalo.edu

(4186)

The Relationship Between Speech Production and Perception Representations in Different Non-Native Sound Contrasts. MISAKI KATO and MELISSA BAESE-BERK, *University of Oregon* — Previous studies have suggested a dissociation between speech production and perception for non-native speakers. Similarly, in recent work, we demonstrated that native Japanese speakers who could reliably produce the English /r/-/l/ contrast did not reliably perceive it, adding support to studies suggesting that speech production and perception of nonnative sounds may rely on different representations. However, the relationship between the representations for production and perception may differ depending on the contrast being learned. In the present study, we investigate the production-perception relationship for the contrast between Japanese geminate-singleton consonants. This is a nonnative sound contrast where the requirements for production and perception may be more similar because durational difference is important in both production and perception, whereas the English /r/-/l/ contrast relies on different properties in perception and production. Examining how multiple contrasts are related during learning will add insight to the relationship between the production and perception mechanisms.
Email: Misaki Kato, misaki@uoregon.edu

(4187)

Effects of Cross-Linguistic Phonetic Overlap on Lexical Co-Activation in Bilinguals. MARGARETHE MCDONALD, JAN EDWARDS and MARGARITA KAUSHANSKAYA, *University of Wisconsin - Madison* — Cross-linguistic activation occurs when a bilingual activates words in both languages when hearing only one. This phenomenon is reliably observed in bilinguals activating their L1 when listening to their L2, but

is less consistently observed in the opposite direction. This may be the result of L2 activation being more sensitive to the degree of phonetic overlap between words in the two languages. For example, although the initial sounds of the Spanish word *boca* and the English word *bowl* are phonemically both /b/, they are realized with different voice onset times and therefore are not the same phonetically. English /b/ and Spanish /p/ are voiceless/unaspirated; Spanish /b/ is prevoiced. A series of eye-tracking experiments with English-L1/Spanish-L2 bilinguals investigated whether, when hearing an English target word (i.e. *bowl*), participants would activate a Spanish competitor with a phonetically similar onset (*pollo*, Eng: chicken) or a Spanish competitor with a phonemically similar onset (*boca*, Eng: mouth). The findings so far indicate minimal activation of phonemically similar competitors, and suggest that activation of the L1 in bilinguals upon hearing the L2 is sensitive to fine-grained cross-linguistic phonetic differences.

Email: Margarita Kaushanskaya, kaushanskaya@wisc.edu

(4188)

Salience Does Not Always Help: Visual Input Enhancement and L2 Acquisition. IAN S. COMEAUX and JANET L. MCDONALD, *Louisiana State University* — Our previous research has shown that visual input enhancement (VIE) can facilitate the language acquisition process by directing attention towards highly valid and reliable morphosyntactic cues. In the present study, we investigated the effect of VIE when the VIE-marked cues were no longer the most valid cues in the language. Participants learned an artificial language through an actor-assignment task in which the VIE-marked morphosyntactic cues (verb agreement and case marking) were subordinate to an unmarked semantic cue (animacy). These morphosyntactic cues were presented as either 1) unmarked, 2) marked in the same color, or 3) marked in different colors. In the same color condition, participants failed to acquire the morphosyntactic cues. In the different color condition, case marking but not verb agreement was acquired. We conclude that the relationship between VIE and language learning is nuanced and may only be effective for languages that utilize highly valid morphological cues.

Email: Ian Comeaux, icomea1@lsu.edu

(4189)

Learning a Second Language Influences First-Language Grammar Processing. EVE HIGBY and VALERIE L. SHAFER, *City University of New York*, IBANA VARGAS, *City University of New York and St. John's University*, STEPHANIE PEREZ, WENDY RAMIREZ, ERIKA VARELA, JENNIFER MEZA, EVA FERNANDEZ and LORAINE K. OBLER, *City University of New York* — Bilinguals have separate lexicons for their two languages, but do they have separate grammatical systems? The current study investigated whether bilinguals process ungrammatical sentences differently in their native language after learning new grammatical structures in their second language. Thirty-one highly proficient Spanish-English adult bilinguals listened to Spanish sentences and rated their acceptability during electroencephalogram acquisition. Bilinguals rated ungrammatical sentences with grammatical English counterparts significantly higher than sentences that were ungrammatical in both languages (2.5 vs. 1.8 on a scale from 1-5, $p < .001$), and they showed different patterns of modulation of neurophysiological components that index grammaticality (i.e., LAN and P600), suggesting that bilinguals can interpret these sentences in Spanish in real-time, likely using English grammar rules to do so. This is the first known study to demonstrate cross-linguistic effects of grammar from the second language to the first language that occur during real-time sentence comprehension.

Email: Loraine Obler, loraine.obler@gmail.com

LETTER/WORD PROCESSING III

(4190)

The Cost of Visual Degradation: Adding Random Visual Noise to Previews Makes Display Changes Highly Detectable. MARTIN R. VASILEV, TIMOTHY J. SLATTERY, JULIE A. KIRKBY and BERNHARD ANGELE, *Bournemouth University* — It is well-established that reading times are shorter when readers are able to preview the upcoming word in parafoveal vision (the so-called preview benefit effect). However, it has been suggested that parafoveal masks introduce processing costs that may overestimate the preview benefit. Visually degrading the parafoveal preview may reduce these costs and provides an accurate estimate of the effect. The present experiment tested this suggestion by employing a display change detection paradigm. Participants read sentences that contained the traditional identical vs letter mask previews, but half of the time these previews were degraded by randomly replacing 20% of the black pixels with white pixel. The results showed that participants are more likely to detect degraded compared to non-degraded parafoveal masks (a d prime difference of 2.61). Fixation durations were also longer after a degraded compared to a non-degraded mask. Therefore, the present pattern of results suggest that visually-degraded parafoveal masks with random visual noise introduce another type of processing costs, and alter the way in which attention is allocated to the text during reading.

Email: Bernhard Angele, bangele@bournemouth.ac.uk

(4191)

Effects of Font Properties on Reading Performance of Individuals With Dyslexia. WAH PHEOW TAN, *Temasek Polytechnic, Singapore*, LOIS LIM, *Dyslexia Association of Singapore* — Previous studies demonstrated that font size and text spacing of printed text affected reading performance of individuals with dyslexia. The current study addresses two gaps in this area, namely the combined effects of both font size and text spacing and their effect on non-alphabetical scripts (e.g., Chinese), by systematically manipulating both font size and inter-text spacing of English passages (Experiment 1), and Chinese sentences (Experiment 2), and measuring the reading performance (i.e., speed, accuracy and comprehension) of children with dyslexia. Error analysis was conducted to investigate the effects of manipulated text on reading errors. The findings demonstrated that increased font size either improved or did not impede reading performance. The effects

of increased text spacing is mixed, with reduced omission errors for both English and Chinese text, but worse reading comprehension scores for English text. The theoretical and application implications of the findings are discussed.
Email: Wah Pheow, Tan, wahpheow@tp.edu.sg

(4192)

Transposition Effects in Visual Word Recognition in Hindi. ANURAG RIMZHIM, *Central Connecticut State University & Haskins Laboratories*, AVANTIKA JOHRI and DAMIAN KELTY-STEPHEN, *Grinnell College*, CAROL A. FOWLER, *University of Connecticut*, LEONARD KATZ, *University of Connecticut & Haskins Laboratories* — Transposition effects (slower and less accurate lexical decision responses to nonwords such as PSATE [compare PASTE] than PLUTE) reveals flexible position coding of written units. Readers of many orthographies (English, Spanish, Basque, French) but not all (Hebrew, Katakana) show transposition effects. This difference is attributed to different linguistic and orthographic characteristics of languages in the two categories (Frost, 2012). Brahmi-derived orthographies of Indian languages are generally considered to be alphasyllabaries, having both syllabic and alphabetic characteristics, with the CV-syllable proposed as its orthographic unit (Rao et al., 2012). However, Rimzhim, Katz & Fowler (2014) proposed that these orthographies are functionally predominantly alphabetic with the *letter* as a relevant orthographic unit. We report transposition effects in different types of Hindi words in a lexical decision study involving transpositions of either 2-consonants, 2-vowels, or a consonant and a vowel. Results highlight the relevance of the letter as a written unit in Hindi.
Email: Anurag Rimzhim, anurag.rimzhim@ccsu.edu

(4193)

Effects of Consecutive and Random Presentation of Varied Contexts on the Acquisition of New Word Meaning. CAITLIN RICE, *University of Pittsburgh*, MICHAL BALASS, *Towson University*, NATASHA TOKOWICZ, *University of Pittsburgh* — Meaning acquisition during new word learning is an incremental process (Nagy et al., 1985). Encountering a new word in varied contexts facilitates learning more than repeated contexts (Bolger et al., 2008). In second language vocabulary acquisition, ambiguous words are recalled more accurately when translations are taught in a single vs. separate training session (Degani et al., 2014). In this study, we investigated whether encounters with words in varied contexts lead to greater learning if they occur at different times (separately) or at the same time (consecutively). Participants (N=31) learned rare English words in varied context sentences presented separately or consecutively throughout training. Results showed better performance on a semantic judgment task for words trained consecutively. This consecutive advantage may be due to a greater ability to make contrasts between consecutively vs. separately presented contexts, which may allow learners to derive a more detailed meaning representation.
Email: Natasha Tokowicz, tokowicz@pitt.edu

(4194)

The Character is the Gateway to Meaning Even When Chinese Read Pinyin. LIN CHEN, *Sun Yat-sen University*, CHARLES PERFETTI and XIAOPING FANG, *University of Pittsburgh* — Pinyin, a phonemic transcription of Chinese, is widely used in teaching Chinese. The interesting question is when skilled readers process Pinyin, do phonological, orthographic, and semantic representations of Chinese become activated? Activation of three lexical constituents was found in an explicit word-naming task and an implicit color-judgment task, respectively. Semantic and phonetic radicals of corresponding characters were activated in both word-naming and color-judgment task. Phonological and semantic facilitation was found only in the explicit word-naming task. Overall the results indicated that reading alphabetic Pinyin causes activation of the corresponding. Although Chinese can be read by the Pinyin Romanized alphabet, character reading is the dominant print experience for literate adults. The character thus becomes the gateway to the Chinese lexicon, the point of access to meaning. We demonstrate the dominance of the character in meaning processing by showing that it is activated even when native Chinese speakers read Pinyin.
Email: Lin Chen, chenlin36@sysu.edu.cn

(4195)

Facilitatory and Inhibitory Effects in One-Letter Masked Form Priming. DAVID R. HARVEY and JAMES S. ADELMAN, *University of Warwick* (Sponsored by Colin Davis) — Masked priming has been used extensively to explore how words and non-words can facilitate or inhibit lexical processing, but very little has been done to investigate how such processing can be affected by a single letter. We present research that uses one-letter primes in a lexical decision task with four letter words. We found that a single letter identity prime (e.g., b+++ - BAND) caused reaction time facilitation relative to an unrelated letter prime (e.g., j+++ - BAND). A prime consisting of a letter taken from a neighbour of the target word (e.g., k+++ - SNOW) caused inhibitory priming relative to an unrelated letter prime (e.g., m+++ - SNOW). Identity prime facilitation and orthographic neighbour prime inhibition have previously been shown with whole-word primes, but the finding of one-letter priming effects is novel. We explore the possible interpretations and implications of these results, and discuss to what extent letter-level inhibition mechanisms could replace lexical inhibition in current models of visual lexical access.
Email: David R. Harvey, david.harvey@warwick.ac.uk

(4196)

Word Segmentation in Chinese Reading: The Role of Character Positional Frequency. CHUANLI ZANG and FEIFEI LIANG, *Tianjin Normal University*, NAZEL I. BLYTHE, *University of Southampton*, XINGSHAN LI, JUEJUN BAI and GUOLI YAN, *Tianjin Normal University*, SIMON P. LIVERSEDGE, *University of Southampton* — Chinese text is printed as a continuous string of characters without interword spaces. A key question is how readers segment words and whether they use a statistical cue - the probability of a given character appearing at a word beginning or end to facilitate word segmentation

and identification during reading. In Experiment 1, three types of pseudowords were constructed based on the character's positional frequency, providing congruent, incongruent, and no positional information respectively. The pseudoword was embedded into two sets of sentences for the learning and test phase. Critically, the results showed clear effects of character positional frequencies both in the learning and test phase. In Experiment 2 three analogous types of pseudowords were created while position-specific neighbourhood size were controlled. Consistent results were observed with Experiment 1, demonstrating that Chinese readers are sensitive to character position frequency information as a cue to the likely locations of word boundaries.

[illegible] Chuanli Zang, dedipsy@yahoo.com

(4197)

Cues to Stress Assignment in Reading Aloud. MARIA KTORI, PETROULA MOUSIKOU and KATHLEEN RASTLE, *Royal Holloway, University of London* — Research on reading aloud has focused exclusively on monosyllables, and thus our understanding of how stress is assigned is remarkably limited. The present study documents the individual influences of several key sublexical cues to stress assignment, and is one of the very few that examines rigorously the interplay between sentence-level and word-level cues to stress assignment in reading. Experiments 1, 2, and 3 investigated the effects of prefixation, orthographic weight, and vowel length on stress assignment in single word reading aloud. We found that the presence of a prefix repelled stress, while syllables with more letters and long vowels attracted stress. Experiment 4 investigated the effects of these cues on stress assignment in sentence reading. Results showed that sublexical cues influenced stress assignment over and above higher-level contextual and rhythmic cues. We consider these findings in the context of extant rule-based, distributed-connectionist, and Bayesian approaches to stress assignment in reading.

Email: Maria Ktori, maria.ktori@rhul.ac.uk

(4198)

How Do Foveal Processing Load and Parafoveal Preview Influence Eye Movements Control in Chinese Reading XUEJUN BAI, MANMAN ZHANG, CHUANLI ZANG and GUOLI YAN, *Tianjin Normal University* (Sponsored by Xingshan Li) — Previous studies on alphabetical language reading demonstrated foveal processing difficulty leads to decreased parafoveal previews on reading times, but not on word skipping. However, this may differ in Chinese reading as more preview benefits might be obtained due to its visually dense writing system. Experiment 1 examined whether foveal load affected the upcoming words' fixations and skipping during normal reading. Experiment 2 explored how foveal load modulated parafoveal preview on fixations and skipping using boundary paradigm. The results showed high foveal load caused longer fixations and less skipping on word n+1 than the low foveal load condition, while correct preview lead to more skipping and shorter fixation on word n+1 than incorrect preview. However, there was no interaction between the two factors, demonstrating that foveal load in Chinese reading does not modulate parafoveal previews on fixation times, and foveal load and parafoveal preview might independently affect word skipping.

Email: Xuejun Bai, bxuejun@126.com

(4199)

Individual Differences in Eye Movements Are Consistent Across Time in Reading. BENJAMIN T. CARTER and STEVEN G. LUKE, *Brigham Young University* — Eye movements are used to study many cognitive phenomena, including language processing and development, attention, memory, perception, as well as individual differences in cognition and cognitive impairments. However, these studies assume that eye movements are stable across time. The present study examined eye movement reliability in normal individuals. Forty-seven participants completed two sessions of a reading task separated by one month. Fixation duration, saccade amplitude, first fixation duration, gaze duration, total time, go-past time, skipping, refixation and regression probabilities were calculated and compared both between sessions and across trials. All correlations were highly significant, indicating that eye movement behaviors are stable within individuals across several weeks and highly stable across trials within each individual. Differences in sensitivity to lexical variables (frequency, predictability, length) were also compared, and were also observed to be highly stable across time. Eye movements in reading are therefore suitable for studying cognitive development and longitudinal change.

Email: Steven Luke, steven_luke@byu.edu

(4200)

Visual Word Processing in an Atypical Learning Situation: The Case of Non-Arabic-Speaking Qur'anic Memorisers. SITI SYUHADA BINTE FAIZAL (Graduate Travel Award Recipient) and GHADA KHATTAB, *Newcastle University* (Sponsored by Melvin Yap) — We investigated whether non-Arabic-speaking Qur'anic memorisers implicitly gain lexical and sublexical representations while processing Qur'anic Arabic words. 177 non-Arabic-speaking Qur'an readers (Malay-English bilinguals) did a lexical decision task with stimuli from the Qur'an Lexicon Project. Qur'an vocabulary knowledge and Qur'anic memorisation were also measured. Controlling for age and gender, mixed effects analyses on reaction times revealed robust main effects of lexicality, length, frequency, phonotactic probability, root family size, neighbourhood density, and Levenshtein distance. Significant three-way interactions of these effects with memorisation and vocabulary knowledge revealed that lexicality and frequency effects were the largest for participants with more memorisation and vocabulary knowledge but smallest for those otherwise. More memorisation (but not more vocabulary knowledge) was related to larger frequency effects. More vocabulary knowledge (but not more memorisation) was related to larger root family size effects. Results suggest the implicit learning of lexical and sublexical features of a writing system through statistical exposure to its orthography and phonology, despite limited exposure to semantics.

Email: Siti Syuhada Binte Faizal, s.s.binte-faizal@ncl.ac.uk

(4201)

Parafoveal Preview Effects from Word N+2 During Reading: A Bayesian Meta-Analysis. MARTIN R. VASILEV and BERNHARD ANGELE, *Bournemouth University* (Sponsored by Dennis Drieght) — Do readers obtain information from the second word to the right of the current fixation (word n+2)? This is a question of great theoretical interest, but currently no consensus exists due to the mixed findings in the literature. The present study addressed this issue by doing a Bayesian random-effects meta-analysis of 11 word n+2 studies. Using a range of prior distributions, estimates for the effect size measured with first fixation duration (FFD) and gaze duration (GD) were computed. There was 95% probability that the effect of previewing word n+2 lies between -2.3 and 13.2 ms for FFD (Mean= 5.3), and between -6.1 and 17.12 ms for GD (Mean= 5.4). The probability that the two effects are bigger than 1 ms was 87 and 77 %, respectively. Although the effect sizes were relatively small, the weight of the evidence suggests that readers do obtain some information from word n+2. It is argued that future research should focus not on the existence of n+2 preview effects, but on their theoretical meaning.
Email: Martin R. Vasilev, mvasilev@bournemouth.ac.uk

(4202)

Does Perceptual Grouping Modulate Letter Position Coding? ANA MARCET (Graduate Travel Award Recipient) and MANUEL PEREA, *Universitat de València*, ANA BACIERO, *Universidad DePaul*, PABLO GOMEZ, *DePaul Unversity* — Why are transposed-letter nonwords (JUGDE, CHOLOCATE) so wordlike? Some theorists propose that the effect occurs at an abstract level (via the activation of "open bigrams"), whereas other theorists posit an earlier, more perceptual locus (via location uncertainty). Here we sought to separate the predictions of these families of models by manipulating a perceptual element: color (one-color vs. multicolor [each syllable with a different color]) and brightness (homogeneous vs. heterogeneous [two letters in darker color tone]). If letter position coding occurs at an abstract level, the transposed-letter effect in lexical decision (i.e., the difference between transposed- and replacement-letter nonwords) should be similar regardless of visual form. Results showed that a reduced but substantial transposed-letter effect when the nonwords were presented with color/tone emphasis. Thus, while perceptual grouping does have an effect, a major component of letter position coding is at an abstract level (i.e., the transposed-letter effect has several loci).
Email: Ana Marcet, amarhe4@alumni.uv.es

(4203)

Diminished Effects of Orthographic Neighborhood Density in a Form-Level Task. GABRIELA MEADE, *San Diego State University & University of California, San Diego*, KATHERINE J. MIDGLEY, KURT WINSLER and PHILLIP J. HOLCOMB, *San Diego State University* — Words and pseudowords from neighborhoods with high orthographic density typically elicit larger amplitude N400s than similar items from less dense neighborhoods, an effect thought to reflect co-activation of the lexico-semantic representations of form-similar words. Here, we examined whether this co-activation is automatic versus dependent on explicit lexical processing by comparing neighborhood ERP and behavioral effects in a lexical decision task (LDT) and a superficial letter detection task. As expected, in the LDT, we found larger N400s for stimuli from high neighborhood densities as compared to low neighborhood densities and for pseudowords as compared to words. In comparison, N400 effects of both neighborhood density and lexical status were considerably reduced in the letter detection task. This pattern suggests that co-activation of neighbors is modulated by depth of lexical processing.
Email: Gabriela Meade, meade.gabriela@gmail.com

(4204)

Repeated Adjacent Letters and Consonant Vowel Order in Word Recognition. ILIYANA V. TRIFONOVA and JAMES S. ADELMAN, *University of Warwick* — The present study investigated whether repeated adjacent letters in English played the same role in word processing as two letters with different identity. Previous research with masked priming lexical decision experiments has demonstrated that nonword primes formed by transposing two nonadjacent consonants in a word produce a robust priming effect compared to a two-replaced-letters control. To test whether identical adjacent letters affected word processing, we compared the efficacy of primes formed by transposition of either repeated consonant letters (*opsope-oppose*) or different consonant letters (*codemy-comedy*). Such a manipulation also allowed for exploring the nature of the consonant-vowel (CV) order effect in word recognition. The transposition of one of the repeated letters with another consonant preserved the orthographic CV order but included additional consonant phoneme in the phonological one. Results were discussed with implications for models of word recognition.
Email: Iliyana V. Trifonova, i.v.trifonova@warwick.ac.uk

(4205)

Individual Differences in Sensitivity to Morphological Structure. OLIVER SAWI and JAY RUECKL, *University of Connecticut* — The current study examined individual differences in the effects of morphological structure on visual word recognition. Participants completed both a lexical decision and a battery of tasks assessing a number of linguistic measures, including vocabulary, spelling ability, and print exposure. The critical nonwords in the lexical decision task varied in morphological complexity (e.g., GASFUL vs GASFIL, Crepaldi et al., 2010); the words varied in both family size (e.g., de Jong et al., 2000) and base frequency (e.g., Taft, 1979; 2004). We found that the nonword complexity, base frequency, and family size effects showed systematic variability. Further, the nonword complexity and family size effects patterned very similarly and seemed to index opposite ends of the same dimension of variability. Base frequency, while related to family size, indexed a separate dimension of variability.
Email: Oliver Sawi, oliver.sawi@uconn.edu

(4206)

Neural Correlates of Degradation and Word Frequency Effects During Reading. FEDERICA DEGNO, FRUZSINA SOLTÉSZ, PIRIL HEPSOMALI, NICK DONNELLY and SIMON P. LIVERSEDGE, *University of Southampton* — Reader's eye movements (EMs) and fixation-related potentials (FRPs) were simultaneously recorded in a boundary paradigm reading experiment to investigate the foveal and parafoveal influences of both visual and linguistic processing during sentence reading. Before crossing the boundary, a degraded or an identical preview of the target word was presented. After crossing the boundary, previews were replaced by high or low frequency target words. EM data were analysed for the pretarget, target and posttarget words, and ERP analyses for early components time-locked to fixation onset of pretarget, target and posttarget. Analysis of EM measures revealed additive effects of degradation, and frequency. FRP analysis showed effects of degradation on pretarget and target, and a main effect of frequency on posttarget. Interactive effects in FRPs occurred at the pretarget and target words, and were marginal for the post-target word. Our results demonstrate correspondences between EM and FRP effects, suggesting that our manipulations influenced separate stages of lexical processing. In addition, our findings indicate that the FRP data may reflect qualitatively different (interactive) effects to which the eye movement record is insensitive.
Email: Federica Degno, F.Degno@soton.ac.uk

DISCOURSE PROCESSES I

(4207)

The Impact of Refutation Texts: Implying a Scientific Misconception Can Facilitate Learning. KRISTIN M. WEINGARTNER, AMY M. MASNICK and LORI REIDER, *Hofstra University* — We examined the role of refutation texts in learning to replace science misconceptions. Because they call misconceptions to the foreground, refutation texts may help people overcome the misconception (Broughton & Sinatra, 2010). To test this claim, we had students who expressed a common misconception in physics read one of three passages about the issue. The passages differed in whether the misconception was explicitly stated, implied, or not mentioned at all. We found that students who had been exposed to the misconception, either explicitly or implicitly, were less likely to express that misconception when they had been questioned about the topic shortly after reading the passage or one week later. These findings have important implications for practices in science education.
Email: Kristin Weingartner, kristin.weingartner@hofstra.edu

(4208)

Demanding Domains: Comprehension Under Dual Task Differs by Knowledge Domain. CONNIE SHEARS, SAMIRA AMIRAZIZI, HYE RYNN J. LEE, JOSHUA C. KIM, LUCIE JEROME, NATASHA HAMILTON and MACKENZIE SMITH, *Chapman University* — Readers draw knowledge-based inferences to connect implicit ideas across discourse differently depending upon the knowledge domain being processed. Cognitive demands impact comprehension processes such that "less demanding" knowledge domains support inference formation while "demanding" domains, under increased cognitive load, do not (Shears, et al., 2007). Using a dual-task paradigm, we compared the domain of emotions (positive, negative, neutral) to physical cause and effect and planning knowledge under varying load conditions. We hypothesized physical knowledge and neutral emotions would be less demanding, thus target word recognition would vary less under load conditions. Load impacted all knowledge domains reducing accuracy. Surprisingly, this was significant for neutral emotional stories, but not positive or negative. This is counter-intuitive, suggesting cognitive demands contribute to comprehension processes uniquely for emotional language.
Email: Connie Shears, Ph.D., shears@chapman.edu

(4209)

Memory for Physical Attributes of Characters in a Narrative. MICHAEL T. PALENA and DAVID E. COPELAND, *University of Nevada, Las Vegas* — While research has shown that readers track characters described in a narrative (e.g., Zwaan & Radvansky, 1998), comparatively little work has been done to show what kind of physical information gets represented in memory. Across two experiments, this study examined the mental representations readers construct for the physical attributes of characters in a narrative. Participants were asked to read a narrative followed by memory tests (recall and recognition) for the characters. Before the memory tests, participants were instructed to rely on either memory explicitly from the story or their imagined representations. The instructional groups differed in that the imagination group produced more contradictory and elaborative responses than their memory group counterparts – this was true for all types of memory tests. The effect was more pronounced for the minor characters in the story, suggesting that even in the absence of thorough character descriptions, readers still construct detailed representations of character.
Email: David Copeland, david.copeland@unlv.edu

(4210)

Event Segmentation in L2 Reading Comprehension: A Case Study of Japanese University Students Studying English as a Foreign Language. SHUICHI TAKAKI, *Fukushima University* — According to Event Segmentation Theory (EST), humans perceive a continuous event segment by segment. We need to comprehend the hierarchical structure of the event so that we are able to understand everyday activities in the world. EST has given accounts of reading comprehension as well as film comprehension. Some studies have shown that event perception was influenced by individual factors such as age differences. Therefore, the present study investigated the characteristics of event segmentation in L2 reading comprehension while taking L2 reading proficiency into account. Japanese university students segmented an English passage into discrete events. The participants were divided into groups in terms of their L2 reading proficiency. Characteristics of the segmentation were compared between groups in terms of hierarchical alignment,

segmentation agreement, and event length following previous studies. Results of this study showed that event segmentation in L2 reading comprehension depended on L2 reading proficiency.
Email: Shuichi TAKAKI, takaki@educ.fukushima-u.ac.jp

(4211)

Representing the Voice of a Story Character. SRI SIDDHI N. UPADHYAY, KENNETH HOUGHTON and CELIA M. KLIN, *Binghamton University* — Readers frequently encounter information about a character's voice in narratives. In two self-paced reading experiments, we examined the Auditory Perceptual Simulation (APS) account (Zhou & Christianson, 2015), which suggests readers simulate traits of a character's voice (e.g., speech rate, accent) via inner speech. In Experiment 1, participants read a fictional biography of a native English speaker or a non-native English speaker with weak English skills. They then read an email written by the character. The email contained errors on non-target lines in the non-native condition, consistent with a non-native speaker's style. The two versions of the email had 16 target lines in common. In Experiment 2, the biography was not included. In both experiments, reading times were longer on the target lines in the non-native condition. Future experiments are needed to understand the exact role of the errors in the non-native condition. We tentatively conclude that, consistent with the APS account, readers simulated the character's voice, leading to slower reading in the non-native condition, due to the expectation of a slower speaking rate or to unfamiliarity with the imagined accent of the character.
Email: Sri Siddhi N. Upadhyay, supadhy1@binghamton.edu

(4212)

What Predicts Structure Building Ability? KHUYEN NGUYEN, *Washington University in St. Louis*, WALTER REILLY, *University of California - Davis*, SHARDA UMANATH, *Claremont McKenna College*, CINDY WOOLDRIDGE, *Washburn University*, MARK A. MCDANIEL, *Washington University in St. Louis* — The structure building framework is a prominent conceptualization of how people comprehend texts. According to this framework, there exist individual differences in structure building ability, which have been shown to predict memory, comprehension, metacomprehension, and classroom performance. However, it is unclear what actually underlie these differences in structure building ability. To better understand potential underlying mechanisms, we conducted an exploratory study to identify possible cognitive processes that can predict structure building ability. In particular, we had a large sample of undergraduate participants complete a battery of cognitive tasks designed to tap into the general constructs of suppression, knowledge activation, and building connections across information. Our results indicated that contrary to popular belief (cf. Gernsbacher, Varner, & Faust, 1990), general inhibitory ability (as indexed by Stroop and Flanker performance) is not related to structure building ability. Rather, being able to build connections (as indexed by Ravens, Remote Associates, and Analogies performance) significantly predicted structure building ability.
Email: Khuyen Nguyen, k.nguyen@wustl.edu

(4213)

Task Specificity and Multiple Document Integration. KARYN P. HIGGS, M. ANNE BRITT and JOSEPH P. MAGLIANO, *Northern Illinois University* — Students are often required to complete reading tasks that require them to integrate across multiple documents, which is challenging. Readers have to identify information that is relevant to the task in the individual texts (which are often written for purposes other than that specified in the student's task), and then integrate that information into a mental model. The goal of this study was to explore the extent that task specificity facilitates 1) identifying information that is relevant to the task and 2) integrating that information into a mental model associated with the task. The results of the study demonstrated that the more specific task instructions are, the better able participants were to identify relevant content and then to integrate that content into a coherent mental model. However, the results also indicate that readers integrate content when executing the task, rather than when reading the texts.
Email: Karyn Higgs, khiggs@niu.edu

(4214)

Converging Evidence for the Spontaneous Validation of Text Information. AMALIA M. DONOVAN and DAVID N. RAPP, *Northwestern University* — Skilled reading involves both the comprehension and validation of text content. But need one process occur before the other? Two-stage accounts argue that readers first comprehend information rapidly and automatically, followed by the effortful process of validating the truth of that information. But recent evidence indicates validation can also occur rapidly and automatically, rather than only following comprehension. We sought to replicate these intriguing findings with Richter, Schroeder, and Wöhrmann's (2009) Stroop paradigm task. Participants read true (e.g., Cows produce milk) and false statements (e.g., Cows produce tea) via rapid visual serial presentation, tasked with judging whether the last word of each statement was spelled correctly. Consistent with previous findings, participants made slower spelling judgments after reading false compared to true statements. Validity of the statements, unimportant for making the judgments, exerted an influence during the task. Follow-up examinations must now assess the sensitivity of these spontaneous evaluations during comprehension.
Email: David Rapp, rapp@northwestern.edu

(4215)

The War of the Ghosts: Constructing Situation Models in Multimedia. KRIS GUNAWAN, *Centenary University*, DAVID E. COPELAND, *University of Nevada, Las Vegas* — People construct situation models of the described events during narrative comprehension (e.g., Zwaan & Radvansky, 1998). While most narrative research uses text, narratives can be presented in various multimedia formats, including illustrations. This study examined situation model processing when people are presented with a narrative through text and pictures. People were assigned to a text-only, pictures-only, or text-pictures group and instructed to read and/or view a comic book version of the folktale known as *The War of the Ghosts*

(Bartlett, 1932). They were given an immediate recall test of the story and another after a two day delay; their judgments and response times of processing event changes in the story were also assessed. While people were susceptible to false mental representations and normal forgetting, the findings showed that the formation and retention of situation models were influenced by the contextual cues of the multimedia type.
Email: Kris Gunawan, krisgunawan@gmail.com

(4216)

The Relationship Between Language Specific Skills, Domain General Skills, Inference Generation, and Comprehension. RYAN D. KOPATICH, KEITH K. MILLIS, CHRISTOPHER PARKER, MELISSA RAY and JOSEPH P. MAGLIANO, *Northern Illinois University* — Readers approach any task with a set of skills to support comprehension. These skills are both specific to language (e.g., general reading comprehension proficiency, vocabulary) and domain general resources (e.g., working memory capacity, metacognitive awareness). However, comprehension arises, in part, from inference processes that give rise to a coherent mental model. It is well documented that individual differences in language specific and domain general skills and resources accounts for variability in both the effectiveness of inference and comprehension. However, little is known regarding the relation between aspects of that reader, inference processes, and comprehension. The goal of this study was to assess the nature of the relationships (e.g. moderation, mediation) between language specific skills and domain general resources and inference generation on comprehension outcomes. The results of the study suggest that the impact of language specific skills and domain general resources on comprehension is partially mediated by effective inference processes.
Email: Joseph P. Magliano, jmagliano@niu.edu

(4217)

How Does the Presence or Absence of a Title Modulate Processing of Ambiguous Passages in Individuals With Autism: An Eye Movement Study. VALERIE BENSON, *University of Southampton,* JOHANNA KAAKINEN, *University of Turku,* PHILIPPA HOWARD, *University of Southampton* — Weak Central Coherence (WCC) theory proposes that individuals with Autism Spectrum Disorders (ASD) fail to use contextual information to facilitate their global processing and understanding of ambiguous text. This study investigated behavioural and eye movement measures of typically developing (TD) and ASD adult participants when reading ambiguous passages of text with and without titles. Individuals with ASD showed no differences in comprehension accuracy, gaze duration on target words, or total time spent fixating target words for passages presented with or without a title, indicating that the presence of titles did not facilitate processing, at least at the lexical level, in the ASD group. There was however a difference in total time on target words for TD readers between the titles and no titles conditions. These results suggest that ASD individuals fail to use the contextual information provided by a title to facilitate their reading of ambiguous passages, and provide some support for WCC theory.
Email: Valerie Benson, vb1@soton.ac.uk

(4218)

Specific Relevance Instructions Promote Selective Reading Strategy Compare to General Relevant Instruction in Expository Texts: Evidence From Eye-Tracking Study and Summary Task. INMACULADA ESCUDERO, *Universidad Nacional de Educación a Distancia*, JOSE A. LEÓN, JOSE D. MORENO, LORENA A. MARTÍN and RICARDO OLMOS, *Universidad Autónoma de Madrid*, MARCOS RUIZ, *Universidad Nacional de Educación a Distancia,* ROBERT F. LORCH, *University of Kentucky* — McCrudden and Schraw (2007) described two basic types of relevance instructions that researchers have used to investigate task-induced reading: Specific vs General instructions. Specific instructions typically highlight discrete text elements (e.g., why questions), whereas general instructions highlight broad themes or purposes for reading (e.g. make a summary). The aim to this study was to analyze whether a specific vs general instructions could affect differently way in online reading processing (number of fixations and regressions), as well as off line cognitive processing (summary task). 41 undergraduates were instructed to read six expository texts in one of two instructions. Results revealed that specific instruction promote significant greater number of fixations and regressions, and number of words in the summary task. A significant interaction instruction x relevant information was founded in both measures. These results indicate that the instruction evoke intentions in the reader´s mind being selectively directed to relevant text information.
Email: Inmaculada Escudero iescudero@psi.uned.es, iescudero@psi.uned.es

(4219)

The Role of Explanation Quality in Knowledge Revision. KELSEY WILL, *University of Minnesota*, HALEY VLACH, *University of Wisconsin-Madison*, PANAYIOTA KENDEOU, *University of Minnesota* — The purpose of the current study was to understand the role of texts that refute and explain common misconceptions (i.e., refutation texts), in the generation of quality explanations and determine if explanation quality predicts revision of misconceptions. Participants read refutation and non-refutation texts addressing 10 common misconceptions. Post-test responses written after reading were coded based on quality, accuracy, and source dimensions. Analysis of these responses showed less circularity and uncertainty descriptors and more accuracy and causal connections in the refutation than the non-refutation condition. Scientific authority/text was the most frequent source used to justify the responses across both conditions. Further, these explanation quality indicators explained significant variance in post-test accuracy. Profiles analysis determined three clusters of readers: coherence-building readers, non-coherence building readers,

and promiscuous readers. Together, the results suggest that refutation texts support the generation of quality explanations, which facilitate knowledge revision.
Email: Panayiota Kendeou, kend0040@umn.edu

(4220)

Differing Cognitive Mechanisms of Perspective-Taking in Production and Comprehension: Evidence From Young Adults and Aphasia. ALISON M. TRUDE and NAZBANOU NOZARI, *Johns Hopkins University* — The ability to accommodate an interlocutor's perspective in producing or understanding speech, known as perspective-taking (PT), has shown links to general cognitive processes (e.g., working memory, inhibition). If similar cognitive abilities underlie PT in production and comprehension, we would expect a relationship between PT in the two. We compared behavioral and eye-tracking measures of PT in young adults (Exp 1) and an individual with nonfluent aphasia (Exp 2) in a referential communication task. Exp.1 demonstrated that PT in production and comprehension were correlated with different cognitive mechanisms and different scene-processing strategies. Exp.2 revealed PT deficits consistent with limitations in cognitive resources, rather than lexical retrieval difficulties. Collectively, these results suggest (a) PT in production and comprehension rely on different cognitive processes and abilities, and (b) PT imposes a cognitive load that affects linguistic processes such as word retrieval.
Email: Alison Trude, alisontrude@gmail.com

(4221)

Linguistic Differences in Truthful and False Confessions. LISA S. KEMP and DANIELLA K. CASH, *Louisiana State University* (Sponsored by Janet McDonald) — Previous research has demonstrated that jurors consider a confession to be the most compelling piece of evidence (Kassin, 2012). However, there are multiple documented cases where an innocent suspect has erroneously confessed to a crime that they did not commit. In its most basic form, a confession is either truthful or false (i.e., a lie). We applied text analysis to true and false confessions in criminal cases to see if there were distinguishable linguistic characteristics. These findings were compared to a meta-analysis comparing truthful and deceptive statements obtained in the laboratory (Hauch et al, 2014) and we outline the way such statements vary between real and laboratory scenarios. Additionally, we examined the communicative context through Grice's Cooperative Principle expecting that false confessors would display less ambiguous language and less repetition relative to truthful confessors. Results revealed that false confessors actually repeated more information, while also providing more unique information.
Email: Lisa Kemp, lkemp4@lsu.edu

NEURAL MECHANISMS OF COGNITION II

(4222)

P300 Components in a Three-Stimulus Oddball Paradigm. TROY A. SMITH, LYNN CAMERON, ELIZABETH VILLALOBOS and PHILIP BRUST, *University of North Georgia* — The fact that there are distinct subcomponents of the P300 event related potential is often under appreciated. The P3A is a frontal component that is typically elicited by novel stimuli that are do not require a response. The P3B is a parietal component that is typically elicited by novel stimuli that require an active response such as a key-press. To date, only a handful of studies have examined these subcomponents within the same subjects, and no studies have examined the P3a and P3b with different types of stimuli. Here we report results from a three-stimulus oddball paradigm in which frequent non-target stimuli occur with 80% probability, novel irrelevant stimuli 10%, and novel task-relevant stimuli 10%. Participants completed blocks of this task using both visual stimuli and auditory stimuli. This paradigm allows us to separate the influence of novelty, attention, and memory in the generation of P300 signals.
Email: Troy A. Smith, troy.smith@ung.edu

(4223)

Distinct Neural Resources Support Multitasking Sub-Processes. EMILY CUNNINGHAM, *University of Illinois at Urbana-Champaign*, NATHAN WARD, *Tufts University*, ERIKA K. HUSSEY, ERICK J. PAUL and ARTHUR F. KRAMER, *University of Illinois at Urbana-Champaign* — Two mechanisms thought to underlie multitasking are task-switching and dual-tasking. Here, we examine these processes in a paradigm that parametrically introduces both in the same experimental context. Participants responded to either the case (upper/lower) or identity (vowel/consonant) of letters based cues, while sometimes being directed to count the number of letters of a particular color. Cued task-switching and dual-tasking demands were orthogonally manipulated to create four trial sets (fixed-single; fixed-dual; switch-single; switch-dual) presented in a blocked fMRI design. Comparisons of activation patterns associated with task-switching and dual-task performance suggest these processes may be associated with distinct neural profiles. These neural profiles will be discussed in the context of developing neurostimulation protocols to temporarily alter task-switching and dual-tasking performance and to better understand individual differences in multitasking performance.
Email: Nate Ward, natejohnward@gmail.com

(4224)

Theta and Alpha Oscillations Play Dissociable Roles in Goal-Directed Attention. ANTHONY M. HARRIS, PAUL E. DUX, CAELYN N. JONES and JASON B. MATTINGLEY, *The University of Queensland* (Sponsored by Roger Remington) — Recent studies have characterized distinct oscillatory frequencies associated with feedforward and feedback visual information flow. Theta oscillations have been associated with feedforward signaling, while alpha oscillations have been associated with feedback processes. It remains unclear whether such oscillatory activity is recruited for task-based processing. We investigated the roles of theta (4-8 Hz) and alpha (8-14 Hz) oscillations in human goal-directed visual attention. We had participants respond to a brief target of a particular color among heterogeneously colored distractors. Prior to target onset, we cued one location with a lateralized, non-predictive cue that was either target- or non-target-colored. We recorded

brain activity using electroencephalography (EEG), with the aim of analyzing cue-elicited oscillatory activity. We found that theta oscillations lateralized early and in response to all cues, and this lateralization was stronger if the cue matched the target color, consistent with a feedforward signal enhanced by feature-based prioritization. Alpha oscillations lateralized later, and only in response to target-colored cues, consistent with a feedback signal involved in the allocation of spatial attention.
Email: Anthony M. Harris, anthmharris@gmail.com

(4225)

tDCS Does Not Modulate Response Times in a Visuomotor Vigilance Task. LAUREN L. RICHMOND and JEFFREY M. ZACKS, *Washington University in St. Louis* — Transcranial direct current stimulation (tDCS) is a safe, noninvasive neurostimulation technique that has gained recent popularity. However, the conditions under which tDCS can modulate behavioral performance are not yet well understood. Here, we attempted to conceptually replicate previous tDCS studies showing faster response times (RTs) during anodal stimulation of motor regions compared to sham stimulation. In two studies, anodal stimulation was applied to motor cortex while participants performed a task in which they were asked to press a button as quickly as possible when the timer on screen started to count up. The first study employed a single-session between-subjects design; the second study employed a two-session within-subjects design. In neither experiment was there evidence that tDCS influenced RTs relative to sham. Although anodal tDCS is known to increase motor excitability, our findings suggest that this does not reliably translate to faster responding.
Email: Lauren Richmond, lauren.richmond@wustl.edu

(4226)

Effect of Scene Predictability on the ERPs of Object Recognition. GENEVIÈVE JODOIN, *Université de Montréal*, MATHIEU B. BRODEUR, *McGill University* — Visual scenes facilitate cognitive processes underlying object recognition, although the precise nature of this effect remains unclear. The present ERP study investigates the time course of visual object recognition processes under two facilitative scene effects, namely anticipation and congruity. Nineteen participants responded to objects that could either be easily predicted from their scene or not, and that were either congruent with their scene or not. A posterior negativity, thought to reflect object integration within the scene, emerged earlier for predictable (300 ms) compared to unpredictable (400 ms) objects. The effect of anticipation at frontal sites was a positivity between 400 and 1000 ms. An effect of anticipation that was inverted in polarity was also found posteriorly between 600 and 1000 ms. Interestingly, congruity exerted its influence on the ERP before anticipation. We conclude that anticipation does not modulate early object recognition processes, and occurs only after object-scene congruity has been assessed.
Email: Mathieu Brodeur, mathieu.brodeur@douglas.mcgill.ca

(4227)

Hardwiring: Innateness in the Age of the Brain. GIORDANA GROSSI, *State University of New York - New Paltz* — "Hardwiring" is a familiar term to describe the properties of certain behaviors or brain regions. As its usage has increased exponentially in the past five decade, even in the scholarly literature, the concept appears to have gained a cloak of respectability in scientific discourse. However, its specific meaning is difficult to pinpoint. Here I examine how "hardwiring" has been used in the psychological and neuroscientific literature. The analysis reveals two major themes, once centered around certain purported characteristics of behaviors and brain regions, such as fixedness, the other used to describe these and other characteristics within an evolutionary narrative. Within this narrative, the analysis reveals a considerable degree of overlapping between "hardwiring" and the folk biology concept of innateness (e.g., species typical, unlearned, genetically determined, adaptive, present at birth). Various complications arise from this overlapping, casting doubts on the usefulness and legitimacy of "hardwiring" in scientific discourse.
Email: Giordana Grossi, grossig@newpaltz.edu

(4228)

Neural Decoding of Motor Responses With Bayesian Graphical Models. BETH BARIBAULT and JOACHIM VANDEKERCKHOVE, *University of California, Irvine* — Neural decoding models are most often used to reconstruct a stimulus from neural data from sensory areas. If the neural data come from a motor planning area, decoding principles allow one to instead predict a behavioral response from the neural data. A wide variety of neural decoding methods exist, however, the focus of these methods is typically restricted to predictive accuracy. This is because these methods are general. We introduce a custom decoder implemented as a Bayesian graphical model that both allows for accurate behavioral predictions and allows for many parameters with meaningful interpretations (e.g., response bias) to be estimated at the same time. The decoder model was used to analyze electrophysiological data recorded during an object location discrimination task in which mice made binary motor responses. By using model parameter distributions as the basis for inference, we were able to make statements about the underlying neural process that would not be possible with most traditional decoding methods. We demonstrate how the Bayesian decoder allowed us to gain greater insight into the dynamics of the neural processes underlying observed behavior.
Email: Beth Baribault, bbaribau@uci.edu

REWARD, MOTIVATION AND DECISION MAKING

(4229)

Flexible Biases in Visual Attention Arise From Relative Value Associations. K G. GARNER, DAVID J. KEEP and JANE E. RAYMOND, *University of Birmingham* — How do value-associated stimuli that are persistently present in a scene influence control over goal-directed visual attention to other information? Biased competition theories of attention predict

that the relative, not absolute, associated value of concurrent stimuli in a scene should bias visual processing even before visual targets are specified. Although single unit data from monkey support this, direct evidence of relative value biases in human attention is lacking. Here, participants first viewed arrays with high and/or low value-associated placeholders (500 ms), then brief, predictable spatial pre-cues, followed by a speeded letter search task. Response times were faster for targets presented in the higher versus lower value placeholder when short but not long cue-target delays were used. These findings show that relative reward potential is used to bias visual processing and that, given sufficient time, such biases can be flexibly suppressed when priorities are abruptly changed by alternate information.
Email: K. G. Garner, getkellygarner@gmail.com

(4230)

Anticipation of Monetary Reward Can Attenuate the Vigilance Decrement. ALEX MITKO, MALLORY GROSSO and GUANYU LIU, *VA Boston Healthcare System*, RACHAEL MORRIS, *University of Kent*, JOSEPH DEGUTIS and MICHAEL ESTERMAN, *VA Boston Healthcare System* — Motivation and reward can have differential effects on separate aspects of sustained attention. We previously demonstrated that continuous, incremental reward/punishment during sustained attention improves overall performance, but has no effect on vigilance decrements. One explanation for these consistent vigilance decrements is that motivation decreases as the task progresses because there are less potential future gains/losses. This would predict that keeping future gains/losses consistent throughout the task would reduce the vigilance decrement. In the current study, we examined this possibility by comparing two rewarded conditions: continuous-small loss (CSL) vs. anticipate-large loss (ALL) during a 10-minute go/no-go sustained attention task. Participants began each task with the potential to keep $18. In the CSL version, small monetary losses were accrued continuously throughout the task for each error. However, in the ALL version, participants lost all $18 if they erroneously responded to one target trial that occurred toward the end. Typical vigilance decrements were observed in the CSL version but were reduced in the ALL version, suggesting that a looming large loss can attenuate the vigilance decrement.
Email: Michael Esterman, esterman@gmail.com

(4231)

The Impact of Alcohol Cognitions and Alcohol Contexts on Perspective Taking. JAMES E. CANE, *London South Bank University*, HEATHER J. FERGUSON and PHILIP ULRICH, *University of Kent*, IAN APPERLY, *University of Birmingham* — Alcohol-related cognitions can have a detrimental effect on social interactions even in the absence of alcohol consumption. Over two experiments we examined the impact of alcohol-related cognitions and contexts on perspective taking ability, which is the cornerstone of most social interactions. Experiment 1 (N=89) explored how alcohol-related environments and alcohol urges influence perspective taking. Experiment 2 (N=58) examined whether the presence of alcohol-related objects influences perspective taking. Neither alcohol-related environments nor alcohol urges influenced perspective taking (all ps>.1). However, when alcohol objects were in shared view and other objects were in privileged view (i.e. behind an avatar but available to the participant) participants were slower to report objects from their own perspective (p<.05). These findings indicate that the avatar's gaze and the salient nature of alcohol objects combined to draw and hold participants' attention towards common ground. Implications for the role of attention in perspective taking will be discussed.
Email: James Cane, j.e.cane@lsbu.ac.uk

(4232)

Negotiating Your Way to Less Work – and to Worse Relationships. EINAV HART and MAURICE SCHWEITZER, *University of Pennsylvania* — Does negotiating one's wage lead to better, or worse, work ethic? Do negotiations increase one's involvement and effort in the subsequent work task? Or do they increase competitiveness, and diminish cooperative effort? Using an experimental real-effort paradigm, we examined employees' work effort after they negotiated their wage, or after they were told of a pre-set wage. Negotiations decreased the time employees spent working, and the quality of work produced. The effect of negotiations was mediated by employees' perceptions of rivalry. Our results imply that negotiations decrease the kindness of a high wage, turning the relationship more contentious. This, in turn, diminishes employees' desire to reciprocate and work harder. We shed light on the potentially harmful consequences of negotiating work and service contracts.
Email: Einav Hart, einavi@gmail.com

(4233)

Danger That Lurks in Brilliance: Does Perceived Academic Self-Efficacy Lead to Unethical Decisions? REHA OZGURER and SUMEYRA TOSUN, *Suleyman Sah University* — Perceived self-efficacy influences the ethical decisions of the individuals in the face of the ethical dilemmas. Two opposing results showed that self-efficacy may result in more ethical decisions (Kuo & Hsu, 2001) or more unethical decisions, especially if it was above the certain threshold (Staring & Breteler, 2004). Focusing on perceived academic self-efficacy which is a specific domain of this concept, this study aimed at revealing the possible influences of the academic self-efficacy on ethical decision making. In this study, between-subject design was used and negative and positive feedbacks were given to the 44 participants to increase or decrease their academic self-efficacy after they completed an academic test. Then, the participants were asked to complete the unethical decision making scale which included eight hypothetical scenarios and the average scores of the participants in the scale were calculated. The results showed that there was no significant influence of perceived academic self-efficacy on ethical decision making. On the other hand, there was a significant interaction of the life goals of the participants and the feedbacks given to them on their ethical decision scores. This study is important since it sheds light on the reasons of the unethical decisions and acts of the people with high academic status who are expected to decide ethically.
Email: Reha Ozgurer, rozgurer19890303@hotmail.com

(4234)

Effect of Incentives on Choice Reaction Time During a Neurocognitive Assessment: The Risk of Unintentional Sandbagging on ImPACT. VINCENT T. YBARRA, *The University of Oklahoma*, PHILIP SCHATZ, *Saint Joseph's University*, EDWARD T. COKELY, *The University of Oklahoma* — We investigated the effects of external motivation on neurocognitive test performance. Seventy university student volunteers were randomly assigned to different groups. The participants in the reward condition were told for every correct answer, a question would be taken off the test, thus making it shorter. The participants in the punishment condition were told for every incorrect answer, a question would be added to the test, thus making it longer. All incentives were sham, as the tests in both the reward and punishment conditions were identical to control except for what was told before testing. Participants completed the tablet ImPACT test. Univariate ANOVA's revealed significantly slower choice reaction time for punished participants compared to the control condition via the Color Match task [$F(2,67) = 3.49$; $p = .031$]. Univariate ANOVA's revealed significantly lower perceived performance with punished participants compared to the control condition [$F(2,67) = 3.41$; $p = .030$]. This study is the first empirical validation that punishment while conducting ImPACT affects choice reaction time. This is important information, as a protocol must be made to control for/observe the effect of extraneous factors during a neurocognitive assessment, which has been an overlooked concern for concussion diagnostic tests.
Email: Vincent T. Ybarra, Vincent.Ybarra-1@ou.edu

(4235)

Differentiating Spatial and Temporal Motivation Gradients in Dynamic Approach and Avoidance Goal Pursuit. TIMOTHY BALLARD and ANDREW NEAL, *University of Queensland* (Sponsored by Simon Farrell) — Spatial and temporal motivation gradients refer to the increase in motivation as one nears a goal state or deadline respectively. These gradients are both assumed to be steeper for avoidance than approach goals. Although the gradients are attributable to psychologically distinct processes, they have been treated as a common construct. We disentangle these gradients in an experiment in which people make prioritization decisions whilst pursuing either two approach or two avoidance goals. We manipulate the strength of the gradients by varying the distance to the goal state and the deadline, and examine the effects of these manipulations on goal prioritization. Our results suggest that for approach goals, the temporal gradient is steeper than the spatial gradient. For avoidance goals, the spatial gradient is steeper than the temporal gradient. These findings suggest that more work is required to understand the processes underlying the effects of space and time on motivation.
Email: Timothy Ballard, t.ballard@uq.edu.au

(4236)

Do Ways of Knowing Predict Aspects of Identity? KATHLEEN M. GALOTTI, *Carleton College* — The Attitude Toward Thinking and Learning Scale (Galotti, et al., 1999) presents statements exemplifying either a connected knowing (CK) or separate knowing (SK) epistemological orientation. SK involves an analytic, detached, and critical orientation to knowledge, while CK encompasses a more contextual, holistic, empathic approach. The instrument has shown gender-related differences in a variety of published studies, with the typical finding that males have slightly higher SK than CK scores, and females showing significantly higher CK than SK scores. My research team sought to establish whether CK and/or SK predict one's engagement with different intellectual activities, both ones typically carried out in or for a class (e.g., proving a theorem, learning about another culture) or done independently (e.g., playing a role playing game). We also examined whether these scores predicted the degree to which participants felt their performance on the task would reflect on their skill or core aspects of their identity. The sample consisted of 200 undergraduates enrolled in four-year colleges and universities across the US. Results are discussed in terms of the Ways of Knowing framework (Belenky, et al., 1986).
Email: Kathleen M. Galotti, kgalotti@carleton.edu

(4237)

Caught in the Middle: The Implicit Appeal of Political Partisan Conspiracies for Non-Partisan Responders. CHELSEA K. JOHNSON and NICHOLAS D. DURAN, *Arizona State University*, STEPHEN P. NICHOLSON, *University of California Merced* — Political party identification has an immense influence on shaping individual attitudes and processes of reasoning, even to the point where otherwise knowledgeable people will endorse political conspiracies that support one's political in-group and simultaneously disparages an out-group. Although recent research has explored this tendency among partisans, less is known about how Independents, i.e., without any partisan leaning toward Republican/Democrat, respond in comparison. One possibility is that Independents are neutral or equally divided between partisan views, and thus partisan-directed political conspiracies hold minimal appeal. Conversely, Independents may be just as susceptible to motivated reasoning biases as Republicans and Democrats. In this study, we explore these possibilities by bypassing explicit responses and evaluating the implicit appeal of conspiracies using an action dynamics (mouse-tracking) approach. We found evidence that both Independents and self-identified partisans exhibit hidden motivations to endorse right- and left-wing conspiracies, and in some cases, such biases were greater for Independents.
Email: Nicholas D. Duran, nicholas.duran@asu.edu

(4238)

Loss Aversion Reflects Information Processing, not Bias: A Drift Diffusion Model Study. SUMMER N. CLAY, *Claremont Graduate University*, ALISON HARRIS, *Claremont McKenna College*, JOHN A. CLITHERO, *Pomona College*, CATHERINE L. REED, *Claremont McKenna College* — Defined as increased sensitivity to losses, loss aversion is often conceptualized as a cognitive bias. However, findings that loss aversion has an attentional and/or emotional component suggest that it may instead reflect differences in information processing. To distinguish these alternatives, we applied the drift diffusion model (DDM) to choice and response time data in a card

gambling task with unknown risk distributions. Loss aversion was measured separately for each participant (N=104). Dividing the participants into terciles by loss aversion lamba, we found that the most loss-averse group showed a significantly lower drift rate than the other two groups, indicating overall slower uptake of information. In contrast, neither the starting bias nor the threshold separation (barrier) varied by group, suggesting that decision thresholds are not affected by loss aversion. These results shed new light on the cognitive mechanisms underlying loss aversion, consistent with an account based on information processing speed.
Email: Cathy Reed, clreed@cmc.edu

(4239)

Rational and Emotional? How Cognition and Feelings Influence Moral Decision Making. BRANDY N. TIERNAN, JULIAN WRIGHT, JOHN S. LANGFORD, JAMES G. HEATHERLY, HAYDEN REECE, ANNA GRISHAW and JACKMAN CORLEY, *University of the South* — Increased cognitive effort is required to evaluate a scenario and to make a utilitarian decision in order to maximize benefits and minimize costs. Affective processes and cognitive control processes enable individuals to respond efficiently to moral dilemmas that induce conflict and/or are incongruent with personal and social values. We examined whether emotional primes influence one's ability to judge the appropriateness of a decision with ease, depending on the type of dilemma. Participants read and responded to personal moral dilemmas, impersonal moral dilemmas, and non-moral dilemmas. Each response was preceded by either a positive, negative, or neutral prime word. The results revealed an interaction between emotional prime type and dilemma type. Emotionally salient primes lead to decreased reaction times for judgments related to personal moral dilemmas, whereas reaction times for judgments related to impersonal moral dilemmas increased. These findings demonstrate emotion differentially affects judgment reaction time depending on the type of dilemma. We also discuss a follow up procedure that will employ EEG/ERP methods to observe changes in brain activity related to emotional primes and moral judgments.
Email: Brandy Tiernan, bntierna@sewanee.edu

(4240)

Aging and Adaptive Speed-Accuracy Settings in Rapid Incentivized Decisions. SEBASTIAN HORN, WOUTER VAN DEN BOS, ROBERT LORENZ and TIMOTHY J. PLESKAC, *Max Planck Institute for Human Development* — Even in the most elementary decision tasks, older adults' response times are substantially longer than younger adults'. One line of research suggests that older adults are more reluctant to commit errors and set overly cautious decision criteria. In this study, we examined the relationship between such speed-accuracy criterion settings and structural brain connectivity in younger and older adults in a rapid incentivized decision task. Previous investigations of the relationship used paradigms with fixed trial numbers and instructional speed-accuracy manipulations. In such task ecologies (without clear time-on-task limits), adaptive decision makers may not be motivated to select efficient criteria that maximize their gains per time. In contrast, the present study made reward-rate optimization an explicit goal and offered a standard for success in meeting this goal. Adaptivity of younger and older adults' decision styles and findings from drift-diffusion modeling and structural brain imaging will be discussed.
Email: Sebastian Horn, Sebastian.Horn@mpib-berlin.mpg.de

(4241)

Medial Frontal ERPs: Feedback, Reward Processing, and the Self? ROBERT WEST, *DePauw University*, STEPHEN ANDERSON, *Iowa State University* — ERPs have been used to study the neural correlates of feedback processing related to gains and losses. The feedback negativity/reward positivity distinguishes gains from losses between 250-400 ms after feedback is delivered. This ERP component is often associated activity in the anterior cingulate/medial frontal cortex. In the current study, we examined the effect of agency on medial frontal ERP activity in a simple gambling task wherein either the subject or the computer made a choice on each trial and the subject won or lost 5 cents. There were two distinct patterns of medial frontal ERP activity. The first distinguished wins from losses when the subject made a choice. The second distinguished player choice trials from computer choice trials, regardless of the outcome. These findings reveal that the reward positivity is not generally related to reward processing, but instead may be limited to instances where one makes an active choice.
Email: Robert West, robertwest@depauw.edu

FUNDING FROM US DEPARTMENT OF EDUCATION

(4242)

Funding Opportunities for Cognitive Psychologists Through the Institute of Education Sciences. ERIN HIGGINS, *Institute of Education Sciences* — The Institute of Education Sciences provides funding support for researchers to apply theories and recent findings from psychological science to education practice through the National Center for Education Research and the National Center for Special Education Research. For example, through the Cognition and Student Learning topic within the Education Research Grants program, the Institute supports research that capitalizes on our understanding of how the mind works to inform and improve education practice in reading, writing, mathematics, science, and study skills. Erin Higgins, the program officer for the Cognition and Student Learning topic, will be available to answer questions and talk to attendees about their proposed work at the Friday night and Saturday at noon poster sessions.
Email: Erin Higgins, Erin.Higgins@ed.gov

DIGITAL CONTENT EDITOR POSTER

(4243)

The Psychonomic Society and Social Media: Putting the Public Into Science and Making Science Public. STEPHAN LEWANDOWSKY, University of Bristol (Digital Content Editor), and the PSYCHONOMICS DIGITAL TEAM — The Psychonomic Society has been extending its digital presence for

the last two years, and our blog posts at www.psychonomic.org have gathered a growing readership. Two "digital events" carried the scientific discussion from special issues of the Psychonomic Bulletin & Review into the public domain, and some of the Society's research has elicited increasing media interest. At a time when science and scientists are increasingly subjected to scrutiny by the public, politicians, and other stakeholders, the Society is committed to provide the public with information about its research and to solicit public commentary. Join the digital team at our poster to contribute to the discussion and to learn more about the Society's engagement on digital and social media.

Email: Stephan Lewandowsky, Stephan.Lewandowsky@bristol.ac.uk

POSTER SESSION V

Saturday Evening
Hynes Convention Center, Grand Ballroom A-C
Viewing 4:00-7:30, Author Present 6:00-7:30

AUDITION

(5001)

The Interaction of Perceptual Dimensions in Auditory Category Learning. CASEY L. ROARK and LORI L. HOLT, *Carnegie Mellon University* — The dual systems theory of category learning posits that category distributions requiring selective attention to a single dimension and those requiring integration across dimensions engage distinct neural systems. Our goal was to examine the influence of the dimensions defining categories on learning. Participants trained with feedback to learn auditory categories that required either selective attention to one of two acoustic dimensions, or integration across the dimensions. Across training accuracy, generalization to novel exemplars, and decision bound computational models that approximate strategy use, there was a bias to integrate across dimensions rather than to selectively attend to either dimension that affected performance in a manner unexpected by the dual systems theory. But, this bias to integrate was eliminated when the category boundary was rotated to reflect a negative relationship between dimensions. These findings demonstrate the importance of understanding perceptual, as opposed to physical, dimensions and their interaction during category learning.
Email: Casey L. Roark, croark@andrew.cmu.edu

(5002)

An Auditory Bias for Short-Short-Long Rhythms. ANDREW J. LOTTO, *University of Florida*, DONALD G. TRAUT, *University of Arizona* — Previous research has demonstrated that humans have biases to hear particular rhythms or groupings for sequences of tones such as hearing tones varying in intensity as *loud-quiet* instead of *quiet-loud* and hearing tones varying in duration as *short-long* instead of *long-short*. The current work was based on the observation that patterns of *short-short-long* (SSL) are common in music and advertising jingles. The question is whether the prevalence of these patterns may be due in part to a bias to perceptually organize auditory events that vary in duration into SSL. In an initial experiment, we presented listeners with steady state tones that varied in length with 2 short tones (100 ms) and 1 long tone (200 ms). Three sequences were created that started with each of the possible orders (SSL, LSS, SLS), but an amplitude ramp at the onset and offset of the sequence obscured the starting order. Participants were asked to identify the order of the sequence from the three possibilities (SSL, LSS, SLS). Overwhelmingly, listeners reported hearing SSL for all of the orders (70% of responses). These results demonstrate a strong bias to hear sequences as SSL, which may relate to its prevalence in music and advertising.
Email: Andrew Lotto, andrew.lotto@gmail.com

(5003)

The When and How of Sound Discrimination. MATTSON W. OGG, L. ROBERT SLEVC and WILLIAM J. IDSARDI, *University of Maryland - College Park* — The detection and identification of auditory objects is a fundamental task for listeners and, compared with vision, presents a unique problem since the physical features required to recognize attended or "streamed" targets must develop over time. Thus, the questions of *how* and *when* auditory objects are identified are fundamentally linked. We conducted two target detection studies where natural speech, music, and environmental tokens were gated in duration from 12.5 to 200 ms. Discrimination was reliable by 25 ms and in most cases at 12.5 ms. Speech discrimination relied strongly on sound onsets (along with spectrotemporal and noise features): stimuli with consonants, possessing highly variable onsets, were reliably discriminated later than vowels. Attack features were also crucial for discriminating music and environmental sounds, as were brightness and noisiness for each category, respectively. Our results identify specific acoustic features that underpin the ability to rapidly discriminate auditory objects early in auditory processing.
Email: Mattson Ogg, mogg@umd.edu

(5004)

Auditory Perceptual ERP Effects of Spatial Release From Informational Masking. BENJAMIN H. ZOBEL, RICHARD L. FREYMAN and LISA D. SANDERS, *University of Massachusetts Amherst* — EEG was recorded while listeners detected vocoded words (targets) presented with vocoded two-talker speech (maskers). Targets and maskers were always presented from the same location, but identical copies of the maskers were sometimes also presented from another location with a lead time of 4 ms. Although this latter arrangement adds masking sound, it produces the precedence effect for maskers and the perception of spatial separation between targets and maskers. Consistent with previous research, target detection threshold was reduced by more than 20 dB with the spatial cue of the precedence effect, suggesting substantial release from informational masking. Further, targets presented at the same level elicited clear auditory evoked potentials only in the precedence effect condition. Otherwise, target onsets largely failed to elicit the so-called obligatory auditory ERP response. The perception of spatial separation between targets and maskers dramatically facilitates the representation of target sounds at early stages of auditory processing.
Email: Benjamin H. Zobel, bzobel@psych.umass.edu

(5005)

Feel the Bass: Effects of Auditory and Tactile Bass Stimulation on Musical Groove and Movement. MICHAEL J. HOVE and STEVEN A. MARTINEZ, *Fitchburg State University* — Bass frequencies in music have recently been associated with enhanced time perception, groove ratings ('the

musical quality that compels movement'), and movement. The exact mechanisms remain unclear. Here we examine the effects of musical bass presented to auditory and tactile modalities. Participants (n=22) listened to ten high-groove musical excerpts. Each excerpt was presented twice—once over sound-isolating earphones (auditory condition) and once over the earphones plus a subwoofer that stimulated the body (auditory + tactile condition). Participants tapped their finger along with each excerpt; we recorded body movement; and participants rated each excerpt. Results showed that the auditory+tactile condition yielded higher ratings of groove and enjoyment. Participants also tapped harder (but not more accurately) in the auditory+tactile condition. Findings suggest that bass felt in the body produces a multimodal auditory-tactile percept that is arousing and might promote movement though the close connection between tactile, kinesthetic, and motor systems.
Email: Michael Hove, michaeljhove@gmail.com

(5006)

The Game Sounds the Same: Change Deafness, Divided Attention, and Sports Expertise. JOHN G. NEUHOFF and KATHARINA S. BOCHTLER, *The College of Wooster* — We examined change deafness using real-world radio broadcasts of sporting events. In Experiment 1, participants heard clips from the home team broadcast of an American football game that was switched midway to the away team broadcast (different announcers). Over 90% of participants failed to notice the change, but this rate fell to 68% when listeners were directed to listen for a change. Experiment 2 presented a hockey broadcast with the same home/away switch and revealed a significant decline in change deafness among three groups who were respectively instructed to "just listen" (83%), "listen for a change in announcer ***or*** a goal scored" (divided attention, 60%) and "listen for a change in announcer" (directed attention, 35%). In Experiment 3, the broadcast changed from a hockey game to a basketball game. Over 50% still failed to notice the switch, and there was a significant negative correlation between sports expertise and change deafness. The results confirm that divided attention increases change deafness even when participants are directed to listen for a change and that expertise is a factor in detecting unexpected auditory change.
Email: John G. Neuhoff, jneuhoff@wooster.edu

(5007)

Effects of Two Perceptual Learning Tasks on Perception of Shape From Sound. PATRICK A. CABE, *University of North Carolina - Pembroke*, JOHN G. NEUHOFF and KATHARINA S. BOCHTLER, *College of Wooster* — Previous work demonstrated human ability to discriminate ellipse shapes using friction-generated sounds made by ellipses rotating against a contactor, but with substantial inter- and intra-individual variability. Perceptual learning manipulations can improve perceptual performance, but empirical comparisons of perceptual learning tasks are rare. We studied the effects of perceptual learning on ellipse shape-from-sound perception, in large samples (n = 105, n = 101). We used two methods (multiple-choice; scalar judgment), both with a single rotation speed. After training with feedback on judgment accuracy, we tested participants in a no-feedback transfer task, under either the same or different rotation speeds. Performance was quite variable in both training and transfer tests (actual vs. estimated shape correlation magnitudes, .00 to > .9), with evidence of improvement in some, but not all, participants. However, under the conditions we used, neither training method produced substantially better improvement in judgment accuracy.
Email: Patrick Cabe, patrick.cabe@uncp.edu

(5008)

Questioning the Automatic Cooperation Between Vision and Hearing. LAURA M. GETZ and MICHAEL KUBOVY, *University of Virginia* — Previous research has found that there is an automatic association between auditory and visual dimensions such as the height a pitch and the size of an object. From this, researchers have assumed that such audiovisual correspondences are the result of bottom-up processing. In a series of studies using a modified speeded classification task, we sought to separate bottom-up and top-down effects. We asked participants to pair audiovisual dimensions in "compatible" (e.g., high pitch/small circle) and "incompatible" (e.g. high pitch/large circle) conditions. We compared reaction times across conditions and found that in most cases participants pair the dimensions either direction with similar speed and accuracy. We conclude that audiovisual correspondences either jointly rely on bottom-up and top-down processing or are solely the result of top-down effects such as task instructions. We thus strongly question the assumption of automaticity prevalent in the cross-modal correspondence literature.
Email: Laura Getz, lauragetz@virginia.edu

(5009)

McGurk Effect in Perceiving Gender Through Voice Characteristics. ZEHRA F. PEYNIRCIOGLU, JOSHUA TATZ, WILLIAM BRENT and JORDAN R. WYATT, *American University* — Demonstrations of non-speech McGurk effects are rare and sometimes not considered true analogues. We presented videos of males and females singing a single syllable on the same pitch and asked participants to indicate the true range of the voice — soprano, alto, tenor, or bass. For one group of participants the gender shown on the video matched the gender of the voice heard and for the other group they were mismatched. Soprano or alto responses were interpreted as "female voice" decisions and tenor or bass responses as "male voice" decisions. Identification of the voice gender was 100% correct in the preceding audio-only condition. However, whereas performance was also 100% correct in the matched video/audio condition, it was only 31% correct in the mismatched video/audio condition. Thus, the visual gender information overrode the voice gender identification, showing a robust non-speech McGurk effect.
Email: Zehra Peynircioglu, peynir@american.edu

MUSIC COGNITION

(5010)

Does Musical Training Affect Emotion Processing Abilities? Evidence for Enhanced Levels of Empathy in Amateur Musicians. NINA FISHER, REINER SPRENGELMEYER and INES JENTZSCH, *The University of St Andrews* — Research suggests that we use music to regulate our emotions over the short-term, however it is not known whether music can alter general emotion processing abilities in the long term. Two cross-sectional studies exploring the link between musical activity and emotion processing abilities including emotion recognition, empathy, and general well-being in 203 adults with varying levels of musical training, are presented. Musically trained participants did not significantly differ from non-musicians in measures of emotional well-being or in their ability to recognise emotional information in facial or gestural stimuli. Musical practice time was positively correlated with levels of empathy and auditory emotion recognition. The potential link between music and empathy supports theory that suggests the mirror neuron system is activated and mental state attribution engaged during musical activity. It is suggested that musical activity could potentially train these skills with transfer effects to higher order processes beyond the musical domain.
Email: Nina Fisher, nkf@st-andrews.ac.uk

(5011)

That Note Sounds Wrong! Age-Related Effects in Processing of Musical Expectation. ANDREA R. HALPERN, *Bucknell University*, IOANNA ZIOGA, MARTIN SHANKLEMAN and JOB LINDSEN, *Goldsmiths University of London*, MARCUS T. PEARCE, *Queen Mary University of London*, JOYDEEP BHATTACHARYA, *Goldsmiths University of London* — Part of musical understanding and enjoyment stems from the ability to accurately predict the next note of a melody. Selective violation of expectations can add to aesthetic response but radical violations may be disliked or not comprehended. We investigated whether a lifetime of exposure to music would enhance their reaction to unexpected endings to unfamiliar melodies. Musically untrained older and younger adults listened to melodies that had expected or unexpected ending notes, according to Western music theory. Ratings of goodness-of-fit were similar in the groups, as was EEG response to the note onset (N1). However, in later time windows (P200 and LPC), the amplitude of a response to unexpected vs. expected endings was both larger in older adults, corresponding to greater sensitivity, and more widespread in locus, consistent with a dedifferentiation pattern. We conclude that older adults refine their understanding of this important aspect of music throughout life, supported by changing patterns of neural activity.
Email: Andrea Halpern, ahalpern@bucknell.edu

(5012)

Sing a Song About Sharing: Music Making and Preschoolers' Sharing Behavior. SARA L. BECK and JOHN J. RIESER, *Vanderbilt University* — Children's media relies heavily upon musical sequences to convey prosocial messages, but little is known about the conditions under which children's social behavior is most likely to be influenced by music. Recent research has shown that joint music making can result in increased cooperative behavior among preschoolers (Kirschner & Tomasello, 2010) and that moving to a beat can foster increased prosocial behavior in infants as young as 14 months (Cirelli, Einarson, & Trainor, 2014). No studies to date have examined the impact of song lyrics on children's behavior. We investigated 4 and 5-year-olds' sharing behaviors following one of four experiences: engaging in joint singing and movement to a novel song with either prosocial or neutral lyrics, and engaging in joint non-musical play with either prosocial or neutral content. Analysis on the first two conditions collected (music/prosocial lyrics and play/neutral lyrics) shows that children in the music/prosocial condition share more readily than those in the play/neutral condition ($t(21)=-1.891$, $p=.05$). Data collection is underway for the other two conditions, which will enable us to examine the unique contribution of lyrics in facilitating prosocial behavior.
Email: Sara Lynn Beck, sara.l.beck@vanderbilt.edu

(5013)

Vocal Control When Singing a Single Note Is Not the Same as When Singing a Musical Phrase. LINDSAY A. PLATER, JUSTEENA ZAKI-AZAT, NICHOLE E. SCHEERER and JEFFERY A. JONES, *Wilfrid Laurier University* (Sponsored by Naseem Al-Aidroos) — Singing requires precise control of the vocal articulators to achieve a desired vocal pitch. Studies have demonstrated that compensatory responses are produced when participants' auditory feedback regarding their vocal pitch is shifted upwards or downwards while they produce a vowel. Although studies have investigated responses during single vowel productions, little research has focused on musical phrases in order to investigate the role of musical context. We asked participants to sing single notes (no-context blocks), and the song "Happy Birthday" (context blocks). Participants' auditory feedback was shifted downwards by 100 cents (one semitone) and fed back to them in real time. Results indicate that the responses elicited by the feedback perturbations were larger, and peaked sooner, when they occurred during the production of a musical phrase than when they occurred during the production of a single note. These results indicate that the vocal motor control system integrates auditory feedback differently when singing a musical phrase compared to when singing a single note.
Email: Lindsay Plater, plat2640@mylaurier.ca

(5014)

Distinguishing Syntactic Violations and Ambiguities in Language and Music: A Neurophysiological Study. CAITLIN Y. TING, RON J. BECK, CARRIE N. JACKSON and JANET VAN HELL, *Pennsylvania State University* — The Shared Syntactic Integration Resource Hypothesis proposes the same processing resources are used for syntactic processing in language and music (SSIRH; Patel, 2003; 2008). Supporting this hypothesis, Patel et al. (1998) observed a brain component typically associated with syntactic processing in language (i.e., P600) in response to syntactically manipulated chord progressions. However, Featherstone et al. (2013) also observed

a frontal negativity (i.e., N500) in response to syntactically manipulated chord progressions. We examined whether the choice in syntactic structure can help explain the multiple components previously observed. Participants listened to sentences and chord progressions containing syntactic violations and ambiguities while event-related potentials were recorded. Participants showed the P600 for language violations, but did not show the predicted P600 for language ambiguities. Furthermore, participants showed an N500 for music violations, but no particular brain component for music ambiguities. These results suggest that it is important for theoretical models to distinguish between syntactic ambiguities and violations in language and music, which is not captured by the SSIRH.
Email: Caitlin Ting, caitlin.y.ting@gmail.com

(5015)

Language and Music: Effects of Task Demand on Shared Processing. ERICA R. KNOWLES, *Berklee College of Music*, PATRICK C.M. WONG, *The Chinese University of Hong Kong* — The past decade has seen a focus on whether shared aspects between language and music result in the use of common neural resources. Research supports both sides of the debate, for overlap and for significant non-overlap of the two domains. A major difference between the diverging conclusions is task used. The present study considered effects of task demands and domain-specific features of the input using an AGL generalization procedure in order to provide insight into the overlap argument. Overall, it was found that between-domain generalization occurred during an implicit task in that only those in the music condition were able to successfully generalize to novel musical-tone based strings whereas generalization was found both within-domain and between-domain during an explicit task. The results of the present study suggest that reliance on neural resources may be modulated by both the domain-specific constraints of the input and task demands given.
Email: Erica R. Knowles, eknowles@berklee.edu

(5016)

Where's the Key? A Test of Octave Equivalence in Recognition Memory for Melodies. ABIGAIL L. KLEINSMITH and W T. NEILL, *University at Albany, State University of New York* — Kleinsmith et al. (2013 Psychonomics) demonstrated a key-distance effect on recognition of transpositions of studied melodies: Target melodies were discriminated from foils more easily, the closer in pitch height to the originally studied keys. Is this key-distance effect due to pitch-specific or pitch-class (octave-equivalent) representations in memory? In the present experiment, participants were familiarized with a melody in two keys (C, D), and then tested on recognition of that melody in keys of C, C#, D, G and C an octave above the original key. Among new keys, discriminability (d`) was worst for the most distant, yet "octave equivalent" key of C, while recognition in the physically closest (but harmonically unrelated) key of C# was comparable to the originally studied keys. The results imply that the key-distance effect reflects pitch-specific, and not class-specific, representations in memory. As such, these results contradict assumptions of many Western musicians and music theorists.
Email: Abigail L. Kleinsmith, akleinsmith@albany.edu

(5017)

Individual Differences in Pitch Memory Affect Musical Preferences. ALEKSANDRA SHERMAN and ROUNAK MAITI, *Occidental College* — Prior work has demonstrated that individual's visual working memory (VWM) is associated with art preferences, such that individuals with higher VWM appreciate more visually complex artworks than those with lower VWM (Sherman et al., 2015). Here, we investigated the extent to which pitch memory influences individual's music preferences. Research suggests that musically-'naïve' individuals' complexity preferences follow an inverted-U shape (Berlyne, 1975). We hypothesized that the peak of this inverted-U would shift as a function of pitch memory. Participants rated fifty ~15-second music excerpts ranging in style, completed a pitch memory task (after Deutsch, 1972), and a 2-back VWM task. Our results demonstrate a significant correlation between peak preferred complexity and pitch memory, such that individuals with higher pitch memory enjoyed more acoustically complex music (defined as the Shannon entropy) than individuals with lower pitch memory. Our result highlights the interaction between formal features and perceptual capacity in shaping music appreciation.
Email: Aleksandra Sherman, asherman@oxy.edu

(5018)

Vocal Pitch Production Accuracy of Steady Tones and Bends. JAMES T. MANTELL, ZOEY FORRESTER-FRONSTIN, MARY K. MCCARTHY and KELSEY P. HANCOCK, *St. Mary's College of Maryland* — The song stimuli utilized in vocal production research tends to be composed of single steady tones or steady tone sequences. Traditional pitch accuracy analyses examine note-central segments while ignoring pitch content during the initial and final segments of each produced tone. This within-subjects experiment compared the accuracy with which occasional singers imitated single tones that varied in tone stability. Nineteen college students imitated synthetic vowel tones that were either steady or contained a single bend at the beginning or end of the tone. Bends varied in duration (200 or 500 ms), direction (upward or downward), and pitch magnitude (1 or 2 semitones). Produced pitch vectors were compared with analogous stimulus vectors to permit analysis of pitch accuracy across entire tones. We hypothesized that bend accuracy depends on target pitch such that upward bends are imitated best when the target pitch is closer to the top of one's vocal range.
Email: James T. Mantell, jtmantell@smcm.edu

(5019)

Spontaneous Production Rates Are Similar Across Motor Tasks With Comparable Acoustic Outcomes. REBECCA SCHEURICH, ANNA ZAMM, CURTIS BOGETTI and CAROLINE PALMER, *McGill University* — Spontaneous production rates in music, speech, and walking occur in

the absence of external cues; these rates may reflect natural frequencies at which limb movements are optimally efficient. Less is known about the consistency of these rates across different motor tasks with similar perceptual outcomes. The current study investigated spontaneous production rates across tasks of different motor complexity with similar acoustic outcomes: piano performance and rhythmic tapping. Pianists were recruited to perform familiar melodies with one hand (multiple fingers) and to tap the rhythms of the same melodies (one finger) on an electronic keyboard at a comfortable rate. Results showed that spontaneous production rates were highly correlated within individuals across melodies, and did not differ across piano performance and tapping tasks. These results suggest that spontaneous production rates may reflect task-general timing mechanisms.
Email: Rebecca Scheurich, rebecca.scheurich@mail.mcgill.ca

NUMERICAL COGNITION

(5020)

The Role of Space in Complex Mathematics: Stable Grounding or Soft-Assembled Skills? TYLER MARGHETIS, ROBERT L. GOLDSTONE and DAVID LANDY, *Indiana University* — Do automatic number-space associations (SNAs) ground higher mathematics (Lakoff & Núñez, 2000; Hubbard et al, 2005)? While "higher" (/"lower") numbers facilitate higher (/lower) responses (Ito & Hatta, 2004), such SNAs seldom correlate positively with advanced mathematical skills (e.g., Cipora & Nuerk, 2013), suggesting that SNAs may be epiphenomenal. Another possibility is that, rather than playing a stable role, spatial processes are soft-assembled to support varied functions. To investigate the task-specificity of spatial processing, we presented participants with equations (e.g., x + 2 = 5) using Graspable Math (GraspableMath.com), in which terms are dragged around with a mouse as if they were objects. Participants either solved the equation or found the largest/smallest number. Greater numbers were clicked *higher* than lesser numbers. In the Solving task, however, this spatial deflection was dampened — evidence that SNAs are situational and task-specific. We suggest that, with more complex forms of mathematical reasoning, space may be redeployed from representing magnitude to encoding algebraic relations.
Email: Tyler Marghetis, tmarghet@indiana.edu

(5021)

How Do You Count? Cognitive Processing Systems of Enumeration. PAUL M. GARRETT and ALEXANDER THORPE, *The University of Newcastle*, DAVID LANDY, *Indiana University*, JOSEPH HOUPT, *Wright State University*, AMI EIDELS, *The University of Newcastle* — The ability to quantify or *enumerate* sets of items, is basic to our everyday experience. For example, choosing the queue with the least amount of people at airport security will save you both time and hassle. Typically, small sets of items (i.e., queues) are enumerated through one of two processes: *subitizing*, for the rapid and effortless enumeration of items one to four, and *counting* for the slow and accumulative enumeration of larger item sets. The current study investigates how these two forms of enumeration are integrated by the human cognitive system. Using an advanced mathematical-modelling framework termed *Systems Factorial Technology*, we assessed three fundamental properties of system processing: Architecture (parallel vs. serial), stopping rule (exhaustive vs. minimum time processing) and workload capacity. Our findings provide insight into how the human brain integrates numerical information, and the disparity between systems of subitizing and counting.
Email: Paul Garrett, paul.garrett@uon.edu.au

(5022)

Alerting Cues Enhance the Subitizing Process. YARDEN GLIKSMAN, *Ben-Gurion University of the Negev*, NOAM WEINBACH, *Stanford University*, AVISHAI HENIK, *Ben-Gurion University of the Negev* (Sponsored by Yoav Kessler) — Enumeration of elements differs as a function of their range. Subitizing (1-4) is consider to be a pre attentive process. In contrast, small estimation (5-9) is a less precise linear process. However, recent studies found that when attentional resources were occupied elsewhere, the subitizing process was impaired. In the current study, we examined whether subitizing can be facilitated by improving engagement of attention. Specifically, brief alerting cues that increase attentional engagement were presented in half of the trials during enumeration tasks. In Experiment 1, participants were required to enumerate dots presented in random arrays within the subitizing or small estimation range. Alerting facilitated enumeration of quantities in the subitizing range, but not in the small estimation range. We suggested that the benefit of alerting on the subitizing process was achieved via enhancement of global processing, a process that was previously associated with both alerting and subitizing. In Experiment 2, we presenting quantities in a canonical array and demonstrated that when global processing was used for items in the small estimation range, a subitizing-like pattern was revealed in quantities beyond the subitizing range.
Email: Yarden Gliksman, yarden.gliksman@gmail.com

(5023)

Testing Competing Models of Two-Digit Number Representation: Decomposed Versus Holistic Processing. KRISTEN A. BOWMAN and THOMAS J. FAULKENBERRY, *Tarleton State University* — Though several studies on two-digit number comparison reflect holistic processing of magnitude, Verguts and De Moor (2005) found that participants formed only decomposed representations of decade and unit magnitude and not holistic magnitude. The present study was an extension of Verguts and De Moor (2005). Participants performed a two-digit comparison task. We manipulated decade distance (same, different) and numerical distance (small, large). Participants were faster when comparing same-decade pairs versus different-decade pairs. Additionally, there was a significant distance effect for same-decade pairs, but no such distance effect for different decade pairs, indicating that processing the decade digit was sufficient for comparison on these pairs. These findings replicate Verguts and De Moor (2005). In addition, our large decade distance effect reflects additional processing requirements for

different-decade pairs. In all, this suggests that people separately process the decades and units of two-digit numbers, providing further evidence for decomposed processing.
Email: Thomas J. Faulkenberry, faulkenberry@tarleton.edu

(5024)

Nothing or Zero? On the Processing of Empty Sets. MICHAL PINHAS, *Ariel University*, RUT ZAKS-OHAYON and JOSEPH TZELGOV, *Ben-Gurion University of the Negev* — The question whether humans' process null numerosity as zero has received little research attention. In this study, we manipulated the context in which empty sets are perceived by varying task instructions and the response mode. Experiment 1 tested comparisons of pairs of nonsymbolic magnitudes. Null numerosity was presented as an empty set, while numerosities 1-9 were presented as dot arrays. Participants were asked to choose the larger/smaller numerosity within the pair. The results revealed an attenuated distance effect for comparisons to an empty set versus comparisons of numerosities 1-9. For the latter type of comparisons, responses were faster for "choose larger" versus "choose smaller" instructions. This difference was not apparent for comparisons to an empty set. Experiment 2 examined whether these findings could be a result of processing only the non-null numerosity within the pair by testing the influence of the task instructions and response mode (vocal or key response). The results demonstrated a significant distance effect for comparisons to empty sets only with key press responses. Our findings suggest that perceiving nothing as zero is reliant upon the experimental context in which it is presented.
Email: Michal Pinhas, michalpinhas@gmail.com

(5025)

Reasoning Strategies With Rational Numbers Revealed by Eye-Tracking. PATRICK PLUMMER and MELISSA DEWOLF, *University of California, Los Angeles*, MIRIAM BASSOK, *University of Washington*, PETER C. GORDON, *University of North Carolina at Chapel Hill*, KEITH J. HOLYOAK, *University of California, Los Angeles* — Recent research has begun to investigate the impact of different formats for rational numbers on the processes by which people make relational judgments about quantitative relations. Fractions, as compared to decimals, yield more accurate judgments about types of ratios conveyed by displays of discrete objects, whereas accuracy is substantial lower for both formats when displays show continuous quantities. We report an experiment that used eye-tracking methods to delineate the strategies that are evoked by different types of rational numbers for the different types of quantities (discrete versus continuous). Results showed that eye-movement behavior during the task was jointly determined by display and number type. Regardless of number format, discretized displays led to more instances of counting. The results suggest that counting strategies only led to higher accuracy when discrete displays were presented with fractions. When subjects relied on magnitude estimation and comparison, accuracy decreased regardless of number notation.
Email: Patrick Plummer, pplummer@ucla.edu

(5026)

The Impact of Emotion on Numerical Estimation: A Developmental Perspective. EMILY A. LEWIS, *Tulane University*, ALEXANDRA M. ZAX and SARA CORDES, *Boston College* — Recent literature has revealed underestimation effects in numerical judgments when adult participants are presented with emotional stimuli (as opposed to neutral). Whether these numerical biases emerge early in development however, or instead reflect overt, learned responses to emotional stimuli across development is unclear. In the present study children (ages 6-10) and adults were presented with happy and neutral facial stimuli in the context of a numerical bisection task. Results reveal that children, like adults, underestimate number following emotional (i.e., happy) faces (relative to neutral). However, children's, but not adult's, responses were also significantly more precise following emotional stimuli. In a second experiment, adult judgments revealed a similar increase in precision following emotional stimuli when numerical discriminations were more challenging (involving larger sets). Together results are the first to reveal children, like adults, underestimate number in the context of emotional stimuli and this underestimation bias is accompanied with enhanced response precision.
Email: Alexandra Zax, azax@wesleyan.edu

(5027)

The Body as a Reference Point in Counting. RONIT GOLDMAN and JOSEPH TZELGOV, *Ben-Gurion University of the Negev*, NURIT GRONAU, *The Open University of Israel* (Sponsored by Tal Makovski) — In the present study we tested object counting behaviors asking whether the body plays a role as a reference point from which counting begins. Participants were presented with images of rooms containing objects, and were asked to select the object in the n^{th} location (e.g., "select the 3^{rd} chair"). Results showed that the dominant counting strategy relies on participants' egocentric reference point: higher n^{th} values were mapped further away from the body's center. Furthermore, when an image of an avatar represented the participant in the room, the vast majority of participants counted in relation to the avatar's position. Participants that used alternative mapping strategies were consistent with a known spatial mapping of numbers, and were unaffected by the location of the avatar. Overall, our results suggest that the body plays a major role as a reference point for counting objects, supporting the notion of embodiment of numeration.
Email: Ronit Goldman, ronitgo@bgu.ac.il

(5028)

Selection of Procedures in Mental Division: Relations Between Self-Reports and Eye-Movement Patterns. MATTHEW G. HUEBNER, KASIA MULDNER and JO-ANNE LEFEVRE, *Carleton University* — Adults typically solve simple division (e.g., 10/5, 72/8) either by retrieving the solution from memory or relying on a procedural transformation. Sixty-eight participants solved division problems, with 34 reporting their solution processes after each problem. Patterns of self-reports for large problems (i.e., dividends larger than 25) were used as initial criteria to define distinct performance groups (retrievers

and non-retrievers). Ex-Gaussian statistics (i.e., mu and tau) for large division problems were then entered into a discriminant function analysis to categorize the remaining participants and evaluate the accuracy of original groupings based on self-reports. Eye-tracking data indicated that retrievers allocated less attention to the operands (vs. the operator) compared to non-retrievers across both small and large problems. This information about online processing throughout the course of the trial highlights the specific problem components that solvers use in mental division tasks and provides further insight into the cognitive architecture responsible for arithmetic performance.
Email: Matthew G. Huebner, matthewhuebner@cmail.carleton.ca

(5029)

All SNARC Tasks Are Not Created Equal: An Analysis of Individual Differences in Spatial-Numerical Association of Response Codes. OLGA F. LAZAREVA, CODY DRESSLER and KATHERINE BERGER, *Drake University*, REGINA GAZES, *Bucknell University* — The spatial-numerical association of response codes (SNARC) effect describes a tendency to respond to Arabic numerals representing smaller quantities (e.g., 1 or 2) faster if the response is located on the left than if it is located on the right, and vice versa for larger quantities. The SNARC effect has been interpreted as an evidence of automatic spatial organization of numeric information, and has been reported for many non-numerical dimensions. In several experiments, we explored whether the same participants exhibit similar pattern of SNARC effect in both numerical (parity, magnitude) and non-numerical (length, brightness) tasks. The principal component analysis consistently produced a three-factor solution suggesting that the direction and the strength of the SNARC effect were not consistent across the explored tasks. We found that the classical SNARC task, parity, consistently loaded on a single factor that was not shared by the tasks relying on object properties (e.g., brightness, line length). The loadings of the tasks using magnitude (e.g., the number of the items in an array) depended on the stimulus type. Overall, our results suggest that the SNARC effect exhibited in number-related tasks is largely independent from the SNARC effect in tasks using physical attributes of the objects. Our data also indicate that the directionality and the strength of the SNARC effect in Western populations more variable than previously assumed.
Email: Olga Lazareva, olga.lazareva@drake.edu

(5030)

Answers to Complex Division Problems Are Automatically Activated After Practice. LOEL N. TRONSKY, LISA IANNUCCILLI and JENNIFER POLLOCK, *Albertus Magnus College* — It is well documented that adults store arithmetic problems and answers in associative memory networks. Also, for addition and multiplication, research has demonstrated that answers are automatically activated upon presentation of a problems' addends/operands (e.g., LeFevre, Bisanz, & Mrkonjic, 1988; Galfano, Mazza, Angrilli, & Umilta, 2004). The goal of the present experiment was to extend this finding to division. After practicing complex division problems (76 ÷ 4) for 75 minutes, participants completed a number-matching task. In this task two digits were presented (cues), and participants decided if a subsequent digit (probe) matched either of the cues. Participants were slower to reject a quotient probe than a non-quotient probe; thus, quotients were automatically activated and were interfering with the rejection of non-matching probes. The use of complex division problems rules out the possibility that this interference effect was due to the dividend's activation of a complementary multiplication fact (De Brauwer, 2007).
Email: Loel Tronsky, ltronsky@albertus.edu

(5031)

Conceptual Understanding of Fraction Addition. DAVID W. BRAITHWAITE, JING TIAN and ROBERT S. SIEGLER, *Carnegie Mellon University* — Learning fractions is a critical step on the pathway from whole numbers to algebra. The present study demonstrates that sixth to eighth grade children lack conceptual understanding of even the most basic fraction arithmetic operation: addition. Conceptual understanding of addition was assessed using estimation tasks which permit accurate performance without knowledge of fraction addition procedures. In Experiment 1, children failed to provide accurate estimates of fraction sums, and accuracy did not improve when they were instructed to think about the magnitudes of the addends before estimating each sum. In Experiment 2, children separately estimated individual numbers and sums of the same numbers, and estimates of sums were regressed against sums of individual estimates. This regression was significant when the numbers were whole numbers, but non-significant for most children when the numbers were fractions. The findings demonstrate that many children cannot use their knowledge of individual fraction magnitudes to derive accurate estimates of fraction sums, and thereby suggest that in the context of fractions, children fundamentally do not understand addition. Educational implications of the findings are discussed.
Email: David W. Braithwaite, baixiwei@gmail.com

(5032)

The Gender – Numerical Congruity Effect? The Impact of Speaker Gender on Parity Judgments. DOUG ALARDS-TOMALIN, JASON P. LEBOE-MCGOWAN, TODD A. MONDOR and LAUNA C. LEBOE-MCGOWAN, *University of Manitoba* — Many interactions have been found between judgements of numerical information and other magnitude dimensions. For example, small numbers (e.g., 1/9) are categorized faster when presented in small font sizes than when they are presented in larger font sizes. In a recent study, Wilkie and Bodenhausen (2012) found that the parity of numbers also influence the speed of gender ratings. When participants rated the masculinity/femininity of gender neutral stimuli (baby photographs), they were rated as more male when paired with odd numbers and as more female when paired with even numbers. We further tested this interaction between assessments of gender and number parity using a standard congruity paradigm. In this experiment, people rapidly categorized the parity of numbers presented auditorily in either a male or female voice. If people do possess an implicit association between gender and the parity of numbers, as observed by Wilkie and Bodenhausen, parity judgments should

be performed more rapidly for numbers read in a conceptually congruent voice (male voice/odd number; female voice/even number) than when numbers are presented in a conceptually incongruent voice (female/odd number; male/even number).
Email: Doug Alards-Tomalin, d.w.tomalin@gmail.com

(5033)

Are Finger Dexterity and Finger Gnosis Abilities Linked to Numerical Skills? NOLWENN GUEDIN and CAROLINE CASTEL, *University of Geneva,* JOËL FLUSS, *Children's Hospital of Geneva,* CATHERINE THEVENOT, *University of Lausanne* — In typical developing children, performance on a finger gnosia test measuring finger perception is a better predictor of mathematical achievement than classical tests measuring intelligence. This relationship could be partly explained by finger counting and, in this case, finger dexterity could also be associated with numerical skills. We examined this possibility in typical children and in children with unilateral cerebral palsy (CP) who suffer from finger motor impairments. Interestingly, for typical children aged between 7 and 15, finger gnosia and finger dexterity performance were both correlated with performance in a numerical comparison and in an addition task. In children with CP, only the correlation between finger dexterity and addition performance turned to be significant. This differential pattern in correlations suggests that the development of numerical skills depends on sensorimotor characteristics and experiences.
Email: Catherine Thevenot, catherine.thevenot@unil.ch

(5034)

Math Performance, Attitudes Toward Math, and Finger Gnosis. MICHAEL P. KASCHAK and AMANDA L. KOWALSKY, *Florida State Univeristy* — Finger gnosis, the ability to mentally represent one's fingers, has been shown to predict mathematic ability in children. More recently, researchers have shown that this relationship also holds for college students. We sought to replicate and extend the finding that finger gnosis is a predictor of mathematic ability in young adults. We assessed the relationship between college students' calculation fluency, SAT scores, attitudes about math (math anxiety, ability, identification, and utility), and finger gnosis. Our results replicate the previous finding that finger gnosis predicts calculation fluency in adults; however, finger gnosis was not a predictor of SAT math performance in this sample. Furthermore, finger gnosis was a significant predictor of math anxiety, as well as, self-reported math ability. Finger gnosis did not predict math identification or utility.
Email: Amanda Kowalsky, kowalsky@psy.fsu.edu

(5035)

Does Really the Numerical Value of Numbers Affect the Perceptual Size of Arabic Numerals? JIHYUN HWANG and SONGJOO OH, *Seoul National University* — In numerical comparison tasks, it is known that the semantic size of numbers influences the perception of their physical size. However, previous results were obtained only by using reaction time paradigm. Accordingly, it is unclear whether the effect reflects a perceptual process, or simply a cognitive bias. In this study, we measured the perceived size of numbers across different semantic size of numbers in the Ebbinghaus paradigm that is known to enhance perceptual difference induced by the effect. Each stimulus was consisted of a target on the center and six surrounding numbers. The target number was always 5, while the inducers varied from 2 through 9. Participants were asked to respond whether or not the target number looked smaller or larger than inducers. The points of subjective equality (PSE) were calculated from both inducers size conditions; smaller or larger. The analysis showed that participants were more likely to see the target number smaller when surrounded by larger inducers, *vice versa*. This result directly indicates that the semantic size of numbers influences the perceptual size of numbers during numerical comparison process.
Email: Jihyun Hwang, jihyun.hwang0304@gmil.com

EMOTION AND COGNITION III

(5036)

Distortions in Time Perception: Individual Differences and Sense of Control. SIMONA BUETTI, GAVIN J. P. NG, KRISTEN L. SANDERS, JUYOEN HUR and WENDY HELLER, *University of Illinois* — Typically, the perceived duration of an emotional image depends on its arousal and valence content. However, when participants are given a sense of control over the images in a time estimation task, arousal and valence no longer distort time perception (Buetti and Lleras, 2012). The goal of this study was to investigate whether individual differences in perceived control over life events modulates the effects of control in the temporal judgement task. We administered the Desire for control and the Locus of control (evaluating three sources of control: internal, powerful other, and chance) questionnaires and manipulated the sense of control within-subjects on a large sample. The results replicated Buetti and Lleras (2012). Furthermore, linear mixed-effects model analyses indicated that both control scales substantially contribute to improve the model fit over a model that only includes control, arousal, and valence.
Email: Simona Buetti, sbuetti@gmail.com

(5037)

The Role of Perceptual Salience in Affective Conditioning. TAEWAN KIM, YOON KYUNG LEE and SOWON HAHN, *Seoul National University* — Using the classical conditioning paradigm, we investigated the necessity of the conditioned stimulus-unconditioned stimulus (CS-US) contingency awareness during affective conditioning. An aversive sound stimulus was used as US, and three different levels of visual stimuli that varied in terms of the perceptual discriminability (high, low, control) were used as CS. The voluntary attention toward UC (high, low) was also manipulated as a between-subject condition. After the conditioning training, participants conducted a lexical decision task consisting of emotional words and nonwords so that the association between CS and US can be measured as the size of priming effect. When participants paid attention towards US, there was a strong CS-US association regardless of the CS discriminability. However, when subjects

tried to ignore the US, the association between CS and US was observed only if CS+ and CS- can be easily distinguished. The result provides support for conditioning without awareness.
Email: Taewan Kim, taewankim90@gmail.com

(5038)

A Different Aspect of Metacognition: The Effect of Induced Affects on Problem Solving Strategies. SEOK-SUNG HONG, KYUNGIL KIM, *Ajou University* — In general, individuals with high metacognitive ability are better at learning and problem solving. However, having higher metacognition, the stronger experience of negative emotion. This is supposed to negatively influence problem solving. To address this issue, two experiment are conducted. Experiment 1 compare high and low metacognition groups' corresponding *Cognitive Reflection Test (CRT)* accuracies. Experiment 2 examine the differences in CRT accuracy depending on metacognitive ability when positive/ negative affect was induced. In Experiment 1, high metacognition group show high CRT accuracy. Experiment 2 show that when negative affect is induced, the resulting CRT accuracy of high metacognition group was similar to that of low metacognition group. The results suggest that metacognition, which acts as an emotion perceiving sensor, perceives negative emotion more strongly and negatively influences task performance.
Email: Kim, Kyungil, kyungilkim@ajou.ac.kr

(5039)

Comparing Mental Simulations of Positive and Negative Events: The Devil Is in the Details. VANNIA A. PUIG and KARL SZPUNAR, *University of Illinois at Chicago* — Over the last decade, psychologists have devoted considerable attention to episodic future thinking—the ability to imagine specific future events. Much of the extant work comparing positive and negative future event simulation reports greater detail for positive as compared to negative events. In the present article, we suggest that the typical finding of greater detail for positive than negative events arises because of a methodological confound in the literature. Specifically, there is often no control for frequency of prior thinking. In order to address this confound, we controlled for frequency of prior thinking by using the experimental recombination procedure—which required participants to simulate novel events in response to random person-location-object triads—and coded for objective levels of specific detail using the Autobiographical Interview. The results of two experiments demonstrate a strong tendency for participants to generate greater internal detail for novel negative as compared to novel positive future events.
Email: Vannia A. Puig, vpuig@uic.edu

(5040)

On the Influence of Cognitive Control in Implicit Trait Aggression: Stroop Training Does Not Affect Performance on a Modified Version of the Implicit Association Test. RICARDO M. TAMAYO, ANDRES PINILLA and CAROLINA RUEDA, *Universidad Nacional de Colombia* — We adapted the Implicit Association Test (IAT) to measure preferences for aggressive and none aggressive stimuli that were classified as liked or disliked. We tested if training based on the Stroop task may increase cognitive control and thus reverse the fluency effect to aggressive concepts. In two experiments, participants were randomly assigned to either an experimental or a control condition. In the experimental condition participants responded (1) to a modified version of the IAT, (2) were trained in the Stroop task, and (3) were retested to detect transfer effects from the Stroop task to the IAT. In the control condition, participants were exposed to the same sequence of tasks but the Stroop task was replaced by a filler task without inconsistent trials. Performance in both groups significantly decreased for the IAT retest. These effects may be due to carry-over effects from the baseline to the retest independently of the training in the Stroop task. In a second experiment the within-subject manipulation was removed. However, there were no significant differences between the control and the experimental group. These results are interpreted in terms of the lack of bottom-up transfer effects on the IAT from the Stroop task.
Email: Ricardo M. Tamayo, tamayor@gmail.com

(5041)

Pleasant Emotion Induced by Sad Music and Individual Differences in Empathy. AI KAWAKAMI and KENJI KATAHIRA, *Kwansei Gakuin University* — What is the difference between those who love sad music and those who dislike it? In this study, using the Interpersonal Reactivity Index (IRI), we shed light on the effect of individual differences in empathy as a personal trait on liking and experiencing the emotions of sad music. Sixth-grade students and university students listened to music in the minor key (sad music) and reported how they felt and how much they liked it. In addition, they completed the IRI scale, which comprises four subcomponents: empathic concern (EC), personal distress (PD), perspective taking (PT), and fantasy (FS). Results revealed that the correlation between liking sad music and PT was higher for adults than for children. On the other hand, those who liked sad music, both university students and children, experienced not only heightened emotion but also pleasant emotion. Additionally, PT correlated with pleasant emotion, sad emotion, and heightened emotion in the adults while PT correlated with sad and heightened emotions in children. In summation, higher PT ability could be the key to experience pleasant emotion induced by the sad music and prefer it.
Email: Ai Kawakami, amour.kawakami@gmail.com

(5042)

The Academic Anxiety Inventory: Assessing the Impact of Anxiety Across Scholastic Domains. RACHEL G. PIZZIE (Graduate Travel Award Recipient) and DAVID J.M. KRAEMER, *Dartmouth College* — Previous research on anxiety in academic environments has identified deficits in academic performance associated with math-, science-, test-, and trait-anxiety. However, many of these questionnaires do not uniquely identify the specific constructs that they aim to measure, resulting in a large degree of overlap between these ostensibly separable constructs. To better assess individual variation in these anxiety domains, we have developed the Academic Anxiety Inventory (AAI), a self-report questionnaire

with subscales that assess math-, science-, writing-, test-, and trait-anxiety. In a laboratory setting, scores on the subscales of this questionnaire predicted deficits on a standardized test in an adolescent sample of participants. In a high school math class, the AAI math subscale was more sensitive to math deficits than were established measures of math anxiety. Overall, the AAI provides a sensitive measure of anxiety in academic domains, uniquely predicting deficits created by anxious emotion in both laboratory and classroom settings.
Email: Rachel Pizzie, rachel.g.pizzie.gr@dartmouth.edu

(5043)

Reducing Negative Memories by Retroactive Interference. CODY J. HENSLEY, HAJIME OTANI and ABBY R. KNOLL, *Central Michigan University* — Can we reduce highly negative memories of an event by being exposed to an event that is negative but less negative than the prior event? The present experiment was a conceptual replication of Weems et al. (2014), who showed that highly negative memories of Hurricane Katrina was reduced when subsequent experience with Hurricane Gustav was less negative. A list of highly negative pictures was presented followed by an interference list or no list. The interference list consisted of negative pictures which were less negative than those in the first list or neutral pictures. Surprise recall of the pictures from the first list showed evidence of retroactive interference (RI) when the interference list was presented. However, RI was similar between the low and high negative interference lists, indicating that being exposed to an event less negative than the prior event can reduce highly negative memories of the prior event.
Email: Hajime Otani, otani1h@cmich.edu

(5044)

Emotional Face-Name Pair Learning Is Facilitated by Repeated Testing and Highly Arousing Contexts. STEPHANIE A. KAZANAS, *Tennessee Technological University*, JEANETTE ALTARRIBA, *University at Albany, State University of New York* — The current set of experiments investigated the effect of emotional expressions on face-name pair learning. Across these experiments, male and female faces were presented with neutral, happy, angry, and sad expressions and paired with popular names. In Experiment 1, we compared name recall across repeated testing and study blocks, when faces varied in expression from one block to another. Repeated testing with feedback promoted name recall superior to repeated study and testing without feedback, supporting the testing effect with variable study materials. Then, in Experiment 2, participants were instructed to learn the face-name pairs according to their involvement in an assigned emotional context. Name recall was greatest in the happy and angry conditions and lowest in the neutral and sad conditions. Together, these findings support the emotion advantage in memory, but highlight the importance of valence and arousal considerations in this paradigm.
Email: Stephanie A. Kazanas, skazanas@tntech.edu

(5045)

Recognition Memory for Specific Emotion Words. AYCAN KAPUCU, *Ege University*, CAREN M. ROTELLO, *University of Massachusetts Amherst* — The purpose of the present study was to determine whether the effects of emotional stimuli on recognition memory are valence-based or motivation-based. Anger, fear and disgust are all negative and highly-arousing emotions with different motivational properties. Fear and disgust trigger avoidance motivation, whereas anger triggers approach motivation (Carver & Harmon-Jones, 2009). Also, anger and disgust are associated with high certainty but fear is associated with low certainty (Tiedens & Linton, 2001). In three between-subjects conditions, participants studied a list of negative and neutral words, and then completed a delayed recognition memory test. The negative words were anger-related, fear-related, or disgust-related depending on the condition. Negative words led to large liberal bias shifts compared to neutral words but this pattern was similar across emotion conditions. Accuracy differences between negative and neutral words were found only in the anger condition, as anger-related words were recognized worse than neutral words.
Email: Aycan Kapucu, aycan.kapucu@ege.edu.tr

(5046)

More to Be Anxious Over: Induced Math Anxiety and WMC. ERIN E. SOVANSKY and JENNIFER WILEY, *University of Illinois at Chicago* (Sponsored by Stellan Ohlsson) — Math-anxious individuals have been found to perform poorly on computation span tasks compared to non-math-anxious individuals (Ashcraft & Kirk, 2001). However, it is unclear whether inducing math anxiety might reduce performance on only specific working memory tasks (i.e. those involving math), or if the effect might be more general when anxiety is induced. Participants were assigned to either a test condition which completed a math test, or a control condition which instead completed a filler task. WMC measures were administered before and after the test manipulation. Participants in the test condition reported higher math anxiety following the manipulation than the control condition. Further, they showed a decrease in performance on a Running Span task (using letters as stimuli) which varied with anxiety. Operation span performance (using letters as recall items) did not show the same effects. Possible explanations for differences between operation span and running span results are discussed.
Email: Erin Sovansky, esovan2@uic.edu

COGNITIVE SKILL ACQUISITION

(5047)

How Task Characteristics and Cognitive Resources Interact to Predict Performance: Learning in a Static Versus a Dynamic Task Environment. DAVID J. FRANK and BROOKE N. MACNAMARA, *Case Western Reserve University* — Hoffman et al. (2014) proposed several "Dimensions of Difficulty" thought to describe the conditions that make some tasks more or less cognitively demanding. However, these dimensions have never been empirically tested. In this experiment we tested Hoffman et al.'s (2014) Static vs. Dynamic dimension. To do

this, we manipulated whether our task (a game similar to Plants vs. Zombies) was static (turn based) or dynamic (constantly-moving stimuli). Participants played five rounds consisting of two separate phases with different goals (energy collection and zombie fighting). Additionally, half of the participants in each version performed the task under cognitive load. Supporting Hoffman et al.'s (2014) Static vs. Dynamic concept, performance on both phases of the task was better in the static version. Additionally, cognitive load slowed learning and decreased overall performance levels only for the dynamic version, supporting the hypothesis that dynamic tasks rely more heavily on basic cognitive resources.
Email: David J. Frank, djf94@case.edu

(5048)

Predicting Cognitive Training Performance: A Statistical Learning Approach. MICHAEL B. KRANZ and ERIKA K. HUSSEY, *University of Illinois at Urbana-Champaign*, PAULINE L. BANIQUED, *University of California Berkeley*, EMILY CUNNINGHAM and ARTHUR KRAMER, *University of Illinois at Urbana-Champaign* — Multi-stage models of skill acquisition (e.g., Fitts & Posner, 1967) provide a framework to understand performance improvements during cognitive training interventions (e.g., Ackerman, 1988, 2000). Using a subset of data from a training study (Baniqued et al., 2015), we tested the predictive accuracy of a range of baseline cognitive abilities to determine if they selectively map onto distinct stages of skill acquisition. We evaluated performance over training sessions on a visuospatial reasoning task based on a puzzle game (Pipe Mania). Models revealed that pretest fluid intelligence predicted initial training performance, while processing speed predicted learning curve slopes across training sessions. Furthermore, we revealed the importance of individual tests within these cognitive abilities using LASSO model selection and cross validation. This work demonstrates that a skill acquisition framework in combination with statistical learning techniques may be used to better understand individual differences in training performance.
Email: Mike Kranz, mbkranz@illinois.edu

(5049)

The Learning and Generalization of Within-Category Representations. GABRIELA PERALTA and DAVID B. SMITH, *University of Maine*, SEBASTIEN HELIE, *Purdue University*, SHAWN W. ELL, *University of Maine* — When interacting with categories, representations focused on within-category relationships are often learned, but the conditions promoting within-category representations and their generalizability are unclear. We report the results of three experiments investigating the impact of category structure (rule-based or information-integration) and training methodology (classification, concept, or inference training) on the ability to learn and generalize within-category representations (i.e., correlational structure). For the information-integration structure, within-category representations were consistently learned and could be generalized to novel stimuli and to support inference during a test phase. For the rule-based structure, extended inference training resulted in generalization to novel stimuli (Experiment 2) and inference training resulted in generalization to classification (Experiment 3). These results make an important contribution in highlighting the impact of category structure and training methodology on the generalization of categorical knowledge and reveal the complexity of the relationship between these factors and knowledge generalization.
Email: Shawn Ell, shawn.ell@umit.maine.edu

(5050)

The Effects of Training Methodology and Category Similarity on the Compositionality of Rule-Based Categorization. FARZIN SHAMLOO, *Purdue University*, SHAWN ELL, *University of Maine*, SEBASTIEN HELIE, *Purdue University* — Helie and Ashby (2012) argued that rule-based categorization produces an intermediate category representation that can be used in other tasks. The present study explores whether these representations can be combined into more complex representations. Participants were asked to categorize visual stimuli using either a concept learning or classification training condition. At test, pairs of categories were combined to form two new categories. The categories to be combined were either contiguous or non-contiguous in stimulus space. The results show that with both training methodologies, accuracy at test was reduced in the non-contiguous conditions. Additionally, to test whether a motor component is involved in transfer, stimulus-response mapping at test was reversed in the classification task, which further reduced test performance. This suggests that rule-based representations can be combined to form more complex representations when the representations being combined are similar, and that there is a motor component in the transfer performance.
Email: Sebastien Helie, shelie@purdue.edu

(5051)

Learning to Exploit a Hidden Predictor in Skill Acquisition: Tight Linkage to Conscious Awareness. RANDY TRAN and HAL PASHLER, *University of California, San Diego* — It is often assumed that implicit learning of skills based on predictive relationships proceeds independently of awareness. To test this idea, four groups of subjects played a game in which a fast-moving "demon" made a brief appearance at the bottom of the computer screen, then disappeared behind a V-shaped occluder, and finally re-appeared briefly on either the upper-left or upper-right quadrant of the screen. Points were scored by clicking on the demon during the final reappearance. Demons differed in several visible characteristics including color, horn height and eye size. For some subjects, horn height (Exp. 1) or eye size (Exp. 2) perfectly predicted which side the demon would reappear on. For subjects not told the rule (Exp. 1 & 2), the subset who demonstrated at the end of the experiment that they had spontaneously discovered the rule showed strong evidence of exploiting it by anticipating the demon's arrival and laying in wait for it. However, those who could not verbalize the rule performed scarcely better than a control group for whom

the demons moved unpredictably. The implications of this tight linkage between conscious awareness and implicit skill learning are discussed.
Email: Hal Pashler, hpashler@gmail.com

EYEWITNESS IDENTIFICATION

(5052)

The Effects of Eyewitness Expert Testimony and Evidence Type on Jury Decision Making. THOMAS W. HANCOCK and KELLY C. JENT, *University of Central Oklahoma* — The effects of eyewitness expert testimony (EET) and evidence type on jury decision making were examined. Participants either viewed an EET or did not. Next they read a crime scene narrative and saw six icons (three eyewitness and three pieces of physical evidence). The icons were selected based on their perceived importance. Each icon had four additional pieces of evidence (two suggesting guilt and two innocence). After viewing each piece of evidence, the participants made a decision of guilt and a final decision at the conclusion of the experiment. Results indicated that EET significantly increased the perceived importance of the physical evidence. Overall decisions of guilt were also impacted by eyewitness expert testimony in the no EET and EET conditions (62% and 48%, respectively). These findings suggest that providing individuals with eyewitness expert testimony not only affects the perceived value of evidence but also their criteria for making judgments.
Email: Thomas Hancock, thancock7@uco.edu

(5053)

Sleep and Eyewitness Identifications: Changes in Decision Making Strategies. MICHELLE E. STEPAN, *Michigan State University* (Graduate Travel Award Recipient), SHARI BERKOWITZ, *California State University*, JAMAL MANSOUR, *Queen Margaret University*, CHAD PELTIER and *KIMBERLY FENN, *Michigan State University* — Previously, we found that eyewitnesses falsely identified fewer innocent suspects after sleep than after an equal waking interval. We hypothesized that sleep facilitates effective decision-making strategies. To test this, participants watched a mock-crime video and viewed a 6-person target-absent lineup after a waking day (Wake) or a night of sleep (Sleep). We assessed decision-making strategies by monitoring participants' eye movements during the lineup and by asking questions about their decision-making strategies. Participants also completed a memory test about the video. Sleep participants made marginally fewer comparisons between lineup members than Wake, suggesting they were more likely to compare lineup members to their memory [absolute strategy] than to other lineup members [relative strategy]. They were also more likely to report using an absolute strategy when they correctly rejected the lineup. Sleep participants also outperformed Wake on the memory test. Thus, sleep appears to affect both memory and decision making strategies.
Email: Michelle E. Stepan, stepanmi@msu.edu

(5054)

Violations of Justice Prime Convictions in Jurors. COURTNEY A. KURINEC, *Baylor University*, KARENNA F. MALAVANTI, *Carson-Newman University*, BRITTANY N. NESBITT and CHARLES A. WEAVER, III, *Baylor University* — We investigated whether reading about an unjust verdict alters juror decision-making in a later, unrelated case. Mock jurors read one of four newspaper-type articles about a case involving the murder of a child. Two of the articles described cases in which juries came to guilty verdicts, and the remaining articles described cases where the juries arrived at not guilty verdicts. The articles were also manipulated so that the verdict decisions were perceived as just or unjust. After reading the article, jurors reviewed evidence and rendered a verdict on an unrelated armed robbery case in which the actual verdict was ambiguous. Reading an article resulting in conviction increased the likelihood of a guilty verdict in the unrelated case. Additionally, jurors who read an article with a perceived unjust acquittal were more likely to convict on the unrelated case. Thus, conviction biases were primed with a complex perceived violation of justice.
Email: Courtney Kurinec, courtney_kurinec@baylor.edu

(5055)

Asking an Eyewitness to Predict Their Confidence in a Later Lineup Decision Could Harm the Confidence-Accuracy Relationship. JANE BEDNARZ, CURT CARLSON and MARIA CARLSON, *Texas A&M University - Commerce*, DAWN WEATHERFORD, *Texas A&M University - San Antonio*, DAVID YOUNG and ALEX WOOTEN, *Texas A&M University - Commerce* — Few studies have investigated whether eyewitnesses could predict their later lineup performance, akin to a judgment of learning (JOL). We applied calibration analysis across two experiments comparing pre- versus post-lineup confidence (i.e., predicting versus postdicting accuracy). Experiment 1 (N = 177) featured a multiple-block face recognition paradigm, with participants predicting their confidence shortly after encoding (*prior* to each lineup) or only reporting their confidence *after* each lineup. Experiment 2 (N = 855) utilized an eyewitness identification paradigm with a mock crime video. Across both experiments, confidence discriminated best between correct and incorrect lineup choices when collected immediately after the lineup. Pre-lineup confidence was a poor predictor of accuracy. Importantly, simply asking for pre-lineup confidence weakened the post-lineup confidence-accuracy relationship. This implies that police should exercise caution when interviewing eyewitnesses, as they should not be asked to predict their ability to make an accurate lineup decision.
Email: Jane Bednarz, MS, jbednarz@leomail.tamuc.edu

(5056)

Individual Differences in Eyewitness Identification Accuracy and Confidence. KYLIE KEY, JINAN ALLAN, EDWARD COKELY and SCOTT GRONLUND, *University of Oklahoma* — The goal of this study was to examine the relationship between eyewitness accuracy and several individual difference measures such as numeracy (understanding of probability

and statistics), general face recognition ability, cognitive reflection (ability to suppress a spontaneous wrong answer in favor of a deliberative correct answer), response latency, IQ, and so on. We had participants study several faces for one or three seconds. They subsequently made a timed old-new judgment for each face, reported a corresponding confidence judgment regarding accuracy of each decision, and completed measures of the aforementioned covariates. We found strong correlations among IQ, numeracy and cognitive control, and that participants with high levels of each of these factors took significantly longer to make identification decisions than did participants with lower IQ, numeracy and cognitive reflection. Implications of these results will be discussed.
Email: Kylie Key, kylie.key@gmail.com

(5057)

Investigation of Memory Conformity in Social Context Without Confederates. IN-KYEONG KIM, *La Sierra University*, ENOCH S. KWON, *Cornell University*, MELISSA VO, *La Sierra University*, STEPHEN J. CECI, *Cornell University* — The present study investigated memory conformity, using a novel adaptation of the classic Asch social contagion paradigm but without confederates. One participant (minority) and three other participants (majority) in a group watched slightly different scenes of pictures or videos on a 3D TV through dual-play glasses. They then publicly answered questions about the scenes in a group, and privately answered the same questions three days later. The results showed that the minority had less accurate memory, more memory conformity, and changed answers more frequently than the majority, which was true for both the picture and video tasks. The participant was warned about the possibility that other participants viewed different scenes after the second session; however they didn't make significant answer changes after the warning, suggesting memory alteration due to conformity. These findings may have implications for forensic contexts in which multiple-person interviews and exposure to others' answers are involved.
Email: In-Kyeong Kim, ikim@lasierra.edu

(5058)

Are Mock Jurors Prone to Forgetting Witness Uncertainty? RACHEL DEFRANCO and MARIA ZARAGOZA, *Kent State University* — Even credible and highly accurate witnesses are likely to be more certain about some aspects of a witnessed event than others, because not all aspects of a witnessed event are likely to be remembered equally well. Do jurors believe all testimony provided by a credible witness regardless of the confidence with which it is expressed? Prior studies conducted in our lab have shown that the answer depends on the timing of the judgment. At short retention intervals, mock jurors' belief in witness testimony was well calibrated with the amount of uncertainty the witness had expressed, but after one-week, mock jurors accepted as valid all testimony provided by the witness, regardless of the confidence with which it had earlier been provided. The present study tested the hypothesis that, relative to jurors' memory for witness certainty, memory for the uncertainty with which testimony was provided may be disproportionately susceptible to forgetting.
Email: Rachel DeFranco, rdefranc@kent.edu

(5059)

Memorial Benefits and Consequences of Forced Confabulation in Eyewitness Memory. ANDREA N. ESLICK, *Wartburg College*, TAYLOR BAUMGARTNER, *University of Northern Iowa*, HANNAH STRANDBER. — Though eyewitness reports depend upon accurate retrieval, exposure to later misinformation compromises memory (Loftus, 1975). Recalling events after initial viewing may increase suggestibility (Wilford, Chan, & Tuhn, 2013). Experiment 1 evaluated whether this free recall affected memory when misinformation was a product of subjects' own confabulations. After viewing an event, half of subjects recalled the event while the others wrote about an unrelated topic. After, all answered cued recall questions about the event, some of which pertained to event information (and were answerable) and some of which did not (and were unanswerable). Half of the subjects were forced to answer all questions (and to confabulate answers to the unanswerable questions), while the other half were allowed to say "don't know." A final free recall test assessed original memory. When subjects did not recall after viewing, forcing answers on the cued recall test resulted in better final memory than voluntary reports; recalling the event eliminated this difference. Surprisingly, there were no differences in memory errors; Experiment 2 evaluates whether memory errors in this paradigm increase when misinformation is experimenter-generated versus self-generated.
Email: Andrea Eslick, andrea.eslick@wartburg.edu

(5060)

Lineups Are Better Than Showups But Filler Siphoning Is Rarely the Reason. STACY A. WETMORE, *Royal Holloway, University of London*, RYAN M. MCADOO and SCOTT D. GRONLUND, *University of Oklahoma*, JEFFREY S. NEUSCHATZ, *The University of Alabama in Huntsville* — Researchers have begun using receiver operating characteristic (ROC) analysis to measure how well eyewitnesses distinguish between innocent and guilty suspects when tested with lineups and showups (e.g., Wetmore et al., 2015). The results from these studies revealed that lineup performance was superior to showups. Moreover, we argued that lineup performance was superior because lineups afforded better discriminability than showups. The current research explores a counterargument that *filler siphoning* (the presence of known-innocent lineup fillers siphon choices away from the false identification of an innocent suspect) is responsible for the superior performance of lineups. A formally specified model, the WITNESS model, is used to explore the predictions made by filler siphoning. We demonstrate that filler siphoning, as described, rarely explains the superior performance of lineups over showup identifications, and offers no theoretical advancement over the consideration of discriminability.
Email: Stacy A. Wetmore, Stacy.Wetmore@rhul.ac.uk

(5061)

The Own Race Bias in Child and Adolescent Witnesses. CATRIONA HAVARD, *The Open University*, JOYCE HUMPRHIES, *Edge Hill University*, AMINA MEMON, *Royal Holloway University of London* — The present study investigated the own-race bias in British school children using an eyewitness paradigm. 319 participants viewed films of two similar staged thefts, one that depicted a Caucasian culprit and the other an South Asian culprit and then after a delay of 2-3 days, viewed a lineup for each culprit. 176 of the participants were Caucasian and 143 were South Asian. There were also two age groups, children aged 7-9 years and adolescents aged 12-14 years. There was a significant own race bias for the Caucasian participants from both age groups, that resulted in more correct identifications for the own race culprit from target present lineups and more false identifications for the target absent lineups. The South Asian participants from both age groups showed no own race bias and performed equally accurately for culprits of both races. The measures of interracial contact were associated with correct responses for other race targets and varied with actual contact with South Asians supporting perceptual expertise theory. The effects were shown for the first time using dynamic video lineups.
Email: Prof Amina Memon, amina.memon@rhul.ac.uk

(5062)

The Cross-Race Effect in Eyewitness Identification: Reduced Discriminability Does Not Necessarily Imply Reduced Reliability. BRENT M. WILSON, KATHY VO and JOHN T. WIXTED, *University of California, San Diego* — Recognition memory performance is worse for cross-race faces compared to same-race faces (e.g., cross-race *d'* < same-race *d'*), a phenomenon known as the cross-race effect. However, recent research suggests that, as a general rule, people are able to maintain an appropriately conservative high-confidence decision criterion under poor (i.e., low *d'*) memory conditions, thereby maintaining high accuracy for positive identifications made with high confidence. In our research, we found that when tested using a 6-person photo lineup, discriminability was substantially lower for cross-race IDs relative to same-race IDs (i.e., we replicated the standard cross-race effect). However, contrary to a widespread belief, that fact does not imply – nor do the data show – that cross-race IDs are appreciably less reliable than same-race IDs, particularly when IDs of a suspect in a lineup are made with high confidence.
Email: Brent M. Wilson, b6wilson@ucsd.edu

(5063)

The Effects of Retention Interval and Repeated Lineups on Choosing and Identification Rate. WENBO LIN and HENRY L. ROEDIGER, III, *Washington University in St. Louis* — Eyewitness confidence often grows between an initial identification and the time of trial, but why? We examined one plausible candidate: repeated testing. We manipulated the time interval (1-week, 2-weeks, or 3-weeks) between the event and an initial lineup, and the number of repeated exposures (0, 1, or 2 times, a week apart) following the initial lineup (all within subjects). Subjects viewed 12 videos with 12 targets and were asked to make identifications in the subsequent weeks. They were presented with 4 lineups after one week, 8 lineups at after 2 weeks (4 old lineups, 4 new lineups), and 12 lineups at week 3 (8 old lineups, 4 new lineups). Half the lineups were target-present and half were target-absent. The rate of choosing a suspect in a fresh lineup decreased as retention interval increased for both types of lineups, but choosing rate increased with the number of previous lineup exposures. When subjects consistently identified the suspect or an innocent suspect at each repeated identification, confidence generally increased with repetition.
Email: Wenbo Lin, lin.w@wustl.edu

HUMAN LEARNING AND INSTRUCTION III

(5064)

Does Retrieval Practice Improve Question Generation? STEPHEN WEE HUN LIM and ADALYN QIU HUI HENG, *National University of Singapore*, LUDMILA D. NUNES and JEFFREY D. KARPICKE, *Purdue University* — In educational settings, the ability to ask good questions is critical. Two experiments were conducted to explore the extent to which retrieval practice can enhance learners' ability to generate higher-order questions. Participants were randomly allocated to one of two learning groups, wherein they either studied a text repeatedly (*S_S_*) or used a combination of repeated studying and repeated retrieval (*SRSR*). They were then required to – either immediately (Experiment 1) or a week later (Experiment 2) – generate questions based on the text which they had studied. Bloom's (1956) taxonomy was used to differentiate between lower- versus higher-order questions. Whereas question generation performance did not differ between learning groups in Experiment 1, participants in the *SRSR* group asked significantly more higher-order questions than did those in the *S_S_* group in Experiment 2. Real-world implications of the present findings will be discussed.
Email: Stephen Wee Hun Lim, psylimwh@nus.edu.sg

(5065)

The Benefit of Generating Errors During Learning: What Is the Locus of the Effect? ROSALIND POTTS and DAVID R. SHANKS, *University College London* — Guessing translations of foreign words (*hodei?)*, before viewing corrective feedback (*hodei-cloud*), leads to better subsequent memory for correct translations than studying intact pairs (*hodei-cloud*), even when guesses are always incorrect (Potts & Shanks, 2014), but the mechanism underlying this effect is unknown. In four experiments we found support for the proposal that generating errors benefits memory through stimulating curiosity to learn correct answers following an incorrect guess. In Experiment 1, generating possible translations *after* seeing correct answers did not produce better memory than studying without generating, suggesting that an element of surprise is necessary for generating to benefit memory. Experiment 2 found enhanced recognition memory for targets following generating, suggesting increased attention to targets following a guess. In Experiments 3 and 4,

participants rated their curiosity to learn correct answers higher when ratings were given after generating than before, suggesting the act of generation increased curiosity to learn the answers.
Email: Rosalind Potts, rosalind.potts@ucl.ac.uk

(5066)

Variable Practice Enhances Learning of Foreign Language Vocabulary. NICHOLAS C. SODERSTROM, *Dickinson College*, ERIN M. SPARCK and ELIZABETH LIGON BJORK, *University of California, Los Angeles* — Varying the conditions of practice, or study sessions, has been shown to boost long-term learning, even though such schedules pose a relatively greater challenge for learners during acquisition. We examined whether variable practice could enhance the learning of foreign language vocabulary words. Learners studied Lithuanian-English word pairs across four study-test cycles according to four different practice conditions. In two constant-practice conditions, learners either always attempted to retrieve the English words or the Lithuanian words during practice; whereas, in two variable-practice conditions, learners retrieved a mixture of English and Lithuanian words during practice. We found that the variable-practice conditions outperformed the constant-practice conditions on a final retention test, regardless of whether the final test required retrieving the English or Lithuanian words. Furthermore, learners seemed to recognize that variable practice was an effective way to acquire vocabulary in the current paradigm. Theoretical and practical issues will be discussed.
Email: Nicholas Soderstrom, nsoderstrom@psych.ucla.edu

(5067)

Does Retrieval Practice Enhance Learning and Transfer for Term-Definition Facts? STEVEN C. PAN and TIMOTHY C. RICKARD, *University of California, San Diego* (Sponsored by Craig McKenzie) — In many pedagogical contexts, *term-definition* facts which link a concept term (e.g., "*vision*") with its definition (e.g., "*the ability to see*") are learned. Does retrieval practice involving recall of the term (given the definition) or the definition (given the term) enhance later recall, relative to other techniques? Moreover, does any memory benefit for the term transfer to later recall of the definition, or vice versa? In three experiments, subjects studied term-definition facts and then trained on two-thirds of the facts via multiple-choice tests with feedback. Half of the test questions involved recalling terms; the other half involved recalling definitions. The remaining facts were untrained (Exp 1) or restudied (Exps 2-3). A 48 hr delayed multiple-choice (Exps 1-2) or short answer (Exp 3) final test assessed recall of all terms or all definitions. Retrieval practice yielded better recall and apparent transfer relative to no training, but yielded only better term retrieval and no transfer relative to restudy. Thus, retrieval practice selectively benefits the learning of term-definition facts—a finding with implications both for theories of the retrieval practice effect and for optimizing educational practice.
Email: Steven C. Pan, stevencpan@ucsd.edu

(5068)

Language Learning and Proficiency: Differentiating the Impact of Fluid Intelligence, Working Memory Capacity, and Executive Functions on Language Abilities. JESSIE D. MARTIN and RANDALL ENGLE, *Georgia Institute of Technology* (Sponsored by Richard Catrambone) — Individual differences work has shown that working memory capacity, and fluid intelligence predictors of language abilities including reading comprehension, verbal achievement, and listening comprehension. Despite this, the processes underlying second language vocabulary acquisition and proficiency remain unclear. Using structural equation modeling, the present study identifies how executive functions (memory updating, attention control, verbal fluency) interact with working memory capacity and fluid intelligence to explain second language vocabulary acquisition and performance. Results indicate that different aspects of language proficiency can be predicted above and beyond working memory capacity and fluid intelligence, when executive functions are considered. Moreover, this pattern of results is consistent with a separation of maintenance and disengagement, such that vocabulary learning in particular, may be driven largely by the ability to disengage from no longer relevant information. Implications for language learning and performance are addressed.
Email: Jessie Martin, jessie.martin@gatech.edu

(5069)

Faded Examples Are Less Effective Than Provided Examples for Declarative Concept Learning. AMANDA ZAMARY and KATHERINE A. RAWSON, *Kent State University* — Declarative concept comprehension is superior after studying provided examples alone versus studying provided examples and generating examples, counter to expectations based on outcomes from research on rule-based concept learning and testing effects. However, students may need more scaffolding for generating examples. The current research investigated if faded examples (from a full provided example, to completing a partial example, to generating an example with a topic cue) improves the effectiveness of the combined technique. Students studied provided examples versus faded examples for social psychology concepts. In Experiment 1, trials for all concepts were interleaved and in Experiment 2, we manipulated blocking versus interleaving. Regardless of schedule, delayed comprehension test performance tended to be greater for the provided versus faded group (ds = .07-.26), and the provided group spent significantly less time during study (ds > 1.94). Considering both comprehension and learning efficiency, faded examples are less effective than provided examples.
Email: Amanda Zamary, azamary@kent.edu

(5070)

Mnemonic Benefits of Elaboration Using Examples. LAUREN E. BATES and EDWARD L. DELOSH, *Colorado State University* — Numerous studies have demonstrated that processing information for meaning produces better memory for that information compared to rote memorization. Elaboration, the extent to which learning is enriched through the integration of information and formation of associations,

is a subset of this topic that is often cited as beneficial, and has been demonstrated in a variety of formats. One method of elaboration has received little empirical attention, despite its common use and widespread beliefs about its effectiveness: The use of examples. We sought to replicate the benefit of having at least one example would have on memory, both in free recall and recognition tasks, using a procedure that offered better experimental control than a previous study completed by Palmere et al. (1983), and included a control condition that equated exposure time.
Email: Lauren Bates, lauren.bates@colostate.edu

(5071)

Cognitive Construals in U.S and Chinese 8th Graders' Intuitive Biology Thinking. YIAN XU and JOHN D. COLEY, *Northeastern University* — Although previous research has documented the development of intuitive biological thinking in young children, there has been little research on later development, and little comparative research. To address these gaps, we compared three core components of intuitive biological thinking among 8th graders in U.S and China. We administered a survey that included multiple measures of *essentialist thinking*, *anthropocentric thinking*, and *teleological thinking*. Comparisons of composite scores suggest that while the two groups did not differ in essentialist and teleological responses, Chinese 8th graders showed significantly less anthropocentric thinking than their U.S peers (t_{151}=5.83, p=.000). This cross-cultural comparison carries important implications in understanding the nature of intuitive biological thought and advancing pedagogical methods in the biology classroom.
Email: Yian Xu, xu.yia@husky.neu.edu

(5072)

The Relationship Between Visual Statistical Learning and Learning in an Artificial Orthography Task. TONG LI and JULIE M. BROWN, *University of Connecticut and Haskins Laboratories*, JINGJING ZHAO, *Shaanxi Normal University*, JAY G. RUECKL, *University of Connecticut and Haskins Laboratories* — In this study, we explored whether visual statistical learning (VSL) is correlated with individual differences in learning to read an artificial lexicon (AL) with systematic mappings between both orthography and phonology (O-P) and orthography and semantics (O-S). The results from the AL task showed that participants learned the O-P and O-S mappings at similar rates and that they acquired knowledge of both whole-word and sublexical correspondences in both mappings. Critically, performance on the VSL task was correlated with both O-P and O-S learning, and these correlations were of comparable magnitudes. These findings suggest that common processes underlie the extraction of transitional probabilities in a VSL task and learning the mappings from printed words to their meanings and pronunciations. In contrast, our results provide no evidence that different processes underlie the acquisition of O-P and O-S knowledge, at least when the statistical structure of these mappings is equated.
Email: Tong Li, Tong.Li@uconn.edu

(5073)

Predictors of Success: Individual Differences in Personality, Study Technique Use, and Academic Performance. JEN COANE, *Colby College*, MEREDITH E. MINEAR and MIKAELA COWEN, *University of Wyoming*, SARAH C. BOLAND and LEAH H. COONEY, *Colby College* — Many factors predict students' success in academic settings, from individual differences in cognitive and non-cognitive factors, to time management and study habits. Among the latter, self-reported use of testing as a study technique is associated with higher grade point averages (GPA; Hartwig & Dunlosky, 2012). Furthermore, different facets of personality (e.g., neuroticism, conscientiousness) are associated with different strategy use and self-regulation of learning (Donche et al., 2013). In the present study, we administered a survey on study habits to a sample of 290 college students, who also completed measure to assess personality, need for cognition, grit, and other potential predictors of academic success and strategy use. Consistent with previous research, self-testing positively correlated with GPA and cramming negatively correlated with GPA. Academic self-efficacy, extraversion, agreeableness, and need for cognition also explained variance in GPA. Thus, academic success depends on joint effects of approaches to learning and specific strategy use.
Email: Jen Coane, jhcoane@colby.edu

(5074)

Implied Audience Interferes With Skill Acquisition for Performance-Oriented Learners. SARA G. GOODMAN and TRAVIS L. SEYMOUR, *University of California Santa Cruz* — Self awareness can influence task performance in several ways. One's orientation toward a learning-focused goal can improve growth and mastery, whereas a sensitivity to competition and external judgment via performance-focused orientation can undermine performance. Engaging in self-directed talk prior to a task can also lead to poorer performance. The current research assesses the impact of continuous first- and second-person self-talk throughout a task, and investigates the relationship between self-talk and goal framing. Continuous first-person self-talk yields improved performance outcomes on a canonical dual-tasking paradigm when compared to second-person self-talk. Participants who reported holding an inherent performance goal orientation demonstrated worse performance when exposed to second-person self-talk, whereas participants who held naive learning goal orientations were not affected by the type of self-talk presented. In cases where individuals are performance-oriented and engaging in a difficult or high-error task, self-talk that implies the presence of observers significantly undermines performance.
Email: Sara Green Goodman, slgreen@ucsc.edu

(5075)

Effects of Cognitive Load on Category Learning. OSUNG SEO and MICHAEL KALISH, *Syracuse University* — Previous research suggests that the relationship between the old categorizing rule and the new categorizing rule can affect the level of difficulty we experience during category re-learning (Kruschke, 1996). In addition to dimensional attention and associative learning, response remapping was introduced in

the model AMBRY (Kruschke, 1996) as another factor to explain the varying difficulties of category relearning. The main purpose of this study was to examine how working memory differentially affects these three factors (dimensional attention, associative learning, and response remapping) in order to further understand the mechanisms of category learning. The experimental design was a close replication of Kruschke's (1996) paradigm with an additional cognitive load task. The result of the experiment suggests that, by adding cognitive load in category relearning, the effect of response remapping remained constant while the effect of dimensional attention has been reduced. However, from the acquired data, it is inconclusive whether associative learning has been affected or not.
Email: Osung Seo, oseo100@syr.edu

(5076)

Roles of Articulatory Movements and Speech Feedback in Japanese Text Comprehension During Oral Reading. TAKAHIRO TERAO, *Japan Society for the Promotion of Science/Nagoya University*, MAIKO TAKAHASHI, *Japan Society for the Promotion of Science/The University of Tokyo*, SACHIKO KIYOKAWA, *Nagoya University* — When reading orally, we produce the auditory information of the text through articulatory movement. We investigated the roles of articulatory movements and speech feedback in Japanese text comprehension. A previous study showed that articulatory movements subserve a function in retaining word order information and that speech feedback facilitates sentence comprehension in Japanese. We assumed that the same effects would be obtained with passage comprehension. Twenty-four undergraduates were asked to read 24 Japanese passages, 6 each with or without articulatory movements and speech feedback. They then answered two types of questions: verbatim memory and passage comprehension. The results showed that the performance of the verbatim memory task improved in the presence of articulatory movements and that the performance of the passage comprehension task improved in the presence of speech feedback. We concluded that articulatory movements support the memory process and that speech feedback facilitates text comprehension in Japanese.
Email: Sachiko Kiyokawa, kiyokawa.sachiko@b.mbox.nagoya-u.ac.jp

(5077)

Are Dense Categories Learned by Similarity? Kloos & Sloutsky (2008) Revisited. INGMAR VISSER, RUBEN VAN BEEK and MAARTJE RAIJMAKERS, *University of Amsterdam* — Under what circumstances and with what stimuli similarity based versus rule based strategies are used has been a contested issue for a long time (eg Kemler-Nelson, 1984, versus Milton, Inkster, Wills, 2014). Kloos & Sloutsky (2008) present an experiment (1c) where both children and adults prefer similarity based category learning using dense categories under unsupervised learning conditions. In the current study we replicate that experiment in a large sample of children (n=106) and adults (n=82) to facilitate studying individual differences (a second condition uses a standard trial-and-error learning phase). Analyzing the data as Kloos & Sloutsky (2008) did, our data show a similar pattern of results. In contrast, a latent class analysis reveals that 60% of participants use single dimensional strategies to classify test stimuli, only 8% of possibly use overall similarity, and the remaining 32% use either inconsitent or guessing strategies. We conclude that there is little evidence for similarity based category learning as a default mode of processing for dense stimuli in children and adults.
Email: Ingmar Visser, i.visser@uva.nl

(5078)

Part-Set Cueing Does Not Explain Collaborative Inhibition for Key-Term Definitions. KATHRYN T. WISSMAN, *Skidmore College* (Sponsored by Daniel Peterson) — Learners recall less information when retrieval practice occurs in a group versus alone, a phenomenon referred to as collaborative inhibition. Whereas prior research has used relatively simple material, the current study investigated whether collaborative inhibition emerges with key-term definitions and evaluated the extent to which the part-set cueing hypothesis explains the effect. The *part-set cueing hypothesis* states that the initial but incomplete output of one group member acts as a part-set cue that reduces recall of the remaining information by the other group member and contributes to collaborative inhibition. In two experiments, learners individually studied key-term definitions and then engaged in retrieval practice, either collaboratively or individually. After a delay, all learners individually completed a final test. Collaborative inhibition during retrieval practice emerged for key-term definitions. Experiment 2 provided evidence that a part-set cueing mechanism does not explain why the effect emerges for key-term definitions.
Email: Kathryn Wissman, kwissman@skidmore.edu

(5079)

Effects of Multi-Day Practice Schedules on Learning and Memory: When Expanding-Schedule Practice Helps. HEATHER-ANNE PHELAN and THOMAS C. TOPPINO, *Villanova University* — Vocabulary learning and memory were studied using educationally relevant temporal intervals. During training, repetitions were distributed over *expanding*, *contracting,* and *uniform* schedules in which inter-repetition intervals increased progressively, decreased progressively, or remained constant, respectively. Study-phase-retrieval theories predict expanding-schedule superiority because, early in training when memories are weak, short inter-repetition intervals should foster more successful study-phase retrieval. Although previous research has been inconclusive, the level of initial training may be critical because extensive initial training may diminish or eliminate the relative benefit of expanding-schedule practice. Over 13 days, college students studied sets of pseudoword-word pairs using the different schedules and took a cued-recall test 14 days later. In Session 1, participants received either low- or high-level training (2 study or 6 study and test-study trials, respectively). In subsequent training sessions, everyone was treated identically (1 restudy trial). As expected, cued recall revealed expanding-schedule superiority following low- but not high-level initial training.
Email: Heather-Anne Phelan, heather.anne.phelan@gmail.com

METAMEMORY/METACOGNITION III

(5080)

Priming and Antipriming of Memory and Judgments of Learning. PRADEEP RAMANATHAN, *California State University East Bay*, ANDRE LINDSEY, *University of Connecticut*, THERESA JINGYUN YAO, DANIELLA GALINDO and SHANNON PEREZ, *California State University East Bay* (Sponsored by Carmen Westerberg) — There has been much debate on the cognitive mechanisms involved in metamemory (self-monitoring of learning and memory), and several models have been advanced – many of which assume explicit cognitive processes. The purpose of the current research (building on previous research: Ramanathan, Kennedy, & Marsolek, 2014) is to further explore the effects of implicit memory (using masked priming and antipriming) on metamemory Judgments of Learning (JOLs) in healthy college students. The primary research questions are: (1) will presenting masked prime and antiprime stimuli during learning in a paired associate task affect recall of word-pairs or measures related to JOLs, and (2) will manipulating the point in the learning phase at which the masked stimuli are presented influence any such effects. All data collection is now complete. Preliminary analysis shows subtle effects of priming and antipriming on measures related to JOLs. We will present a complete analysis of the data at the conference.

Email: Pradeep Ramanathan, pradeep.ramanathan@csueastbay.edu

(5082)

Monitoring and Control of Learning When Given External Incentives. MATTHEW G. RHODES and SARAH J. DELOZIER, *Colorado State University*, HILLARY S. WEHE, *Armstrong State University* — Prior work has demonstrated that providing external incentives (e.g., monetary incentives) does not improve learning but does increase self-reported effort (Nilsson, 1987). In two experiments, participants studied a series of words and made judgments of learning (JOLs) for each item, which they were later asked to recall. Half of the participants were given a global incentive (e.g., leaving the experiment early if able to recall a certain number of words) and half were given no incentive. In Experiment 1, JOLs and recall did not reliably differ between participants given an incentive versus no incentive. Experiment 2 was identical except that study was self-paced. When permitted to control their study time, participants in the incentive condition spent more time studying each item and demonstrated reliably superior recall (d = .59) relative to the no incentive condition. Accordingly, increasing motivation may have more impact on learning outcomes when participants have control over learning.

Email: Matthew G. Rhodes, matthew.rhodes@colostate.edu

(5083)

Memory and Metacognition for Medication Interactions. MARY HARGIS, ALAN D. CASTEL and DOUGLAS BELL, *University of California, Los Angeles* — The ability to remember information about medications is important for people of all ages, but metacognitive biases may affect our memory for this information. In the current study, younger adults were presented with the names of 21 pairs of substances, including real medications, fictitious medications, and consumable substances (e.g., grapefruit). Participants were told that taking each pair together would result in one of the following: a severe interaction (e.g., stroke), a mild interaction (e.g., skin rash), or no interaction. After studying each item, participants indicated how likely they were to remember it. The same interactions were presented in three lists, with recall tests following each list. Overall, participants were underconfident in their performance. They gave higher judgments of learning to the most severe items, but this difference was not present in their recall. Younger adults' metacognition is inaccurate in this task, which has implications for how health-related information is learned.

Email: Mary Bryce Hargis, mbhargis@ucla.edu

(5084)

State-Based Judgments of Learning: Exploring the Roles of Exercise and Time of Day in Metacognition. WILLIAM L. KELEMEN and JOSEPH J. BASSILI, *Texas State University* — Much previous research has focused on stimulus and encoding factors that can influence judgments of learning (JOLs; Dunlosky & Metcalfe, 2009). A few studies, however, suggest that changes in individuals' internal states, including fluctuations due to time of day (TOD) and changes in arousal due to exercise, can influence memory and JOLs (e.g., Hourihan & Benjamin, 2013; Salas, Minikata, & Kelemen, 2011). The present study utilized a 2 X 2 (TOD X exercise condition) within-subjects design to test for changes in JOLs, free recall, and metacognitive accuracy. We tested 40 "evening type" college students who were pre-screened using the Morningness-Eveningness Questionnaire (Horne & Ostberg, 1976) on two mornings and two afternoons, once each time immediately following moderate exercise and once each time in a sedentary state. As predicted, the students showed significantly higher levels of recall in the afternoon compared with the morning and after exercise compared with a sedentary state. Pre-study JOLs were insensitive to the manipulations, but item-by-item JOLs and post-study JOLs showed significant changes and tracked recall. No significant interactions emerged, suggesting an absolute benefit of both manipulations.

Email: William L Kelemen, wkelemen@txstate.edu

(5085)

True or Not? Perceptual Disfluency Lowers Truth Judgments for Aurally-Presented News Items, But It Does Not Affect Recall. MIRI BESKEN, *Bilkent University* — Easily-perceived, fluent items are typically judged to be truer than their counterparts that are more difficult to perceive. Until now, most research employed visual materials to examine this effect. The current study used auditory materials to investigate whether perceptual fluency of aurally-presented news items can also influence truth judgments and memory performance for these items. In a within-subjects design, participants heard short news items over the headphones either in a perceptually fluent, intact presentation format, or in a perceptually disfluent, discontinuous presentation format. Participants were asked to rate all the news items individually for their truthfulness during

encoding, followed by an incidental free-recall test of the news item topics. The intact presentation of news items produced higher truth judgments than the discontinuous presentation, replicating findings of visual modality. There were no differences in memory performance across presentation formats. This shows that perceptual characteristics of aurally-presented news item may affect truth judgments, even though the truthfulness of a message should generally be more pertinent to its content than its perceptual characteristics.
Email: Miri Besken, mbesken@gmail.com

(5086)

Different Answers to Different Audiences: The Effects of Pragmatics on the Regulation of Accuracy-Informativeness Trade-Off When Answering Questions. BEATRIZ MARTÍN-LUENGO, *National Research University Higher School of Economics*, YURY SHTYROV, *Aarhus University*, ANDRIY MYACHYKOV, *Northumbria University* — Research about small conversational exchanges shows that people aim at optimal response relevance when questioned about information known certainly (e.g., "What time is it?"). However, such certainty is often unavailable; yet, speakers may be under social pressure to provide information. We investigated how social situations influence the informativeness level when answering questions under uncertainty. In two experiments participants answered difficult general-knowledge questions placed in a conversation with friends vs. job interview. Participants decided the number of alternatives in an answer (plurality option) and whether it was reported or withheld (report option). With friends, participants reported more answers independently of the informativeness level. In the job interview, single answers were both preferred to multiple ones and more often reported. To conclude, social conventions linked with specific situations influence the level of informativeness in a conversation to the detriment of achievable accuracy. Furthermore, social conventions influenced the metacognitive component of memory reporting.
Email: Beatriz Martín-Luengo, bmartinluengo@hse.ru

(5087)

Level of Encoding Detail Has a Differential Influence on Memory Performance and Metamemory Ratings. TASNUVA ENAM and IAN M. MCDONOUGH, *University of Alabama*, DEBORAH K. EAKIN, *Mississippi State University* — More distinctive encoding often enhances memory, but people often have little insight into factors that affect their own memory (i.e., metamemory). Here, we tested how varying levels of encoding detail affected four types of metamemory judgments (JOLs, EOLs, FOKs, and Confidence) and recognition memory. Participants were presented with word pairs (low detail), picture-word pairs (medium detail), and picture pairs (high detail). The recognition test consisted of a cue word and 5 alternatives. We predicted that 1) more encoding detail would lead to better memory performance and 2) metamemory ratings would increase with encoding detail to the extent that people use encoding detail to inform their metamemory. Results indicated that recognition memory increased with encoding detail, whereas metamemory ratings showed a much weaker effect. The weak metamemory effect was due to a small effect of encoding detail for retrospective judgments (FOKs, Confidence), but no effect for prospective judgments (JOLs and EOLs). These surprising findings suggest that encoding detail was not a primary cue used to inform any of the metamemory judgments and that emphasizing encoding detail might enhance metamemory calibration.
Email: Tasnuva Enam, tenam@crimson.ua.edu

(5088)

The Generation Game: Students' Study Preferences and the Efficacy of Error Generation During Learning. LAUREN GRIFFITHS and PHILIP HIGHAM, *University of Southampton* — Research has shown that students are largely unaware of the memory benefits of generating errors during study, but does this dissociation extend to their actual study habits? Participants studied 64 cue-target pairs, by either reading complete pairs or generating their own target with feedback, and made judgments of learning (JOLs) per item. Forty-eight pairs were restudied in three conditions: Forced-Read, Forced-Generate and Choice, where Choice was the participants' preferred study method (read/generate). After restudying, they made aggregate JOLs (AJOLs) and completed a final cued-recall test. For participants who chose to generate, AJOLs and accuracy were highest for generated items. However, for participants who chose to read, AJOLs were highest, but accuracy was lowest, for items that were read. Furthermore, for read participants, generating twice had no advantage over generating only once. We suggest that study preferences play an important role in the efficacy of error generation.
Email: Lauren Griffiths, lrg1g13@soton.ac.uk

(5089)

Inaccuracies of Metamemory in the Perceptual Interference Effect. JENNIFER M. MARTIN and JEANETTE ALTARRIBA, *University at Albany, State University of New York* — Recent studies have examined individuals' metacognition about the perceptual interference effect and found inaccurate memory predictions for words that were difficult to perceptually process (Besken & Mulligan, 2013; Sungkhasettee et al., 2011). The present study investigated potential factors affecting metamemory accuracy in the perceptual interference paradigm. Participants completed two blocks of naming trials that varied by perceptual fluency and made judgments of learning (JOL) after each trial. A recognition memory task containing trial-by-trial feedback concluded each block. Tendency to view intelligence as fixed or malleable was also assessed (Dweck, 1999). Recognition accuracy results showed a perceptual interference effect, but no effect of practice or views of intelligence. JOLs underestimated accuracy for trials with low fluency in both blocks, but practice improved calibration. Further, these effects do not seem to interact with views of intelligence. Future research should examine individual differences (e.g., reading expertise) that may relate to improved metamemory.
Email: Jennifer M. Martin, jmartin8@albany.edu

(5090)

Effects of High Definition Transcranial Direct Current Stimulation (HD-TDCS) on Memory and Metamemory. ELIZABETH F. CHUA, RIFAT AHMED and SANDRY GARCIA, *Brooklyn College of the City University of New York* — We previously showed that excitation of the dorsolateral prefrontal cortex (DLPFC) using High Definition Transcranial Direct Current Stimulation (HD-tDCS) increased the accuracy of "feeling-of-knowing" judgments. Here, we replicated this finding, and examined if the ability of HD-tDCS to improve feeling-of-knowing (FOK) accuracy varied by difficulty. Participants were tested under 3 HD-tDCS conditions: left DLPFC, left anterior temporal lobe (ATL), and sham stimulation. During stimulation, participants first attempted to recall the answer to a general knowledge question, then gave a FOK judgment, followed by a forced choice recognition task. Each participant completed one block each of easy, medium, and hard questions. In terms of memory, ATL stimulation led to increased recall, mainly for medium difficulty questions. In terms of metamemory, DLPFC stimulation led to better FOK accuracy, and this did not vary by difficulty. These data show that HD-tDCS over the ATL improves memory, whereas HD-tDCS over the DLPFC improves metamemory.
Email: Elizabeth Chua, echua@brooklyn.cuny.edu

(5091)

ADHD, Stigma, and Metacognition: Does It Get Better With Age? JESSIE THORUP, BENJAMIN D. ENGLAND and ADDIE WIKOWSKY, *Missouri Western State University* — Given the increasing prevalence of ADHD in school-aged children, it is important to understand the stigmatization toward diagnosed peers. We investigated if one's understanding and perceived control of their own mental processes (metacognition) alters stigma. In order to investigate this and any differences in age, middle school and college students completed multiple questionnaires, including questions about perceived control/understanding and stigma. Overall, there were few differences between groups, but certain factors—such as age, knowing someone diagnosed with ADHD, and gender—were related to level of stigma, especially toward disclosure of ADHD. Importantly, although perceived level of control and understanding did not differ between age groups, the correlation between control and understanding was only present in the college-aged participants. While we agree with previous work that stigma toward mental disorders may develop during middle school, the underlying causes or influencing factors seem to differ per age – possibly not for the better.
Email: Benjamin England, bengland2@missouriwestern.edu

WORKING MEMORY IV

(5092)

Working Memory Capacity and Proactive Interference Across Visual and Auditory Modalities. JESSE N. ROTHWEILER, KERRI A. GOODWIN and LEAH J. KOTANSKY, *Towson University* — We investigated the effects of high and low working memory capacity (WMC) on auditory proactive interference during a dual-task procedure using a visual search task. We manipulated the difficulty level of a visual search task that coincided with an auditory memory task. During each visual search task participants heard 4 word lists and recalled each list individually. The words for Lists 1-3 were of the same category (e.g., occupations), but were different in List 4 (e.g., fruits). Our results indicated that recall performance of high and low WMC participants varied depending on the visual search task difficulty. High WMC participants were better able prevent proactive interference when the visual search task was easy. Whereas, high WMC participants demonstrated a greater amount of proactive interference when the visual search task was difficult. Together these findings suggest that differences in memory interference depend not only on WMC, but also the amount of cognitive load experienced by the participant.
Email: Jesse Rothweiler, jrothw3@students.towson.edu

(5093)

How to Make a Simple Span Task as Complex as a Complex Span Task. FABIEN MATHY, *Université Nice Sophia Antipolis*, MUSTAPHA CHEKAF, *Université de Franche-comté*, NELSON COWAN, *University of Missouri* — Research has suggested that simple span tasks and complex span tasks measure different theoretical constructs. Simple span tasks are tasks commonly used to measure short-term memory, while complex span tasks are usually considered typical measures of working memory. Because complex span tasks were designed to create a demanding concurrent task, the average span is usually lower (4+/-1 items) than in simple span tasks (7+/-2 items). One possible reason for the higher span of simple span tasks is that participants can detect regularities in the stimulus series (in the absence of a concurrent task), and such regularities can be used to pack a few stimuli into 4+/-1 groups. We predict that the respective spans of these two types of tasks may be equal (at around 4) when regularities are absent from the stimulus lists. We showed with a large sample of participants (N > 300) that (1) Using a simple span task with stimuli offering the smallest amount of relational information so as to make the stimulus lists incompressible, the average span was less than three objects. (2) The chunkability of the material still operated in the complex span tasks, meaning that, unlike rehearsal, chunking can occur even in complex span tasks.
Email: Fabien Mathy, fabien.mathy@unice.fr

(5094)

Does Eye Fixation Have a Functional Role in Visual Memory Retrieval? Further Insights From Error Analysis. MOTOYUKI SANADA, *Kwansei Gakuin University*, TAIJI UENO, *Takachiho University*, RICHARD J. ALLEN, *University of Leeds* — Previous research has shown that correct recognition/recall of visual information is associated with the frequent gaze fixation during retrieval at the spatial position of the target object, suggesting the functional role of eye fixation in visual memory retrieval. Further evidence should be gleaned by investigating an association between the gaze fixation and the error response. Specifically, retrieval of a non-target item (i.e., an error) may also be associated with increased frequency of fixation at the position where the retrieved non-target item originally appeared. This study measured eye movements

during verbal cued recall of one feature (color or shape) from color-shape conjunctions. It was observed that participants frequently looked at the position of the recalled item during retrieval only in the correct trials, but not in incorrect trials. Thus, spatial information might be utilized only when we retain accurate object representations in working memory.
Email: Motoyuki Sanada, msanada@kwansei.ac.jp

(5095)

Word Frequency and Order Memory in Serial Recall. RYAN KORENZ and LEONIE M. MILLER, *University of Wollongong, Australia* — Traditional models of verbal short-term memory posit separate mechanisms for the retention of item and order information. These approaches argue that long-term knowledge regarding the familiarity or meaning of words can only influence the retention of item identity. Contrastingly, it has been proposed that interactive activation within the long-term system for language superimposed upon a primacy gradient at encoding is sufficient to explain order as well as item memory, and as a consequence suggests that semantic variables can influence order memory. The current study extends a line of research testing the proposition that lexico-semantic variables influence the order of items in a presented sequence. Lists of items of either ascending or descending frequency were visually presented to participants in a serial recall task. Rates of order errors between these conditions were compared. Greater order error rates for the ascending frequency lists would be evidence for this account.
Email: Leonie Miller, leoniem@uow.edu.au

(5096)

Effects of Musical Rhythm on Memory. HOPE TOBIN, SARAH KALINOWSKI and ELIZABETH RACE, *Tufts University* — Memory recall is strongly influenced by encoding context, even if the encoding context is secondary to the task at hand. For example, immediate serial recall of digits is facilitated when digits are encoded in familiar compared to unfamiliar visuospatial background contexts (e.g., Darling et al., 2012). The present study investigated whether musical context can similarly enhance memory by manipulating the perceived rhythmicity of a background beat played during a memory encoding task. Participants viewed a series of nine digits while a regular beat, an irregular beat, or a single tone played in the background. Following digit presentation, participants verbally recalled the digits in the absence of any background auditory input. Results suggest that learning in the context of a regular versus an irregular beat leads to enhanced memory retrieval. The relationship between beat perception and memory is discussed.
Email: Elizabeth Race, elizabeth.race@tufts.edu

(5097)

Familiarity, but not Visual Complexity, Affects Letter Encoding in VWM. WILLIAM X. NGIAM, *University of Sydney*, PATRICK T. GOODBOURN, *University of Melbourne* (Sponsored by Alex Holcombe) — Visual working memory (VWM) is limited in both encoding rate and capacity. Does stimulus complexity affect these limits? Observers performed a change-detection task with English letters in different fonts, or letters from unfamiliar alphabets. Average *perimetric complexity* (κ)—proportional to the number of visual features comprising each letter—varied between alphabets. For all alphabets, the number of items held in VWM (*K*) increased linearly with encoding time (indicating the rate of encoding) before reaching an asymptote (indicating capacity). Rate and capacity for each alphabet were unrelated to complexity: Performance was best modelled by assuming rate and capacity were limited in terms of number of *items* (*K*), rather than *features* ($K \times \kappa$). Encoding rate and capacity were higher for familiar (~45 items sec^{-1}; ~4 items) than for unfamiliar alphabets (~12 items sec^{-1}; ~1.5 items). Thus VWM encoding rate and capacity for letters are determined primarily by familiarity with memoranda.
Email: William Ngiam, wngi5916@uni.sydney.edu.au

(5098)

Working Memory Across the Adult Lifespan: An Adversarial Collaboration. JASON M. DOHERTY and STEPHEN RHODES, *The University of Edinburgh*, PIERRE BARROUILLET, *University of Geneva*, VALÉRIE CAMOS, *University of Fribourg*, NELSON COWAN and MOSHE NAVEH-BENJAMIN, *University of Missouri*, ROBERT H. LOGIE, *The University of Edinburgh* — Scientists often pose research questions based on specific theoretical assumptions, and these questions are investigated with like-minded colleagues using procedures and analyses designed to detect expected phenomena. In working memory research this has led to a number of competing models, each with large bodies of published evidence that contradict some or all of the findings of others in the field. Scientific debate, while valuable, can create a cycle that hampers true understanding while creating an extensive yet contradictory literature. Here we introduce our four year international collaboration 'Working memory across the adult lifespan: An adversarial collaboration' (WoMAAC). WoMAAC aims to directly test contrasting predictions of different theories of working memory through use of preregistration of hypotheses and cross-lab replication.
Email: Jason M. Doherty, jason.doherty@ed.ac.uk

(5099)

A Matter of Priorities: High Working Memory Enables Superior Value-Directed Remembering. MICHAEL GRIFFIN and AARON BENJAMIN, *University of Illinois at Urbana-Champaign* — People with higher scores on measures of working memory (WM) also exhibit enhanced free recall from long-term memory. However, they show little to no enhancements on tests of recognition, suggesting that the greater strategic freedom that accompanies recall testing—for example, control over output order and timing—may underlie this relationship. Recent evidence does show that learners with high WM do indeed bring better strategies to retrieval, but there is less evidence of greater effectiveness at encoding. Using the *value-directed remembering* paradigm, in which the to-be-learned memoranda are paired with point values, we examined whether learners with high WM show an advantage in remembering materials that are of high value. Combining data across four experiments that differ in population and

task, we found that learners with high WM do have a modest selective advantage in remembering higher-valued word pairs, thus leading to higher selectivity scores on recall.
Email: Michael Griffin, mgriffn2@illinois.edu

(5100)

No Fixed Chunk Limit in Verbal Working Memory: Beneficial Effects of Chunking Depend on Expectancy and Serial Position of Chunks. MIRKO THALMANN, ALESSANDRA S. SOUZA and KLAUS OBERAUER, *University of Zurich* — We tested the prediction derived from the embedded-process theory of Working Memory (Cowan, 2001) that short-term retention of not-chunked information is independent of the size of a chunk that has also to be remembered. In Experiment 1, we confirmed this prediction using a training procedure to establish chunks, similar to one that has already been used in the literature. In Experiment 2 we found evidence against the prediction controlling for a potential confound associated with the training procedure (i.e., the first item of a chunk is perfectly predictive for the subsequent items). Additionally, the beneficial effect of having a chunk in a list compared to a random combination of items depended on the serial position of the chunk. Experiment 3 showed that chunks help more when presented early in a list, varying serial position of the chunks systematically. Together, the experiments suggest that the limit in short-term retention of verbal information is not described well by a fixed number of chunks.
Email: Mirko Thalmann, mirko.thalmann@psychologie.uzh.ch

(5101)

Access to Information in Working Memory: Serial, Parallel, or Both? PETER SHEPHERDSON and KLAUS OBERAUER, *University of Zurich* — How is information in working memory (WM) accessed in a recognition test? We conducted an experiment using a modified double-factorial design to adjudicate between serial, parallel, and coactive models of comparison between a probe and WM contents. Participants saw two memory stimuli followed by a probe, and had to determine whether the probe matched either memory item. We varied the level of dissimilarity between the probe and each memory item independently. Results showed additive effects of these dissimilarity manipulations when neither memory item matched the probe (consistent with serial exhaustive processing), but no effect of dissimilarity when either memory item was a target (consistent with parallel self-terminating processing). Further, when the probe matched both items RTs showed a substantial redundancy gain. These findings may be explained by a model in which an initial parallel assessment of probe-memory similarity is followed by a serial comparison of the probe with individual items.
Email: Peter Shepherdson, p.shepherdson@psychologie.uzh.ch

MEANING/SEMANTICS II

(5102)

Assumptions About the Mental Lexicon That Can Explain Frequency Effects Without Cognitive Processes Involving Word-Counting. GEOFF HOLLIS and CHRIS WESTBURY, *University of Alberta* — Word frequency is a measure that is central to lexical access. Word frequency itself accounts for more variance in behavioral measures of lexical access than any other measure commonly studied (e.g., Adelman, Marquis, Sabatos-DeVito, & Estes, 2013) and mediates the effects of most other variables (Westbury & Hollis, 2007). It is essential that psychologists provide an explanation of why word frequency effects exist. Some models of memory and language explicitly posit internal processes of word-counting that account for frequency effects (e.g., Morton, 1969; Coltheart et al., 2001; Murray & Forster, 2004). Alternative explanations are that word frequency effects reflect structural — not process — considerations, either of the ambient environment or semantic memory (e.g., Johns, Dye, & Jones, 2014). We describe research using corpus studies and a variety of vector models of semantics (Mikolov, Chen, Corrado, & Dean, 2013; Jones & Mewhort, 2007; Lund & Burgess, 1996) that illustrates, under certain assumptions, word frequency effects can be accounted for by the structure of the ambient environment and semantic memory without needing to posit mental processes that explicitly track frequency information.
Email: Geoff Hollis, hollis@ualberta.ca

(5103)

Extracting Coherent Word Representations. STANKA A. FITNEVA, *Queen's University at Kingston*, MORTEN H. CHRISTIANSEN, *Cornell University* — Language learning involves numerous tasks, e.g., speech segmentation, word-referent mapping, and grammar learning. Research has extensively examined these tasks separately; however, their individual mastery is an unlikely goal for language learners. Rather, language learning is a holistic process oriented toward becoming a competent participant in communicative exchanges. We suggest that the traditional divide-and-conquer approach could produce misleading results. We provide evidence for this in the context of statistical speech segmentation. We replicate findings suggesting that the most widely used paradigm used in this research leads to weak coherence between syllables with high transitional probability (Endress & Mehler, 2009). Findings such as this question whether the output of statistical speech segmentation is word-like units and the significance of statistical learning in language acquisition. However, when the segmentation task is presented simultaneously with a referential assignment task, statistical learning appears to generate phonologically coherent representations.
Email: Stanka Fitneva, fitneva@queensu.ca

(5104)

Effects of Grammatical Gender on Object Description. ARTURS SEMENUKS and WEBB PHILLIPS, *University of Californa, San Diego*, IOANA DALCA, *Queen Mary University of London*, CORA KIM, *Free University Berlin*, LERA BORODITSKY, *University of California, San Diego* — Can quirks of grammar influence the way we think? Here we ask whether the grammatical gender of a noun influences how people think about the noun's referent. Importantly might effects of grammatical gender manifest even in an implicit measure, when participants have no basis to guess that the

task has anything to do with gender? We tested native French, German, and Romanian speakers who were also proficient in English. Participants received 225 English nouns and generated English adjectives that best describe each noun's referents. The adjectives were then independently rated on a masculinity-femininity scale. As predicted, participants for whom a noun was grammatically feminine in their language produced more feminine adjectives than participants for whom that same noun was grammatically masculine. Further analyses reveal how central gender is in people's mental representations, as well as the role of personification in producing such effects of grammatical gender.
Email: Arturs Semenuks, asemenuk@ucsd.edu

(5105)

Evolution of Polysemous Word Senses From Metaphorical Mappings. YANG XU, *University of California, Berkeley*, BARBARA C. MALT, *Lehigh University*, MAHESH SRINIVASAN, *University of California, Berkeley* — What forces have shaped the evolution of the lexicon? Languages evolve under the pressure of having to communicate an unbounded set of ideas using a finite set of linguistic structures. This suggests why the transmission of ideas should be compressed such that one word will develop multiple senses. Previous theory also suggests how a word might develop new senses: Abstract concepts may be construed in terms of more concrete concepts. Here, we bring these two perspectives together to examine metaphorical extensions of English word meanings over the past millennium, analyzing how senses from a source domain are extended to new ones in a target domain. Using empirical and computational methods, we found that metaphorical mappings are highly systematic and can be explained in terms of a compact set of variables. Our work shows how metaphor can provide a cognitive device for compressing emerging ideas into an existing lexicon.
Email: Yang Xu, yang_xu_ch@berkeley.edu

(5106)

What Makes Academic Words Hard? Exploring Dimensions Across Item Types. JOSHUA F. LAWRENCE, JIN HWANG and GRACE LIN, *University of California, Irvine*, ASTE HAGEN, *University of Oslo*, SUSANNE JAEGGI, *University of California, Irvine* — This study examined the relationship between word-level characteristics and item difficulty across four novel types of vocabulary assessment. The analytical sample included 1,741 middle school students from an urban school district in California. Each student completed an academic vocabulary assessment, a standardized reading test (that includes both vocabulary and reading comprehension components), and one of four types of novel vocabulary measures. The novel vocabulary assessments included Multiword expressions, Topical associates, Hypernyms, and Definitions task. The target words that were assessed across test types were the same, and they were general academic words that were chosen from the Academic Word List (Coxhead, 2000). For each target word, we coded for frequency, dispersion, contextual diversity, semantic dispersion, polysemy, and semantic precision. We modeled the relationship between these lexical characteristics and students' performance on each item from the four types of vocabulary assessments using multilevel logistic regressions. We found that lexical characteristics associated with word difficulty in one test type do not necessarily predict difficulty in another, but rather characteristics (excepting frequency) tend to have differential predictive relationships with difficulty across tasks.
Email: Joshua Lawrence, jflawren@uci.edu

(5107)

Metaphors We Love By: Effects of Body-Object Interaction and Semantic Neighbourhood Density on Metaphor Comprehension. HAMAD AL-AZARY and ALBERT N. KATZ, *University of Western Ontario* (Sponsored by Richard Neufeld) — In nominal metaphors a topic noun (e.g., "love") is paired with a vehicle or source noun (e.g., "journey") to create a meaningful, albeit non-literal, statement (e.g., "love is a journey"). We created metaphors which were centered on one single topic (i.e., "love"), and manipulated the vehicles on two factors: the degree to which there was a body-object interaction (BOI), and its semantic neighbourhood density (SND). This resulted in four conditions: (1) high BOI-high SND (e.g., "love is a cigarette"); (2) high BOI-low SND (e.g., "love is a band-aid"); (3) low BOI-high SND (e.g., "love is a mountain"); (4) low BOI-low SND (e.g., "love is a fire"). Participants rated the metaphors on comprehensibility. Both main effects were reliable demonstrating that low BOI and low SND metaphors were rated to be more comprehensible than their high BOI and high SND counterparts. A BOI by SND interaction revealed that low BOI-low SND metaphors were rated to be the most comprehensible. We take these findings as inconsistent with strong embodied accounts of novel metaphor comprehension.
Email: Albert Katz, katz@uwo.ca

(5108)

Word Concreteness and the Processing of Compound Words. CHARLES P. DAVIS, *University of Connecticut*, GARY LIBBEN and SIDNEY J. SEGALOWITZ, *Brock University* (Sponsored by Norman Segalowitz) — The process by which we extract meaning from words is continually being investigated, with research indicating word meaning effects within 200 ms, and perhaps as early as the P100 event-related potential (ERP) component. Compound words present a unique opportunity to examine this process, as they have subcomponents that may or may not be reflected in the meaning of the word (i.e., *transparency*; transparent: bedroom; opaque: deadline). We found that the P100 is modulated by transparency, but transparency is confounded with concreteness. That is, it may be concreteness, reflecting the extent to which words are grounded in real-world experience, that modulates P100 amplitude. Reanalysis demonstrates that concreteness absorbs second-constituent transparency effects but not first-constituent. In a new ERP lexical-decision study with 20 participants, word frequency modulated response time (RT) as usual, but concreteness accounted for dramatically more variability than transparency in a dominance analysis. Further P100 ERP results will be presented.
Email: Charles Davis, charles.davis@uconn.edu

(5109)

Mind the Generation Gap: Differences Between Young and Old in the Representation of Everyday Objects. ANNE WHITE, *KU Leuven*, STEVEN VERHEYEN, *École Normale Supérieure*, BARBARA C. MALT, *Lehigh University*, GERT STORMS, *KU Leuven* — We examined individual differences in the lexical categorization of storage containers as a function of participant characteristics (age, education, gender) and item features. Monolingual Dutch- (N=400) and French (N=300) speaking Belgian adults (age 17 to 75) performed four category judgment tasks with 40 items each. The items included good, borderline, and bad examples of the categories (which were similar to English bottle, jar, box, and can). A mixture Item Response Theory (IRT) analysis revealed the presence of two to five latent groups of categorizers per category. Age was a significant predictor of latent group membership. In both languages, older adults relied more on "classic" materials such as glass or cardboard in their decisions, whereas younger adults emphasized relatively "new" materials such as plastics. These results suggest that common, everyday words for artifacts such as bottle have undergone a gradual shift of meaning in a relatively short time span.
Email: Anne White, anne.white@kuleuven.be

(5110)

How Meaning Similarity Impacts Learning Novel Meanings. CHELSEA M. EDDINGTON, *Amazon Corporate*, NATASHA TOKOWICZ, *University of Pittsburgh* — We examined how meaning similarity impacts the process of learning new meanings to known words. In this experiment participants learned new meanings that were related or unrelated to the vocabulary word's old meaning. Similar to previous research (Rodd et al., 2012) participants learned the words by reading them in paragraphs that created a context for the new meaning of the word. We tested participants' knowledge of the new meanings using a meaning generation task and probed participants' semantic processing of the new meanings using a primed lexical decision task. Participants generated more meaning associates for words with related novel meanings than words with unrelated novel meanings. Interestingly, participants showed significant priming effects for both novel related and unrelated meanings suggesting that participants did incorporate these novel meanings into their semantic networks. However, the priming effect for the novel unrelated meanings was reduced on a delayed test suggesting that without repeated exposure the connections weaken over time.
Email: Chelsea Eddington, c.m.eddington@gmail.com

(5111)

Abstract Concept Features, Norms, and Ontology. JANE E. NEAL and KATJA WIEMER, *Northern Illinois University* — Abstract concepts are often studied through comparison to concrete concepts. But there is increased interest in documenting and understanding distinctions within the class of abstract concepts itself (Ghio et al., 2013; Setti & Caramelli, 2005). The current study expands previous findings (Wiemer-Hastings & Xu, 2005) to a larger sample of concepts. Participants provided ratings of semantic norms (imageability, context availability, context variability, and complexity) for 500 abstract nouns. All independently predicted variability in the concept's rated abstractness (ratings: Brysbaert, Warriner, & Kuperman, 2014). Semantic norms also systematically varied across ontological categories (Keil, 1979; Vendler, 1967). In a second study, 50 participants generated features for 200 of these abstract nouns to explore the relation of semantic norms to types and numbers of features (coding based on Wu & Barsalou, 2009). Features included ontological classifications, related situation properties, and introspective qualities. The findings are discussed in relation to representational frameworks for abstract concepts.
Email: Jane Neal, janeneal233@gmail.com

DISCOURSE PROCESSES II

(5112)

Task-Related Functional Connectivity Changes in Reading Development: A Longitudinal Study. GREG SMITH and ERICA EDWARDS, *University at Buffalo - State University of New York*, JAMES R. BOOTH, *University of Texas - Austin*, CHRISTOPHER MCNORGAN, *University at Buffalo - State University of New York* — Longitudinal studies suggest a developmental shift from phonological to orthographic processing during reading development (McNorgan et al., 2011), implying a change in inter-regional connectivity over this period. The current study used functional neuroimaging (fMRI) to explore developmental changes in functional connectivity across multiple runs of a rhyming judgment task in young readers (8-11 years) over an average of 2.5 years. Preliminary comparisons of measures of functional connectivity at these two time points found that within-session connectivity stabilizes over time, and that this change in stability is correlated with increases in reading fluency. These patterns suggest a dependency of reading development on changes to particular neural pathways.
Email: Christopher McNorgan, cpmcnorg@buffalo.ed

(5113)

Familiarity and Context Have Independent Effects on Metaphor Reading Times. SPENCER CAMPBELL and GARY RANEY, *University of Illinois at Chicago* — Current research in metaphor processing has largely focused on how metaphors are read and comprehended in isolation or in single sentences. The current research uses eye tracking to examine word-by-word reading times metaphors of the "History is a mirror" format. Participants read familiar and unfamiliar metaphors presented within short stories. Story contexts ranged from strongly to weakly supporting the figurative meaning of the metaphor. Consistent with past research, overall reading time was longer for unfamiliar metaphors than familiar metaphors. At the word level, unfamiliar metaphors had longer fixation times for the content words (cat and sailboat), more fixations, and more regressions between the content words, with slightly more emphasis on the final word (sailboat). Contexts that strongly supported the metaphor resulted in shorter overall reading times, shorter fixation durations, and fewer fixations. Context effects did not interact with familiarity.
Email: Spencer Campbell, scampb21@uic.edu

(5114)

In-Text References Hurt Knowledge Construction in Lower Ability Readers. JENNIFER J. STIEGLER-BALFOUR, *University of New England*, KRISZTINA V. JAKOBSEN, *James Madison University*, MICHAEL J. STROUD, *Marrimack College*, DAVID B. DANIEL, *James Madison University* — In a study involving 322 participants across three universities, we explored the impact of in-text parenthetical reference styles on learning and reading comprehension in high- and low-skilled readers. Participants who had completed the Multi-media Comprehension Battery (MMCB) read two expository texts using either APA style references, Chicago style references, or no references, and answered comprehension questions. The results indicated that high MMCB readers, but not low MMCB readers, adapted by decreasing the speed with which they read when encountering text with distractors (i.e., APA in-text citations). As a result, high MMCB readers performed significantly better on comprehension questions as compared to lower MMCB readers. These results suggest that lower MMCB readers may lack sufficient meta-cognitive skills to recognize and adapt to reading situations that contain information not directly relevant to learning goals.
Email: Jennifer J. Stiegler-Balfour, jstiegler@une.edu

(5115)

There Is Nothing Average About an Average Reader. BRENDA A. HANNON, *Texas A&M University - Kingsville* — Do average readers have average performance on measures of the cognitive components of reading? To answer this question, readers were classified as having one of four reading skill levels and then their performances on comprehension and word-level processes were classified as either above average, average, or below average. The results showed that 9% of the average readers (25^{th} to 75^{th} percentile) had deficits in both comprehension- and word-level processes while another 40% had deficits in only one process. Further, 40% of the poorest readers (0 to 25^{th} percentile) had deficits in both types of processes, while another 42% had deficits in only one process. Taken as a whole, these results suggest that we should be cautious when assuming that one deficit explains poor reading performance and that all poor readers suffer from that same deficit. They also suggest that even average readers might benefit from interventions that improve reading skill.
Email: Dr. Brenda Hannon, brenda.hannon@tamuk.edu

(5116)

Integration Between Speakers as a Function of Connectives, Source Reliability, and Reading Ability. DAVID J. BOVERI and KEITH MILLIS, *Northern Illinois University* — Connectives are cues to integrate ideas in discourse. We examined the role of the connective "because" on integrating causally-related expository information said by two speakers. Participants read transcripts of students learning online about science topics (e.g., "tree frogs") from several teachers. We manipulated whether *because* connected sentences between speakers and whether the second speaker was a teacher or a student. Participants answered one simple comprehension question after reading and later answered a causal integration question using a sentence verification task. Participants were more accurate on the integration question when the second speaker was a teacher, but this was qualified by a higher-order interaction with vocabulary and use of connective. Unexpectedly, the presence of *because* interacted with source (student vs. teacher) on response times for answering the comprehension questions. This indicates that the connective and source affected retrieval of representations for text that occurred before the sentences joined by the connective.
Email: David Boveri, daiv.boveri@gmail.com

(5117)

Context and Familiarity Do Not Trump the Effect of Word Frequency in Idiom Processing. KRISTA A. MILLER and GARY E. RANEY, *University of Illinois at Chicago* — We explored whether word frequency effects are altered when words are read as the final word of idiomatic phrases. High and low familiarity idioms ending with high or low frequency target words were matched to literal uses of the idiom phrases or to literal control phrases that ended with the same final words. Results showed no differences in word frequency effects (high frequency target words read faster than low frequency target words) across conditions. Additionally, within both idiom conditions, target words in high familiarity idioms were read faster than target words in low familiarity idioms. No differences in familiarity were observed in the matched literal control condition. The results show that inclusion of a word in an idiom phrase does not change the way that word is processed. Lexical characteristics, such as word frequency, appear to trump anticipatory effects produced by the global context.
Email: Krista Miller, kmille47@uic.edu

(5118)

Jumping the Gap: Sensation Seeking and the Processing of Embodied Metaphors. DAWN G. BLASKO and VICTORIA A. KAZMERSKI, *Penn State Behrend*, GRANT POINTON, *James Madison University* — Sensation seekers are often described as those who seek thrill and adventure and new experiences but are also susceptible to boredom. In the current study we examined the relationship between individual differences in sensation seeking and the reading comprehension of metaphors that embody action, for example, the investment was a skydive. Participants were asked to read sentences after briefly seeing a photo that portrayed a high thrill or low thrill scene. Theories of sensation seeking suggest that thrill seeking would be rewarding, but also that high sensation seekers may be less aroused by activities seen by others as exciting. The results suggest that sensation seeking is multidimensional and both theories may have some support depending on the processing mode involved.
Email: Dawn Blasko, dawnblasko@psu.edu

(5119)

Both Children and Adults Vary in Their Sensitivity to Different Pragmatic Implicatures. IRIS CHIN, MITCHELL GREEN and NICOLE LANDI, *University of Connecticut*, JULIA IRWIN, *Haskins Laboratories*, LETITIA NAIGLES, *University of Connecticut* — Implicatures are information not

explicitly stated but still part of a speaker's intended meaning (e.g., *Some students graduated* suggests not all students did). Different implicatures are generated from adherence to different conversational maxims (e.g., relevance). Little research exists on whether children's competence across implicatures emerges together and whether the abilities required to generate implicatures (e.g., world knowledge, theory of mind) are shared. The current study evaluated four types of implicatures within the same groups of adults and children (7-10 years old): conventional, scalar, relevance, and metaphors. Participants were asked to predict a character's action within a story context, based on a target utterance involving a particular implicature type. Both groups performed significantly worse on conventional implicatures and metaphors compared to relevance and scalar implicatures, suggesting that different implicatures may rely on different mechanisms and/or knowledge. Future analyses will examine the relative contributions of language and theory of mind to understanding implicatures.
Email: Iris Chin, iris.chin@uconn.edu

(5120)

Politeness and Offense in Computer-Mediated Chat. KRIS LIU and JEAN E. FOX TREE, *University of California, Santa Cruz* — An utterance's politeness is often thought be determined by its form. For example, indirect requests are considered more polite than direct requests, and cursing is considered offensive. We tested whether the perception of politeness by a third party can be influenced by how people respond to polite or offensive remarks, and whether politeness can be affected by perceived or actual friendship status. When people read others' computer-mediated chat, the same conversational contribution was considered less polite when an interlocutor's response indicated offense than when it did not. Similarly, contributions were considered more polite when responses indicated no offense than when they indicated offense. Perceived familiarity of the conversational partners also influenced third party judgments of politeness. Impolite contributions were rated as more polite when partners were thought to be friends compared to strangers, though it made no difference whether the partners were actually acquainted.
Email: Kris Liu, kyliu@ucsc.edu

(5121)

Linguistic Divergence Leads to Funnier Jokes. JACKSON TOLINS and JEAN E. FOX TREE, *University of California Santa Cruz* — How does dialogue support collaborative performance? Current theories of dialogue emphasize alignment, or convergence, as a driving force in successful joint activity. But linguistic divergence may be a critical ingredient in the ability of an interacting pair to jointly produce a final product of higher quality. We tested performance on a humor production task for individuals working alone and in collaborative pairs. Although pairs underperformed compared to the funnier, more creative member working alone, the more turn-by-turn linguistic divergence the conversation produced within a collaborative trial, the funnier it was. A trial's funniness was not predicted by the funnier individual's average performance. Collaborative activity relies on progressivity across contributions: Conversations in which the pairs built on each other's talk, taking it in new directions, produced funnier and more creative jokes.
Email: Jackson Tolins, jtolins@ucsc.edu

(5122)

Knowledge Revision: The Role of Inhibition. REESE BUTTERFUSS, PANAYIOTA KENDEOU, *University of Minnesota* — Misconceptions are difficult to revise. One aspect of higher-level cognition that may play a role in the revision of misconceptions is executive functions (EFs). EFs are a set of general-purpose cognitive processes that regulates thoughts and behaviors. One core component of EF is the ability to actively inhibit dominant responses. The present study explored whether individual differences in inhibition were related to knowledge revision processes and products. Participants read 20 texts, half that refuted common misconceptions and half control. Reading times and post-test questions assessed knowledge revision. Reading times indicate that even though EF does not play a role during reading of refutation texts, it does play a role during reading of control texts. Specifically, moderate-EF readers experience less interference from the misconception during reading than their low- and high-EF counterparts. Results are discussed in the context of the Knowledge Revision Components (KReC) framework and models of EF.
Email: Panayiota Kendeou, kend0040@umn.edu

(5123)

Electrophysiological Correlates Associated With Updating Situation Models. DEANNA C. HALL and TODD R. FERRETTI, *Wilfrid Laurier University*, MURRAY SINGER, *University of Manitoba* — This research used ERP methodology to examine how discourse concepts are integrated into a situation model when they were previously explicitly mentioned (match), mentioned with a general term (general match), unmentioned in lieu of another concept (mismatch), or completely unmentioned (null). Passages consisted of two sentences to reduce the influence of decay on the activation of the discourse concepts. N400 amplitudes indicated that the mismatch and null conditions were the most difficult to integrate, followed by the general match and then the match conditions**.** Amplitudes in the Null condition were more negative than for mismatching targets at left-anterior and central-medial electrode sites. Late positivity amplitudes indicated that updating general concepts to be more specific produced the most difficulty. These results provide novel insight into how readers integrate concepts into situation models.
Email: Todd Ferretti, tferrett@wlu.ca

(5124)

Expectations of Lexical Entrainment and Lexical Differentiation in Spoken Word Comprehension. CARL BOU MANSOUR, *University of Illinois Urbana-Champaign*, ALEX CREWS, JESSI JACOBSEN, AIDAN LARSEN, NICOLE MAGATS and SARAH MONAGHAN, *Carleton College*, JIN HONG PARK, *Dartmouth College*, MIJA VAN DER WEGE, *Carleton College* — When sequentially referring to objects, speakers lexically differentiate similar items that

could be referred to with the same reference phrase (Van Der Wege, 2000, 2009). Subsequent research has been mixed over whether listeners benefit from lexical differentiation in resolving reference phrases. Using a referential communication task, Van Der Wege (2007) found that listeners were faster to resolve reference phrases when the speaker lexically differentiated them. However neither Schmader, Horton, and Van Der Wege (2010) nor Yoon and Brown-Schmidt (2013) found any differences using a cohort competition eyetracking paradigm. The current studies explore the question of listener expectations further, by making further adjustments to the context of the reference phrases - in the first experiment by altering the modified reference phrases used so that a bare noun phrase always preceded a modifying clause and in the second experiment by allowing the listener to hear the complete reference phrase before revealing the picture stimuli. While differences in resolution were observed for lexically entrained references, no reliable differences were found between lexically differentiated and undifferentiated references.
Email: Mija Van Der Wege, mvanderw@carleton.edu

(5125)

How Speaking and Listening Relate to Each Other in a Dialogue: An Electrophysiological Study. KAITLYN A. LITCOFSKY and JANET G. VAN HELL, *Pennsylvania State University* (Sponsored by Carrie N. Jackson) — Production and comprehension are typically studied separately. Yet, both are engaged in dialogue, where one individual expresses their thoughts through speech and the other listens to that output for comprehension. Throughout the dialogue this pattern reverses continually, and every speaker is also a listener. We examine how speaking and listening relate to each other within the same individual in dialogue, and compare this to listening and speaking in monologue. Participants completed two cross-modal syntactic priming tasks of active/passive sentences: production-to-comprehension and comprehension-to-production. For monologue, participants completed the task alone. For dialogue, participants interacted with a confederate. For production-to-comprehension, Event-Related Potentials revealed an N400 priming effect that is similar for dialogue and monologue. For comprehension-to-production, dialogue, but not monologue showed priming for proportion of passives produced. This cross-modal priming suggests the processes of comprehension and production are related, and interacting with a dialogue partner modulates aspects of this relationship.
Email: Kaitlyn A. Litcofsky, kaitlynlitcofsky@gmail.com

(5126)

Narrative Engagement, Text Representation, and Spontaneous Literary Interpretation. ALYSSA N. BLAIR and SUSAN R. GOLDMAN, *University of Illinois at Chicago* — Experiencing engagement with a narrative has been theorized as the primary mechanism of narrative persuasion; the current work extends this theory to mental model construction and literary interpretation. In two studies, participants were asked to read narratives texts, rate their narrative engagement (Busselle & Bilandzic, 2009) in those texts, and complete either text representation (Daniel & Raney, 2007) or literary interpretation tasks (Goldman, McCarthy, & Burkett, 2014). The first study specifically examines how measures of narrative engagement influence the strength of surface form, textbase, and situation model representations of a text. The second study investigates whether engagement influences the type of interpretative inferences that readers' make while reading literary texts. Analyses suggest that narrative engagement differentially influences levels of text representation, primarily in increasing memory for surface form information, and the type of literary inferences made during reading.
Email: Alyssa Blair, ablair5@uic.edu

PSYCHOLINGUISTICS IV

(5127)

Is Imagining a Voice Like "Listening" to it? Evidence From ERPs. PEIYUN ZHOU (Graduate Travel Award Recipient), SUSAN GARNSEY and KIEL CHRISTIANSON, *University of Illinois Urbana-Champaign* — Readers who have seen the Harry Potter movies before reading the novels may "hear" actors' voices in their heads during subsequent reading. How much is this mental simulation of voices like "listening" to voices? Two ERP experiments examined the *auditory perceptual simulation* (APS) of native and non-native English speech while participants silently read sentences containing subject-verb agreement or pronoun-case errors. The aim was to compare APS results (e.g., Zhou & Christianson, 2016) to those of Hanulíková et al. (2012), who found that native Dutch speakers "forgive" errors by non-native speakers' during listening. Participants listened to snippets of native and non-native English speakers' speech and were asked to imagine the voice of one or the other speaker while reading sentences. Results revealed differences in N400 and P600 waveforms when imagining non-native speakers compared to natives. Importantly, when imagining non-native speakers committing agreement errors, P600 amplitudes were no different from error-free items.
Email: Peiyun Zhou, pzhou5@illinois.edu

(5128)

When Structure Competes With Semantics: Relative Clause Processing in Chinese. PEIYUN ZHOU, *University of Illinois, Urbana-Champaign*, YUN YAO, *University of Arkansas*, KIEL CHRISTIANSON, *University of Illinois, Urbana-Champaign* — An eye-tracking study examined Chinese relative clauses (RCs) in which syntactic structure and semantic plausibility point toward conflicting interpretations. Some studies show Chinese subject-RCs are easier to process and comprehend than object-RCs (Gennari & MacDonald, 2008; Gibson & Wu, 2011; Hsiao & Gibson, 2003; Levy, 2008). Others find the opposite (Lin & Bever, 2007; Kuo & Vasishth, 2006). No study has yet examined the role of plausibility in Chinese RC processing. 32 Chinese speakers read 56 target sentences in four conditions (plausible subject-RC; implausible subject-RC; plausible object-RC; implausible object-RC) and 176 fillers. Paraphrase verification probes measured comprehension. Results revealed only plausibility affected sentence reading time and response accuracy: reading was faster and comprehension better for plausible sentences. Structure affected neither speed

nor accuracy. Results indicate that plausibility information overwhelmed structural information (Christianson et al., 2010; Zhou & Christianson, 2016). Region-by-region analyses demonstrate how competing information sources inform the unfolding parse.
Email: Kiel Christianson, kiel@illinois.edu

(5129)

High Confidence in Illusory Interpretations Suggests Misretrieval, Not Misreconstruction. AMANDA RYSLING, CAREN M. ROTELLO and BRIAN DILLON, *University of Massachusetts, Amherst* — In sentences like 'The worker was surprised that the resident who said that the neighbor was dangerous was complaining', comprehenders misinterpret the subject of the verb 'was complaining' as 'the neighbor' (Van Dyke, 2007). We tested two alternative accounts of this effect: 1) the verb's semantic features are used as retrieval cues to a subject, creating interference if multiple appropriate nouns are present, and 2) the misinterpretation is reconstructed given a deprecated signal in a noisy channel. Subjects made speeded plausibility judgments and unspeeded confidence ratings in a rapid serial visual presentation task. The plausibility of the subject and main verb, and the presence of a distractor misinterpretable as a subject of the main verb, were manipulated. High-confidence "plausible" responses to implausible sentences occurred more with a distractor, a data pattern expected only under the retrieval cue account.
Email: Amanda Rysling, arysling@linguist.umass.edu

(5130)

The Effect of Self-Paced Reading on Individual Variability in ERPs Elicited by Morphosyntactic Anomalies. AMALIA REYES, DARREN TANNER, *University of Illinois at Urbana-Champaign* — Morphosyntactic anomalies have canonically elicited a P600 response in language-related ERP studies. However, recent studies have shown that this is not true for all participants, as qualitative individual differences in brain responses have now been documented (Tanner & Van Hell, 2014). The goal of the present study was to investigate the effect of reading speed on ERP response variation. We presented monolingual readers with morphosyntactic anomalies in either RSVP (500ms SOA) or self-paced reading format. Individual differences were evident in both presentation groups. Results from this study have implications for neurocognitive theories of language by identifying the role that individual differences in reading rate make to neural signatures of morphosyntactic processing. Moreover, our study sheds light on how methodological factors like presentation mode impact inter-subject variability in brain responses.
Email: Amalia Reyes, amalia.reyes.1993@gmail.com

(5131)

Do Comprehension Questions Affect Syntactic Priming Effects During Reading? KRISTEN M. TOOLEY, *Texas State University* — In comprehension, abstract syntactic priming effects are not as readily obtainable as in production (see Tooley & Traxler, 2010 for a review). This may be caused by production tasks requiring greater depth of processing or by other methodological differences between tasks. To test this, 157 participants had their eye movements recorded while reading 48 prime-target reduced-relative clause sentence pairs. Each prime sentence was followed by a forced-choice, two-option, question that, critically, tapped understanding of the difficult relative clause. Verb overlap was manipulated to be either the same or different between prime-target sentence pairs. MLM analyses of total fixation times at the critical regions revealed a significant position (prime vs. target) by verb overlap (same vs. different) interaction. Priming effects were only observed in target sentences that contained the same verb as the target. This finding casts doubt on a depth of processing account of lexically-dependent syntactic priming effects in comprehension.
Email: Kristen Tooley, Ph.D., ktooley@txstate.edu

(5132)

"The Preponderance of the WHAT?" Factors in the Comprehension of Jury Instructions. JANET RANDALL, YIAN XU, HALEY EMERSON, ABBIE MACNEAL and KATHERINE FIALLO, *Northeastern University* — Jurors are often very confused by jury instructions, the complicated directives that a judge reads to them before deliberating (Charrow & Charrow 1979; Diamond et.al. 2012). This confusion leads to both disengaged jurors and misinformed verdicts (Benson 1984; Marder 2006). Our previous study showed that (a) comprehension inversely correlates with 2 linguistic factors — passive verbs (Ferreira 2003) and "legalese" (Diana & Reder 2006) — and (b) reading while listening improves comprehension (Randall & Graf 2014). However, this earlier study used undergraduate subjects, who are not representative of jurors, and the effect, though significant, was found in only 2 of 6 instructions. In the current study, MTurk subjects, who more closely match the jury pool, showed a more robust ($p<.001$) and widespread effect (present in 5 of 6 instructions), providing even stronger evidence that (a) specific linguistic factors impede comprehension and (b) reading along improves comprehension over listening alone.
Email: Janet Randall, randall@neu.edu

(5133)

Verb Bias Trumps Plausibility in the Processing of Chinese Ambiguous Sentences. ZHIYING QIAN, *University of Colorado Boulder* — Previous research showed that verb bias plays a larger role than plausibility in processing English temporarily ambiguous sentences such as "The bus driver warned the passengers might get too rowdy", in which "the passengers" is ambiguous between the direct object of "warned" and the subject of the sentential complement (Garnsey et al., 1997). In a self-paced reading experiment, the present study compared the relative contributions of verb bias and plausibility in Chinese. 10 direct object bias (DO-bias) and 10 sentential complement bias (SC-bias) verbs were used to create 64 sets of sentences (32 DO; 32 SC), with each set containing four versions that fully crossed ambiguity and plausibility. Results showed that direct object continuation was not considered by the parser after SC-bias verbs, and that plausibility influences

processing only when verb bias allowed it to, contrary to the claim about the importance of plausibility in Chinese sentence processing.
Email: Zhiying Qian, Zhiying.Qian@colorado.edu

(5134)

Salience and Second Language Acquisition: Physical Form, Learner Attention and Instructional Focus. MYRNA C. CINTRON-VALENTIN and NICK ELLIS, *University of Michigan* (Sponsored by David Meyer) — The limited attainment of morphosyntactic forms in Second Language Acquisition (SLA) has recently been researched in terms of three aspects of salience: the physical form of language, learner associative experience, and form focused instruction (FFI). This study examined the role of modality of input presentation – aural, visual, and aural plus visual – in L1 English learners' attentional focus on verb morphology, and the effectiveness of different FFI manipulations. Participants viewed Latin utterances combining lexical and morphological cues to temporality under control conditions and three types of FFI conditions: grammar instruction, verb salience with textual enhancement or emphatic pronunciation, and verb pretraining. Subsequent testing showed that control participants were less sensitive to the morphological cues in comprehension, and less accurately produced these cues. FFI was effective in increasing attention to verb morphology. Learning morphological cues was considerably more difficult from aural than visual presentation. These results demonstrate how salience in physical form, learner attention, and instructional focus all variously affect the success of SLA.
Email: Myrna Cintron-Valentin, mcintron@umich.edu

(5135)

Relationships Between Statistical Learning, Sentence Processing, and Working Memory. OLGA A. PARSHINA, TIMOTHY J. RICKER, ELIZABETH S. CHE, RITA OBEID and PATRICIA J. BROOKS, *City University of New York, College of Staten Island and Graduate Center* — Performance on auditory statistical-learning (SL) tasks has been shown to predict individual differences in sentence processing (Misyak & Christiansen, 2010; 2012). We attempted to replicate this relationship with other measures of SL, while also exploring relationships with working memory (WM) and intelligence. Undergraduates (N=118, all native English-speakers) completed measures of SL (SRT [Lum et al., 2010], ASRT [Nemeth et al., 2010], speech stream [Siegelman & Frost, 2015]), sentence processing (Wells et al., 2009), visual WM (Ricker & Swagman, in prep) and nonverbal-fluid intelligence (Cattell & Cattell, 1973). Only speech-stream accuracy predicted RTs in sentence processing. SRT and ASRT tasks correlated with each other and with the decay rate of information in WM: participants with a faster rate of information loss within WM were better implicit learners of visual-spatial sequences. This relationship is consistent with the view that SL is most efficient when explicit learning is inactive (Janacsek et al., 2012).
Email: Olga Parshina, parshinaolga23@gmail.com

(5136)

Consistency Between Old and New Mappings in Memory Consolidation: Can We Learn Something New From the English Past Tense? JELENA MIRKOVIC, *York St. John University*, GARETH GASKELL, *University of York* — The Complementary Learning Systems model of memory (CLS; McClelland et al. 1995) suggests that the integration of newly learned information into existing memory systems depends on their consistency with existing knowledge: New inconsistent knowledge is likely to rely more on memory consolidation processes. We tested this hypothesis using the English past tense. Participants were trained on a set of novel verbs (and their past tenses) which were phonologically similar to neighborhoods of existing verbs with past tenses that were predominantly either regular (e.g. PLARE*,* cf. *share, stare*), or irregular (e.g. FLEEP*,* cf. *sleep, keep*). Participants were tested after a 12-hr delay that included wake (Experiment 1), or sleep (Experiment 1, Experiment 2 with polysomnography). As predicted by the CLS, at the delayed test participants' memory for the novel forms inconsistent with existing knowledge was subject to strongest forgetting for wake and preservation for the sleep group. The findings also provide evidence in support of a role for domain-general memory mechanisms in learning novel morphological forms.
Email: Jelena Mirkovic, jelena.mirkovic@york.ac.uk

(5137)

Does Co-Speech Gesture Aid Real-Time Language Comprehension? It Depends. RAHELEH SARYAZDI and CRAIG G. CHAMBERS, *University of Toronto* — Previous studies have shown that manual gestures produced while speaking can enhance on-line language comprehension. Here we consider scenarios where talkers describe objects that are present in the physical environment. Of interest is how listeners deploy visual attention in this context and whether gesture cues continue to provide benefits. In Experiment 1, gaze position was monitored as listeners followed instructions from talkers ("Pick up the candy") who did or did not produce gestures reflecting the size of objects. Results showed that gesture cues speeded listeners' eye movements toward intended objects. However, the benefit was mild and occurred only for hard-to-identify (i.e., small) objects. In Experiment 2, background noise was added to test whether challenging auditory environments would increase sensitivity to gesture cues. Surprisingly, we found that noise in fact reduced listeners' use of gesture information. The findings highlight how situational factors govern the uptake of visual cues during multimodal communication.
Email: Craig Chambers, craig.chambers@utoronto.ca

(5138)

Phonetic Symbolism and the Memory of Advertisements. MARILYN BOLTZ, GRACE MANGIGIAN and MOLLY ALLEN, *Haverford College* — Although language tends to display arbitrary symbolic reference, one exception is phonetic symbolism or the association of high-pitch front vowels with small quick objects, and low-pitch back vowels with large slow objects. The purpose of the present study was to investigate the potential impact of this phenomenon upon the memory of

advertisements. Participants were asked to evaluate a set of ads displaying fictitious brand names with high or low pitch vowels that were (in)congruently paired with small and large products. Immediately afterwards, all participants were unexpectedly asked to perform a series of memory tasks that included product and brand name recall, and brand recognition in the presence of a product cue, or vice versa. Results showed that remembering was better for ads containing congruent pairings and especially those with brand names containing back vowels paired with large products.
Email: Marilyn Boltz, mboltz@haverford.edu

(5139)

Improving Random Effects Structures for Generalized Additive Mixed Models of ERPs. BRYOR SNEFJELLA and JOHN F. CONNOLLY, *McMaster University* (Sponsored by Victor Kuperman) — Generalized additive mixed models (GAMM) have been recently applied to the study of event related potentials. GAMM have many benefits, such as allowing the application of regression designs to ERP experiments with continuous predictors, easy incorporation of individual differences, elegant treatment of non-linearities, and fine interpretability. However, poorly specified random-effects structures can lead to overconfident and biased estimates of fixed effects in mixed models (Barr et al., 2013). One large source of variability in ERP experiments is between-trials variability. In previous ERP experiments modelled with GAMM, this has typically been addressed by including factor smooths of trial by participant, and random intercepts or factor smooths by item. We present evidence that these random effects do not capture the full extent of between-trial variability, and that a random intercept for each unique stimulus event in the experiment seems to provide a better overall fit, and likely leads to less bias in the fixed effects.
Email: Bryor Snefjella, snefjebn@mcmaster.ca

CHANGE DETECTION

(5140)

The Effect of Increasing Number of Items in a Location Change-Detection Task With Pigeons and Humans. LAUREN CLELAND, NICK MALONE, RONNIE LEE, JOSH WOLF, JAMES TAYLOR and KENNETH LEISING, *Texas Christian University* — Change detection procedures are commonly used to assess the capacity (number of items) of working memory. In our study, we trained pigeons and humans to complete a location change-detection task which required participants to touch a visual item (colored circle) that had changed in spatial position across a brief delay (0, 100, or 1000 ms). The number of items on the sample and test display varied from 2 to 8 items across trials. A visual mask (a checkered board) was inserted on some trials. The results reveal that longer delays and larger sample sizes led to a decrease in performance for both species. A Mask x Delay interaction indicated that the effect of the mask was different across the two delays, with accuracy disrupted only after 100 ms. The results will be discussed in terms of the attributes of the memory mechanisms (e.g., iconic memory) supporting location-change detection performance.
Email: Lauren Cleland, l.cleland@tcu.edu

(5141)

Multimedia Minded and Distracted? Evidence From a Large-Scale Replication Study. WISNU WIRADHANY and MARK R. NIEUWENSTEIN, *University of Groningen* (Sponsored by Mary C. Potter) — Is media multitasking – that is, the concurrent use of different media in daily life – associated with impairments in information processing? A growing body of research has provided mixed evidence: some have found that media multitasking is associated with increased susceptibility to distractors, whereas others have found that it is associated with a more general impairment, and yet others have found no difference in performance. Here, we report the results of a large-scale replication study (N = 261) in which performance and distractibility were measured in a visual change detection task. Using a Bayes factors analysis, our results showed that heavy (N=63) compared to light (N=62) media multitaskers showed no increased susceptibility to distractors (BF_{01} = 28.63). In addition, an analysis including all participants showed no correlation between media multitasking and overall performance(BF_{01} = 16.46). Taken together, these findings dispell the recent claim that the frequency of media multitasking in daily life is associated with impaired information processing in the lab.
Email: Wisnu Wiradhany, w.wiradhany@rug.nl

(5142)

Car and Motorcycle Conspicuity as a Function of Their Prevalence. BERTRAND SAGER, ELISABETH KREYKENBOHM, GABRIELLE WISH and THOMAS M. SPALEK, *Simon Fraser University* — Motorcycle collisions often involve a car driver that "looked but failed to see" the motorcycle before turning left across its path. Despite countermeasures focusing on sensory factors that contribute to conspicuity, these types of collisions are increasing, and the assumption that motorcycles are difficult to see remains largely unchallenged. In previous work employing images of traffic scenes, we found that motorcycles stood out, without any conspicuity-enhancing treatment. In the present work, we manipulated the prevalence of motorcycles and cars in a context-free display. In-display prevalence had no effect, but target likelihood, which was learned across-trials, did. Motorcycle sensitivity was the same regardless of which vehicle was the likely target, and car sensitivity was lower when cars were the more likely target. Consistent with our previous work, motorcycles do not seem to suffer from a lack of conspicuity, even when studied in prevalence situations closer to the everyday driving context.
Email: Bertrand Sager, bsager@sfu.ca

(5143)

Color Changes Affect Visual Search in a Flicker Task. QIWAN SHI and RICHARD D. WRIGHT, *Simon Fraser University* — We used a flicker task to investigate the role of attention in object perception. In each experiment, participants saw many

bi-color squares in a flickering image and were required to find the one that was changing. We manipulated the component colors of these squares and found that participants were slower to notice color position flipping than color replacement. This indicates that when searching for a target in an array of items, it can be more difficult to verify that an item is changing if that item is outside the focus of attention, and if its component colors merely flip position. This suggests that if squares with colors that flip positions are not sufficiently attended to, they could be mistaken for squares with colors that do not change. And that the flicker task can be used to demonstrate that limited attention can sometimes cause perceptual errors.
Email: Qiwan Shi, qiwans@sfu.ca

(5144)

The Role of Task Relevance and of Attentional Control Settings in Processing Multiple Stimuli Simultaneously. ANNA IZOUTCHEEV, *The Open University of Israel*, GALIT YOVEL, *Tel-Aviv University*, NURIT GRONAU, *The Open University of Israel* — Presenting briefly multiple stimuli simultaneously results in reduced stimulus processing (competition), or alternatively, in an enhanced representation of an ensemble relative to an individual stimulus (redundancy gain). While the two phenomena are well established, the conditions under which each is manifested as well as their specific nature (obligatory vs. controlled) are still largely unknown. In the current study participants performed a change detection task with one face, four identical faces or four different faces with the same expression, and responded to either the character's expression or its identity. In the expression task, redundancy gain was found for both types of multiple stimuli displays, yet performance in the heterogeneous face condition was significantly enhanced only when participants were explicitly notified about the faces' identical expression. In the identity task, competition was found for the heterogeneous display (vs. a single face) regardless of the instructions. These results suggest that participants can successfully ignore an irrelevant stimulus dimension, leading to a cost or benefit in multiple stimulus processing, yet ensemble processing may rely on explicit strategic attentional settings.
Email: Anna Izoutcheev, anne.1987@gmail.com

(5145)

Survival Effects in a Change Detection Task. LISA A. VANWORMER, LISA D. BLALOCK and ELIZABETH A. POWERS, *University of West Florida* — Three experiments examined the impact of survival relevance on change detection for real world objects. In Experiment 1, items in the memory array were from a category rated low in survival relevance (e.g., basketballs) or high in survival relevance (e.g., fire extinguishers). One item changed to a new item within the same category at test. In Experiment 2, we controlled for perceptual distinctiveness by using non-categorical, low-survival relevant objects only in the memory array. At test, one item changed to either a new low-survival object or a new high-survival object. In Experiment 3, the memory array also used low-survival objects and we controlled for arousal effects by changing one item to either a high-arousal, low-survival object (e.g., clearance sign) or to a high-arousal, high-survival object (e.g., handgun) at test. Our results indicate that, in the visual domain, the magnitude and direction of the survival effect vary with perceptual distinctiveness and arousal.
Email: Lisa VanWormer, lvanwormer@uwf.edu

(5146)

The Omnipresence of Detection and Attentional Failures. BENOIT ROBERGE-VALLIERES, *Université Laval*, HELEN M. HODGETTS, *Cardiff Metropolitan University*, FRANÇOIS VACHON and SEBASTIEN TREMBLAY, *Université Laval* — Detecting changes in our environment is essential to several everyday activities (e.g., driving a car) as well as to safety-critical tasks such as air traffic control. Rensink et al. (1997) showed that subjects often fail to detect changes in static visual scenes when concurrently presenting visual disturbances such as the flicker paradigm, whereas St. John et al. (2005) revealed that this attentional vulnerability extends to dynamic visual scenes. The current series of experiments investigates the failure to detect task-relevant changes and events in different simulated multitasking work environments (air traffic control and security surveillance) and in two sensory modalities (visual and auditory changes). Results revealed that detection failures and attentional breakdowns go well beyond specific experimental paradigms and work settings. Our findings showed the omnipresence of these phenomena across various types and complexity of tasks, and revealed that, although hearing is obligatory, auditory changes and events can also go unnoticed.
Email: Benoit Roberge-Vallieres, benoit.roberge-vallieres.1@ulaval.ca

(5147)

Learning to Wait: Dynamic Persistence in Uncertain Environments. JOSE LUIS BAROJA and ARTURO BOUZAS, *National Autonomous University of Mexico* (Sponsored by Federico Sanabria) — Previous reports have suggested that in some environments it might be adaptive to abandon the search for a long-run outcome, while in others it is convenient to persist until the delayed outcome is obtained. Specifically, McGuire and Kable (2012, 2013) reported that human participants are sensitive to the expected delay of reward of uncertain alternatives and that they behave rationally, persisting in their wait when the expected delay decreases as a function of time and giving up the wait when the expected delay increases as time passes. In our experiments, we replicate McGuire and Kable's initial conditions, but we aggregate an unmarked change at some point in the session such that an alternative where persisting was optimal becomes an alternative where persisting is no longer optimal and vice-versa. We measure whether participants detect the change and how quickly they adapt to the new environment. The data we report is a testbed for models of change detection, temporal discounting, and temporal estimation.
Email: Jose Luis Baroja, j.luis.baroja@gmail.com

(5148)

Attentional Flexibility Increases With Age in Visual Change Detection. MARIA J. DONALDSON, *Cleveland State University*, NAOHIDE YAMAMOTO, *Queensland University of Technology*, ERIC S. ALLARD, *Cleveland State University* — Onset primacy is a robust visual phenomenon wherein onset of new objects captures observers' attention more effectively than other types of events such as deletions of previously viewed objects. The present study sought to understand how older and younger adults attend to visual events in the environment, and if onset primacy changes with age. Participants were asked to detect a change (either onset or offset) in visual scenes under conditions in which they were biased toward prioritizing detection of offset by experiencing offsets more frequently than onsets and/or receiving an instruction to attend more to offset than onset. Results revealed that although younger and older participants generally exhibited the same degree of onset primacy, some of the offset-biasing manipulations were more effective in older adults, suggesting that attentional flexibility might increase with advancing age.
Email: Maria J. Donaldson, m.j.donaldson@vikes.csuohio.edu

(5149)

A Different Kind of Weapon Focus: Sensorimotor Experience Reduces Change Blindness. ERIC TAYLOR, *University of Toronto*, JESSICA WITT, *Colorado State University*, JAY PRATT, *University of Toronto* — Attentional allocation is flexibly altered by action-related priorities. Given that tools – and specifically weapons – can affect attentional allocation, we asked whether training with a weapon or holding a weapon during search would affect change detection. In two experiments, participants searched for changes to agents, shootable objects, or environments in the popular flicker paradigm. Participants trained with a simulated weapon or watched a video from the same training perspective and then searched for changes while holding a weapon or a control object. Results show an effect of training, highlighting the importance of sensorimotor experience for the action-relevant allocation of attention, and a possible interaction between training and the object held during search. Simulated training with ballistic weapons reduces change blindness. Theoretically speaking, this result has implications for the interaction between tool use and attentional allocation. Practically speaking, this result informs the responsible use of firearms.
Email: Eric Taylor, j.eric.t.taylor@gmail.com

(5150)

Hemispheric Differences in Change Deafness. SAMANTHA NOLL, KACY O'HAVER and MELISSA GREGG, *University of Wisconsin - Parkside* — It is well established that the left hemisphere processes information in a piecemeal manner, while the right hemisphere processes information holistically. The purpose of the present study was to determine if change deafness, the finding that listeners are poor at detecting changes to auditory scenes, is due to relying on the wrong hemisphere, i.e., right hemisphere dominance during a change detection task could cause changes occurring at the level of individual objects to be missed. On each trial, listeners made a same/different judgment to scenes composed of environmental or speech sounds. Sounds were presented dichotically (two sounds presented to the right ear/left hemisphere and two presented to the left ear/right hemisphere). There was a right hemisphere advantage for detecting changes to scenes composed of environmental and speech sounds, which suggests that a strategy based on the global representation of the auditory scene is more effective for successful change detection.
Email: Melissa Gregg Greggm@uwp.edu, greggm@uwp.edu

(5151)

The Differential Impacts of Task Demands on Change Deafness and Inattentional Deafness. MICHAEL HALL and HEATHER DALY, *James Madison University*, JEREMY GASTON and KELLY DICKERSON, *US Army Research Laboratory* — Several studies claim to demonstrate change deafness, the failure to detect above-threshold changes in auditory scenes, within a single trial. However, since detection failure is preceded by misdirecting attention, they could reflect inattentional deafness. The current investigation used a multi-trial task to distinguish inattentional from change deafness. Arrays consisted of the same four repeating events (to eliminate identification uncertainty) moving randomly through space. Each array contained one event that changed with respect to either presentation rate, intensity, timbre (via low-pass filtering), or continued movement. Listeners reported which event changed; in the inattentional condition listeners first reported the cued event's final location. For intensity and rate manipulations errors increased in the inattentional condition, suggesting that localization demanded additional resources. This was not observed for other manipulations, where performance was generally poor. This suggests that the inattentional condition redistributed resources that were expended in the change deafness condition. Therefore, the distinction between inattentional and change deafness, which can be evaluated together, remains useful.
Email: Heather Daly, hrdaly90@gmail.com

(5152)

Aging and Visual Working Memory: Age-Related Differences in Response Bias and Variability. MATTHEW C. COSTELLO, *University of Hartford*, AARON T. BUSS, *University of Tennessee*, DANIELLE T. KAPLAN and SAMANTHA FERA, *University of Hartford* — Visual working memory (VWM) declines with advanced age, although the mechanism for this decline is poorly understood. The current project explores this topic with two behavioral experiments and a dynamic neural field (DNF) model. The first experiment is a change detection task in which older and younger adults indicated same-different to arrays of colored circles. Results indicated a 'same bias' for older adults, with increased errors on different-trials compared to same-trials. A DNF model was modified to capture the age group differences, indicating an age-related imbalance in excitatory contributions from the VWM field yielding overly robust and broader activation peaks for VWM representation. This suggests that older adults should exhibit greater variability in response distributions but not increased forgetting when estimating a color from memory, a hypothesis supported in

the second experiment. Taken together, we conclude that older adult deficits in VWM are due to increased noise in visual representations.
Email: Matthew C. Costello, mcostello@hartford.edu

VISUAL SEARCH II

(5153)

The Label Feedback Effect: Speaking Modulates Visual Search, but Probably Not Visual Perception. KATHERINE P. HEBERT and STEPHEN D. GOLDINGER, *Arizona State University* — The *label-feedback hypothesis* (Lupyan, 2007) proposes that language can modulate low- and high-level visual processing, such as "priming" a visual object. Lupyan and Swingley (2012) found that repeating target names facilitates visual search (shorter RTs and higher accuracy). However, a design limitation made their results challenging to assess. In this study, we evaluated whether self-directed speech influences target locating (i.e. attentional guidance) or target identification after location (i.e. decision time), testing whether the Label Feedback Effect reflects changes in visual attention or some other mechanism (e.g. template maintenance in working memory). Across three experiments, we analyzed search RTs and eye movements from four within-subject conditions. People spoke target names, nonwords, irrelevant (absent) object names, or irrelevant (present) object names. Speaking target names weakly facilitates visual search, but speaking different names strongly inhibits search. The most parsimonious account is that language affects target maintenance during search, rather than visual perception.
Email: Katherine Hebert, kpjones7@asu.edu

(5154)

Visual Search: You Are Who You Are (+ a Learning Curve). JUSTIN M. ERICSON, DWIGHT J. KRAVITZ and STEPHEN R. MITROFF, *The George Washington University* — The ability to take information learned from one visual search and apply that knowledge to subsequent searches, dubbed "Long-Term Visual Search" (LTVS), provides an important window into how search competencies develop. This project investigated individual differences in visual search performance by examining LTVS in approximately 110,000 participants (data obtained from *Airport Scanner,* Kedlin Co.; see Mitroff et al., 2015 JEP:HPP). While all participants demonstrated learning curves, participants largely stayed within a clearly distinguishable zone of performance from their first searches until the end. Those who ultimately became top performers started stronger, while those who ended as bottom performers began weaker. When broken into four distinct groups by their final performance, an individual's performance in early trials was predictive of their eventual proficiency with over 90% accuracy between top and bottom groups, and over 60% between all pairings, suggesting that searchers' initial abilities explained a fair proportion of their peak potential. (The author is serving as a sub-contractor on the contract to TSA who may potentially use the App used in this research.)
Email: Justin Ericson, justinericson@gwu.edu

(5155)

Search and Memory in Partitioned Spaces. GRAYDEN JF. SOLMAN and ALAN KINGSTONE, *University of British Columbia* — While most visual search experiments present targets and distractors against uniform or featureless backgrounds, typical naturalistic search environments are multiply subdivided – into buildings, rooms, pieces of furniture, drawers, and containers. The influence of this ubiquitous feature on search performance has received relatively little attention in the literature. Here we examine the role of partitions during mouse-contingent repeated search. Evaluating response times, explicit memory performance, and search paths, we report: 1) that partitions facilitate memory, both speeding response times during repeated search and improving explicit memory following search, and 2) that search paths are biased to follow partitions, potentially reducing the memory burden for tracking previously inspected items.
Email: Grayden Solman, grayden@psych.ubc.ca

(5156)

The Effects of Secondary Cognitive Task Demand on Systematic Scanning Behavior During Visual Search. STEVEN W. SAVAGE, *Schepens Eye Research Institute, Massachusetts Eye and Ear, Harvard Medical School*, BENJAMIN W. TATLER, *University of Aberdeen*, DOUGLAS D. POTTER, *University of Dundee* — Previous research suggested that scan paths may include a systematic component and that changes in secondary cognitive task demand are associated with specific changes in oculomotor metrics. This study investigated whether these systematic components rely on higher level cognitive resources and, as such, are affected by increased working memory load. We used Gilchrist & Harvey's (2006) structured and unstructured visual search paradigm in which participants searched for a target and made a present/absent decision with the addition of Savage, Potter & Tatler's (2013) secondary puzzle task. The distribution of saccade directions indicated that scan paths were modulated by secondary cognitive task demand, indexed by a reduction in the frequency of horizontal and vertical in favor of oblique saccades as demand increased. These results suggest that the systematic component of visual search may not be automatic and driven entirely by the structure of the array, but requires higher order cognitive resources.
Email: Steven W Savage CPsychol., steven_savage@meei.harvard.edu

(5157)

Facing a Difficult Task: Integrating Information to Find Faces in Crowds. JAMES D. DUNN, DAVID WHITE and RICHARD I. KEMP, *University of New South Wales* — Humans are often faced with a difficult situation of having to find particular faces in crowds. To find the target we need a search template: a pre-defined representation of the intended target which serves as reference to match against. Robust templates improve performance as they contain the features that distinguish the target from the distractors. However, we don't yet know what information can be integrated to form the best template. To examine this, we tested how to improve template efficiency for facial images by measuring speed and accuracy in

a visual search paradigm. Participants were given either a single image of the target, 4 different images of the target, or a single image created by averaging 20 other images of the target. We found that the averaged photos improved the accuracy of target selection. However, performance was most notably improved when we gave 4 images of the target compared to just one. These findings suggest how to optimize the search template for searching for faces in crowds. Specifically, it suggests that exposure to variability is the key to creating the best template.
Email: James Dunn, j.d.dunn@unsw.edu.au

(5158)

The Role of Decision Making in Cognitive Performance: Attention, Working Memory, and Inhibition. LAURA A. WALL and SCOTT D. BROWN, *University of Newcastle* — The cognitive domains of attention, working memory and inhibition are generally thought to index distinct cognitive processes. However the tasks that we typically use to measure these also share similarities, such as requiring participants to make repeated speeded decisions. It is possible therefore that performance on such tasks is more a measure of decision making processes than abilities in that cognitive domain. Mathematical models of decision making allow investigation of the relative contributions to performance from different components of the decision making processes, such as bias, caution, and motor speed. If decision making processes play a large role in determining performance, then we should expect a high degree of consistency of these components across tasks measuring different cognitive domains. Using a mathematical decision making model, we investigated to what extent individual performance was stable across tasks of attention, working memory and inhibition, in terms of contributions from different cognitive processes.
Email: Laura Wall, laura.wall@uon.edu.au

(5159)

Exploring the Role of Working Memory in Visual Search: Repeating Targets Does Not Diminish the Relationship Between Search and Working Memory Capacity. LAUREN WILLIAMS and TRAFTON DREW, *University of Utah* — Working memory (WM) is thought to play an important role in visual search. However, evidence for this relationship has been mixed. Carlisle, et al. (2011) found electrophysiological evidence that target representations are initially held in WM and are transferred to long-term memory with target repetition. Given this evidence, we should observe a relationship between WM and search for early target repetitions that diminishes with target repetition. This hypothesis was tested across four studies using three types of stimuli (objects, letters, and triple feature conjunction shapes). Multiple potential targets were presented before each search array. Each target set was repeated for six consecutive trials. WM capacity was measured using a change detection task. WM and search correlations ranged from small to moderate. However, no evidence emerged for a differential role of WM for early repetitions. This suggests that performance on early repetitions is not driven by WM limitations, as previously supposed.
Email: Lauren Williams, lauren.h.williams@utah.edu

(5160)

The Onset of a Trailing Stimulus Re-Evokes Activity at the Location of a Previous Target: An Event-Related Potential Study. HAYLEY EP. LAGROIX, KEVIN M.D. BOYD, NADJA JANKOVIC, AARON AN. RICHARDSON, VINCENT DI LOLLO and THOMAS M. SPALEK, *Simon Fraser University* — Perception of the second of two rapidly sequential targets (T1, T2) is impaired when presented up to 700ms after the first (attentional blink; AB). We investigated the neurophysiological mechanisms underlying T1 processing throughout the AB, and used electrophysiological measures (event-related potentials; ERPs) to obviate ceiling constraints typically seen in T1 accuracy. The T1 and T2 stimuli each consisted of a target and a distractor presented either on the vertical or on the horizontal meridian. When T1 was presented horizontally, T2 was presented vertically, and vice versa. T1 and T2 were presented at SOAs of 100, 300, or 700 ms. Presentation of T1 elicited the conventional components. A pronounced activity lateralized to the T1 location was also recorded upon the onset of T2 or an irrelevant stimulus. This unanticipated result suggests that the location of T1 is maintained throughout the AB, even though that information is irrelevant to the T1 task.
Email: Hayley Lagroix, hlagroix@sfu.ca

(5161)

Examining Visual Spatial Attention Using Response-Locked Event-Related Potentials Shows Differences in Post-Attentional Processing. BRANDI LEE DRISDELLE, GREGORY WEST and PIERRE JOLICOEUR, *Université de Montréal* — The N2pc is an event-related potential (ERP) with a posterior negative and contralateral scalp distribution relative to the side of the visual field where attention is deployed. Most N2pc research time-locks data to the onset of the search array (S-N2pc). The goal of the present study was to track the disengagement of visual spatial attention as well as subsequent mechanisms by time-locking to the motor response (R-N2pc). The task was a simple visual search where subjects processed a pop-out target among distractors. The scalp distributions of both the S-N2pc and the R-N2pc demonstrated a similar pattern of activity. We also separated trials by long and short response times (RT) and observed a shorter delay between the onset of the R-N2pc and the motor response for short RTs, likely reflecting the duration of processes taking place after the deployment of visual spatial attention.
Email: Brandi Lee Drisdelle, brandi.lee.drisdelle@umontreal.ca

(5162)

Comparing Brain Activity Related to Attention for Lateral Versus Central Targets Presented Among Distractors. MATTIA DORO, *University of Padova*, PIERRE JOLICOEUR, *Université de Montréal*, ROBERTO DELL'ACQUA, *University of Padova* — Using electroencephalography, we investigated the deployment of visuo-spatial attention in a visual search task. The N2pc is a widely studied lateralized event-related potential characterized by a parieto-occipital negativity peaking 250ms after stimulus onset which is greater on contralateral than ipsilateral electrodes (relative to the side of target presentation). A common interpretation of this component asserts that

N2pc is the summation of a contralateral negativity reflecting target selection and an ipsilateral positive shift reflecting distractor suppression. In our study, we investigated the difference between lateralized and centrally presented targets, in order to observe whether N2pc is actually a product of both hemispheres. Results showed that at posterior electrodes in both hemispheres, the negativity was similar in magnitude for contralateral and central targets. The only lateralized effect observed was a positive shift at ipsilateral sites when the target was lateralized. Results will be discussed in terms of target selection and distractors suppression.
Email: Mattia Doro, mattia.doro@gmail.com

(5163)

Establishing Visual Continuity Across Saccades Is Dependent on Visual Working Memory. STEFAN VAN DER STIGCHEL, NATHAN VAN DER STOEP, ALBERT POSTMA and MARTIJN SCHUT, *Utrecht University* — Despite variance in saccade motor execution, the visual system is able to establish continuity between saccades through corrective saccades. It has previously been hypothesized that these corrective saccades are dependent on the maintenance of the saccade target in visual working memory (VWM). Here we tested the role of VWM in maintaining visual stability using a dual task. Participants had to remember several shapes for later recall. During retention, participants had to saccade to a target in a visual search display. In a subset of trials, the search display rotated during the saccade, evoking a corrective saccade. Corrective saccades were executed slower when VWM was occupied. Furthermore, accuracy on the memory task was impaired in trials in which the display rotated. These results indicate that visual continuity is dependent on visual working memory and that information that is relevant for maintaining visual continuity is prioritized over the current VWM content.
Email: Stefan van der Stigchel, s.vanderstigchel@uu.nl

(5164)

The Effect of Target Detection Times on Target Absent Quitting Thresholds. MARK W. BECKER, GLEN GAGNON and CHAD PELTIER, *Michigan State University* — We test the theory that, in visual search without feedback, the time required to find targets impacts target absent quitting thresholds. To test this theory, we used eye-movement contingent changes to experimentally manipulate target present reaction times (RTs) and investigated target absent RTs. Participants searched an array for a Landolt C with a break on the top. The search task was difficult and detecting the target required fixation. Target present trials began with all stimuli as distractors. During the first eye movement after either 2s or 4s (manipulated in blocks) all stimuli changed to targets. Making this switch during an eye movement masked the change, and insured that the stimulus at the saccade landing position was a target. In this way, we experimentally manipulated target present RTs while keeping all other aspects of the search arrays constant. Target absent RTs were systematically influenced by the target present RTs, but the effect was robust only when target prevalence rates were high (80%). Target present RTs can influence quitting thresholds, but only when there are a large proportion of target present trials; thus, this type of adjustment may be ineffective in real-world scenarios where targets are rare.
Email: Mark W. Becker, becker54@msu.edu

(5165)

The Role of Eye Movements in Parallel Search: Eye Movements Are Neither Necessary Nor Sufficient for Logarithmic Search Functions to Emerge. GAVIN J.P. NG, SIMONA BUETTI and ALEJANDRO LLERAS, *University of Illinois at Urbana-Champaign* — Contrary to most models of visual search, our lab recently reported systematic variance in reaction times in so called "efficient search", reflective of first stage processing times (Buetti et al., 2016). Specifically, response times increased logarithmically as a function of set size, and this increase was modulated by target-distractor similarity. In the present exploratory study, we investigated the role of eye movements in producing these logarithmic functions. Participants completed a parallel search task under both free-viewing and fixed-viewing conditions while their eye movements were recorded. We found that the same logarithmic slopes were produced in both viewing conditions, suggesting that eye movements were not necessary for these slopes. Additionally, we conducted exploratory analyses on the number and probability of eye movements, saccade latency, false alarm fixations, and minimum distance between a fixation and the target. These variables were found to vary with set size, and target-distractor similarity as well.
Email: Gavin Ng, jng17@illinois.edu

(5166)

What Cognitive Processes Mediate Changes in Performance Across the Visual Field? MELISSA PRINCE and JASON S. MCCARLEY, *Flinders University* — Many everyday tasks require observers to process and respond to information across a large area of the visual field (e.g., scanning for road hazards when driving). However, observers are both slower and less accurate when responding to targets located in the periphery. The area of the visual field from which observers can successfully extract information without resorting to head or eye movements – the Functional Field of View (FFOV) – can be assessed by asking participants to identify targets presented at various eccentricities from central fixation. Restrictions of the FFOV have been attributed to both processing speed losses and peripheral crowding. Unfortunately, the measures used to map the FFOV usually conflate different cognitive processes (e.g., processing speed vs. asymptotic discriminability). We used the Linear Ballistic Accumulator model to disentangle the cognitive mechanisms mediating the FFOV in both cluttered and uncluttered displays. Results suggest that both target eccentricity and clutter degrade the quality of information that can be extracted from the display, producing slower rates of evidence accumulation. Moreover, clutter engendered longer nondecision times, consistent with a perceptual filtering cost.
Email: Melissa Prince, melissa.prince@flinders.edu.au

COGNITIVE CONTROL IV

(5167)

The Influence of Top Down and Bottom Up Processes on Task Switching. AARON T. BUSS, *University of Tennessee - Knoxville*, ELIOT HAZELTINE and VINCENT MAGNOTTA, *University of Iowa*, JOHN P. SPENCER, *University of East Anglia* — The task-switching paradigm has been widely used to probe executive function and frontal cortex processing. However, more recent data have revealed a critical role for posterior brain regions in parietal and temporal cortices. In the current study we collected fMRI data while participants performed four different task-switching conditions where they were asked to switch attention between color and shape dimensions, switch the spatial response mappings associated with the stimuli, switch both attention and response mappings, or switch neither. The behavioral data revealed that switch costs were largest when both attention and response mappings needed to be switched. The fMRI data showed that switching attention between dimensions activated lateral frontal cortex, replicating previous findings. However, switching response mappings resulted in activations in regions of parietal and temporal cortices. Further, when participants switched both attention and response mapping, all three ROI's were activated, suggesting that control signals related to switching rules can arise both in a bottom up and top down fashion depending on the nature of challenges posed by the configuration of tasks during the pre- and post-switch phases.
Email: Aaron T. Buss, abuss@utk.edu

(5168)

The Effects of Action vs. Strategy Video Games on Cognitive Control. KIRA BAILEY, *Ohio Wesleyan University*, BROOKE MARTINEAU, *Bay Path University*, SEAN MCCARTHY and KEVIN ROSSI, *Ohio Wesleyan University* — Several studies have demonstrated the benefits of playing action video games (e.g., first-person shooters) on visuospatial cognition, while other work has suggested that playing games may have negative consequences for cognitive control. Few studies have examined the impact of other genres of video games on cognition. The goal of the current study was to replicate previous work examining the effects of action video games on cognitive control, and to extend the literature to another genre, strategy video games. Participants completed the counting Stroop and AX-CPT tasks while event-related potentials were recorded before and after 10 hours of training on either an action video game (*Unreal Tournament 3*) or a strategy video game (*League of Legends*). Behavioral and neural results indicate that the two genres of video games differentially impact the use of proactive and reactive forms of cognitive control.
Email: Kira Bailey, kmbailey@owu.edu

(5169)

Action Scheduling in Multitasking - A Multi-Phase Framework of Response Order Control. ALEKSANDRA PIECZYKOLAN and LYNN HUESTEGGE, *University of Würzburg* (Sponsored by Oliver Herbort) — A crucial challenge in multitasking is to control temporal response order. However, multitasking studies usually focus on interference mechanisms *after* a specific response order has been determined, while a comprehensive study of response order scheduling mechanisms is lacking. In three psychological refractory period (PRP) experiments, we examined the impact of stimulus order, response characteristics, and other factors on response order with a combination of effector systems (oculomotor and manual) that is known to cause response order variability. The results suggest that bottom-up factors alone (e.g., stimulus order) are not the primary determinant of temporal action scheduling. Instead, we found a major influence of effector-based characteristics (i.e., oculomotor prioritization), which could be attenuated by instructions or a predictable task environment. Importantly, substantial effects of between-task compatibility suggest that a stimulus comparison process precedes response order decisions. Based on the present results and previous findings, we propose a multi-phase framework of temporal response order control which emphasizes how cognitive control of action scheduling is dynamically adaptive to task characteristics.
Email: Aleksandra Pieczykolan, aleks.pieczykolan@gmail.com

(5170)

The Eyes' Many Stories About Action-Related Load: Saccadic Amplitude, Latency, Errors, Pupil Response, and Blink Rate. LYNN HUESTEGGE and ALEKS PIECZYKOLAN, *Würzburg University* — Processing load is reflected in several eye-related parameters including saccadic amplitude, latency, errors, pupil response, and blink rate, indicating that "stressed" eyes hesitate, widen, err, and eventually shut down. Here, these facets are analyzed under single- and dual-action demands across different effector systems. Participants in Experiment 1 switched between single manual, single vocal, and dual (manual-vocal) response demands while fixating a central fixation cross. Results suggest dual-response costs for manual and vocal latencies. However, while blink rate and pupil dilation were also increased in the dual vs. single-manual condition, the data from the single vocal condition resembled those from the dual condition. Thus, vocal demands per se might increase blink rate and pupil dilation, potentially overriding any load-related effects. Experiment 2 compared saccade amplitude, latency, pupil dilation and blink rate in blocks of trials involving only basic saccade demands vs. blocks with additional manual key press demands. Results suggest increased saccadic latencies, shortened amplitudes, and changes in pupil dynamics under dual- (vs. single-)action demands, but no effect on blink rates. Taken together, the results suggest that while all parameters may individually be associated with variants of processing load, the underlying mechanisms appear to be distinct.
Email: Lynn Huestegge, lynn.huestegge@uni-wuerzburg.de

(5171)

The Influence of Stimulus Modality on Response Modality Prioritization in Dual Task Control. MAREIKE A. HOFFMANN, ALEKSANDRA PIECZYKOLAN and LYNN HUESTEGGE, *University of Würzburg* — Performing two actions simultaneously (vs. in isolation) usually yields dual-response costs in terms of longer reaction times or higher

error rates. However, these costs are typically not evenly distributed across both responses when different response modalities (effector systems) are involved. Previous studies involving pairwise combinations of oculomotor, manual, and vocal responses reported evidence for an ordinal prioritization pattern among effector systems: Oculomotor actions dominate vocal actions, whereas vocal actions dominate manual actions. However, these studies involved only a single stimulus to trigger both responses. In the present study, we employed two distinct (visual and auditory) stimuli to trigger pairwise combinations of saccades, manual, vocal, and pedal responses. Our findings replicate and extend previous patterns of effector system prioritization and quantify the impact of stimulus modality on dominance patterns. Implications for flexible resource scheduling models of dual-task control are discussed.
Email: Mareike Hoffmann, mareike.hoffmann@uni-wuerzburg.de

(5172)

Conceptual Overlap Rather Than Modality Pairings Affects Task Switch Costs. JONATHAN SCHACHERER and ELIOT HAZELTINE, *University of Iowa* — The modality compatibility effect refers to changes in the interference effects between tasks depending on the input and output modalities. For example, dual-task costs are smaller when pairing a visual-manual task with an auditory-vocal task (compatible) than when the opposite pairing is used (visual-vocal, auditory-manual; incompatible). Stephan & Koch (2010, 2011) reported these effects in a task-switching paradigm, with incompatible pairings exhibiting greater switch costs than compatible pairings. However, with these tasks there was conceptual overlap between the stimuli and responses for one task in the compatible pairing. In Experiment 1, we reversed this conceptual overlap condition to an incompatible pairing and found greater switch costs in the compatible condition, contrasting previous findings. In Experiment 2, we eliminated conceptual overlap in both tasks and found no effect of modality compatibility on switch costs. These results reveal that modality pairings do not necessarily affect switch costs when conceptual overlap is eliminated.
Email: Jonathan Schacherer, jonathan-schacherer@uiowa.edu

(5173)

Evidence the Attentional Bias Towards Somatic Threats Involves Threat Detectors in the Dorsal Posterior Insula. ROBERT DOWMAN, NICHOLAS LISZCZYNSYJ, JONAS EBERT and KATE WOLF, *Clarkson University* — The cross-modal endogenous cuing paradigm was used to investigate the brain mechanisms underlying the attentional bias towards somatic threats, such as a painful electrical stimulus applied to the sural nerve or a non-painful sural nerve stimulus presented in a pain context. The behavioral reaction time data show that a non-painful sural nerve stimulus is detected and reorients attention more quickly when presented in a pain context than a pain absent context. The behavioral and electrophysiological data argue against the attentional bias being due to general arousal associated with the pain context. Rather the results suggest that the attentional bias is due to activation of somatic threat detectors in the dorsal posterior insula. The somatic threat detector activation ultimately elicits a phasic response in the locus coeruleus, which in turn results in the facilitation of cerebral cortex neurons involved in the decision and response processes time-locked to the somatic threat.
Email: Robert Dowman, rdowman@clarkson.edu

(5174)

Do Visuospatial Reference Frames Produce Performance Asymmetries in the Simon Task? Evidence from Hand- and Foot-Press Responses. JING CHEN, *New Mexico State University*, JULIA C. SEIBOLD, *RWTH Aachen University*, QI ZHONG, *Purdue University*, JOCHEN MÜSSELER, *RWTH Aachen University*, ROBERT W. PROCTOR, *Purdue University* (Sponsored by Motonori Yamaguchi) — The Simon effect is a spatial stimulus-response compatibility effect in which the spatial dimension of the stimulus is task-irrelevant. This effect is often larger for the stimulus located on the dominant-hand side of participants. Early results of Wallace (1972) did not show this asymmetric pattern when participants were not allowed to see the response keys or their hands placed on them at any stage during the experiment. However, a recent study showed the pattern when the participants placed their hands on the keys prior to their being covered up (Seibold, Chen, & Proctor, 2016). We tested whether viewing of the effectors/keys in advance is sufficient to induce the asymmetric Simon effect pattern for hand as well as foot responses. The pattern was replicated for both hands and feet but not when participants were unable to see the effectors placed on the response devices prior to starting the experiment.
Email: Robert W. Proctor, proctor@psych.purdue.edu

(5175)

Set-and-Element Level Compatibility in the Oculomotor System. COURTNEY J. GRIFFIN-OLIVER and ROBERT W. PROCTOR, *Purdue University* (Sponsored by Kim-Phuong Vu) — Set-level and element-level compatibility are two ways to differentiate between components of stimulus-response compatibility. Element-level compatibility (the difference between incongruent and congruent mappings) has been shown to be an increasing function of set-level compatibility (differences between pairings of stimulus and response sets), which particularly influences performance for the congruent mapping. The present experiments sought to evaluate this phenomenon within the oculomotor system through eye-tracking in two experiments. Stimuli were squares in left and right locations or centered location words left and right. The difference between congruent and incongruent mappings of left-right eye-movement responses and spoken "left"-"right" responses in one experiment and left-right eye-movement responses and left-right keypresses in another. Eye-movement responses produced a smaller mapping effect with physical locations than with verbal stimuli, possibly because the target locations for the eye-movement responses were designated by outline boxes. Implications of these results for understanding saccades and anti-saccades are considered.
Email: Courtney Griffin-Oliver, griffino@purdue.edu

(5176)

How Does Sense of Body Ownership Vary With Cognitive Effort? ZANE ZHENG and LYNDSEY CHARETTE, *Lasell College* — Converging evidence suggests that sense of body ownership is based on multisensory integration of incoming information, as demonstrated by the rubber-hand illusion, where *seeing* someone stroke the fingers of a fake hand while *feeling* the stroking on one's own hidden hand evokes the illusory ownership of the fake hand. However, whether and how this process of embodiment may vary as a function of cognitive effort remains unknown. Here we developed a dual-task paradigm in which participants were instructed to perform N-back tasks (from 0-back to 3-back) on the identity of the stroked fingers during the induction of the rubber-hand illusion. Across two experiments, we showed that the strength of body ownership was strongly modulated by the cognitive effort only when the task load was moderate (i.e., 1-back) but not when the load was overwhelming (i.e., 3-back), and that the effect of cognitive effort was specific only to when the multisensory cues supporting the illusion were coherent. Therefore, our findings suggest that sense of body ownership may be more strongly influenced by the higher-level cognitive control than previously thought.
Email: Zane Zheng, zzheng@lasell.edu

(5177)

Exploring Modality Compatibility in the Response-Effect Compatibility Paradigm. NOÈMI FÖLDES and ANDREA M. PHILIPP, *RWTH Aachen University*, ARNAUD BADETS, *Université de Bordeaux*, IRING KOCH, *RWTH Aachen University* — The ideomotor theory states that actions are coded by anticipatory perceptual representations of their effects. This notion has been investigated with the response-effect compatibility (REC) paradigm, in which responses have been shown to be facilitated if ensuing perceptual effects are compatible with the response (R-E compatibility). Additionally, according to the notion of ideomotor compatibility, certain response-effect (R-E) mappings are stronger than others due to resemblance of features of response and effects (e.g., vocal-auditory mapping). In our study we investigated the role of modality compatibility of R-E mappings in two REC experiments. In Experiment 1, we investigated R-E code compatibility (a specific type of modality compatibility), while in Experiment 2 we directly compared performance with a modality compatible and incompatible R-E mapping (auditory-verbal vs. visual-verbal). Overall, results revealed some evidence for an influence of code compatibility and somewhat stronger evidence for an influence of modality compatibility influence. The findings provide first evidence for modality compatibility of response-effect mappings.
Email: Noémi Földes, Noemi.Foeldes@psych.rwth-aachen.de

(5178)

A Computational Model of Task Selection During Human-Automation Interaction. YUSUKE YAMANI, NICOLE D. KARPINSKY and CHRISTOPHER D. MORLEY, *Old Dominion University*, WILLIAM J. HORREY, *Liberty Mutual Research Institute for Safety* — Automation can operate at different stages of information processing, improving human-machine system performance in various operational environments. However, characteristics of automated aids can also counterproductively impact human behavior and cause inappropriate use of automation potentially due to poor allocation of attentional resources to multiple tasks. To better characterize operators' task selection when using an aid, we have developed a computational model of multitasking when interacting with an automated aid operating at different stages of information processing. Each task is represented as a vector of its resource demands, informed by task analysis and coding guidelines. Automation is likewise represented as a vector of automation functionality. The model accounts for automation alleviating resource demands, outputs a conflict value for each task pair, and predicts the order and magnitude of task selection during human-automation interaction.
Email: Yusuke Yamani, yyamani@odu.edu

AUTOMATIC PROCESSING

(5179)

Negative Priming Effects Using Large Pools of Words From Distinctly Different Languages. EWALD NEUMANN, KRISTIN S. ROCHFORD, IVY NKRUMAH and PAUL N. RUSSELL, *University of Canterbury* — Negative priming (NP) typically entails slowed responses to a target item in a selective attention task when an immediately preceding distractor item becomes the subsequent target, compared to a control condition in which there is no such identity ignored repetition. An ongoing controversy in the NP literature, however, is whether this effect can be obtained when a relatively large pool of words is used. Several labs have claimed that in order to produce NP with words, the words must be encountered at least several times as an attended target prior to becoming the distractor word and subsequent target word in an ignored repetition condition. Contradicting the belief that NP cannot be produced using once and only once presented ignored words, we observed atypically large and long-lasting NP effects. English words were used in Experiment 1, and words in Twi, the native language of Ghana, Africa were used in Experiment 2.
Email: Ewald Neumann, ewald.neumann@canterbury.ac.nz

(5180)

Stroop Interference in a Match-to-Sample Task: Implications for Semantic and Response Competition Accounts. MARSHALL L. GREEN, *Mississippi State University*, LAWRENCE LOCKER, TY W. BOYER and BRADLEY R. STURZ, *Georgia Southern University* — The Stroop effect has long been studied when investigating attentional processes; however, debate remains concerning the source of the effects during a matching Stroop task. Semantic competition describes competing semantic processes associated with the word and color dimensions of the stimulus prior to response selection. Response competition describes competing response codes activated by articulating the word versus the color dimension at the time of response selection. We presented the Stroop sample and response options consecutively without retention interval (Experiment 1), and we presented sample and response

options simultaneously (Experiment 2). Collectively, results indicated RT interference on incongruent trials, both when the foil response option was related to the irrelevant dimension and when the foil response option was unrelated to the irrelevant dimension. Stroop asymmetry was only observed when sample and response options were presented simultaneously. The matching task may serve as an ideal method to dissociate semantic from response competition.
Email: Marshall L Green, mg2057@msstate.edu

(5181)

Attentional Bias Modification for the Simple Feature: Preference and Choice Could Be Changed? TOMONARI SHIMOMURA, *Chukyo University*, TOMOE INUKAI, *Kobe Shinwa Women's University* — In the present work we examined whether a manipulated attentional bias for simple stimuli induces shift in preference and increase motivation to selection for the biased stimuli. The prior studies showed that food and beverage, like chocolate and alcohols, could be biased with attentional bias modification (ABM) procedure and increase intake of the foods. We investigated whether a biased color could induce such a change in preference and choice. A specific color was biased using dot-probe paradigm and we compared preference to the biased, non-biased, and neutral colors before and after the procedure. In addition, two-alternative forced choice task between biased and non-biased color was imposed to the participants after the experiment. We found that there is no difference in preference but biased color was more selected in the choice task.
Email: Tomonari Shimomura, t-shimo@lets.chukyo-u.ac.jp

(5182)

Comparing 2011-2019 to 2015: Congruency Effect Differences for Number Magnitude and Past-Future Time Judgments. AIPING XIONG and ROBERT W. PROCTOR, *Purdue University* — Although some congruency effects (e.g., the SNARC effect) have been attributed to representations of the abstract conceptual dimensions (e.g., number) in terms of more concrete dimensions (e.g., space), an alternative account based on the notion of polarity correspondence has received some empirical support. In this study we tested implications of the polarity-correspondence account. In Experiment 1, no SNARC effect was obtained when participants judged whether numbers from the sets 2011-2014 and 2016-2019 were smaller or larger than 2015. When participants were instructed to perform the same task but making past-future judgments in Experiment 2, a SNARC-like effect appeared. We conclude that polarity correspondence provides an adequate explanation for the results. The polarities are not distinct when all numbers judged for magnitude are large, whereas portraying the task as past and future provides a binary distinction between the two number sets corresponding to the left and right response distinction.
Email: Aiping Xiong, xionga@purdue.edu

(5183)

Immunization From Flanker Interference by Subliminally Presented Neutral Distractors. RICARDO MAX, *New York University*, HAYLEY E.P. LAGROIX and VINCENT DI LOLLO, *Simon Fraser University*, YEHOSHUA TSAL, *Tel Aviv University*, THOMAS M. SPALEK, *Simon Fraser University* — In typical flanker tasks response time (RT) to identify a target is slower when the target is flanked by incongruent distractors than when flanked by neutral distractors. In the present work, the target was a line slanted left or right. In the *Incongruent* condition, the target was flanked by incongruent distractors (the alternative target slant) until response. In the *Neutral* condition, the target was flanked by neutral distractors (half circles) until response. In the *Neutral-to-Incongruent* condition, the target was flanked by neutral distractors for 33 ms, replaced immediately by incongruent distractors until response. RTs in the Neutral and in the Neutral-to-Incongruent conditions were similar and significantly faster than the Incongruent condition. Notably, in the Neutral-to-Incongruent condition, participants were phenomenologically unaware of the neutral distractors, as though the incongruent distractors backward-masked the neutral distractors. In contrast, in the behavioral responses (RT), it was as though the (subliminal) neutral distractors forward-masked the incongruent distractors, thus immunizing target identification from flanker interference.
Email: Ricardo Max, ricardo.max@nyu.edu

(5184)

An Eye Tracking Examination of Male Attractiveness by Conceptive Risk Females. RAY GARZA, ROBERTO R. HEREDIA and ANNA B. CIESLICKA, *Texas A&M International University* — Previous research has indicated that females prefer men that exhibit an android physical appearance where fat distribution is deposited on the upper body (i.e., shoulders and arms) and abdomen. This ideal physical shape has been associated with perceived dominance, health, and immunocompetence. Although research has investigated attractability of men with these ideal characteristics, research on how females visually perceive these characteristics is limited. The current study investigated visual perception and attraction towards men in Hispanic women of Mexican-American descent. Using a front posed male image and manipulating the waist to chest ratio (WCR), women rated the male body image associated with upper body strength (low WCR 0.7) as more attractive. Additionally, high-conceptive risk women made quicker judgments of attractiveness than low-conceptive risk females. These findings suggest that physical characteristics in men that exhibit upper body strength are strong predictors of attraction, and visual perception is influenced by female conceptive risk.
Email: Ray Garza, ray.garza@tamiu.edu

(5185)

Chiari Malformation and Hyper-Vigilance: An EEG Study. JAMES R. HOUSTON and PHILIP A. ALLEN, *University of Akron*, MEI-CHING LIEN, *Oregon State University*, FRANCIS LOTH, *University of Akron*, SAREL VORSTER, *Cleveland Clinic Foundation*, MARK G. LUCIANO, *Johns Hopkins*

University Medical Center — Chiari Malformation Type I is a neurological syndrome in which the cerebellar tonsils descend into the cervical spine area resulting in cervicomedullary compression (i.e., the brainstem becomes compressed). We hypothesize that this compression causes fiber-tract damage to the ventral- and/or dorsal-stream attentional pathways. Thus, we examined the effect of attentional demands in processing facial emotions for 15 Chiari patients and 12 controls using a dual-task (Task 1 tone discrimination, Task 2: emotional face discrimination task [angry, happy, or neutral]) that varied stimulus onset asynchrony (SOA: 100, 300, and 900 ms). P1 and P3 ERP components were measured as indices of ventral and dorsal attentional stream processing, respectively. While no ERP group differences in SOA (a measure of attentional capacity) or emotional valence were observed, Chiari patients showed significantly higher-amplitude P1 (but not P3) than controls. These results suggest hyper-vigilance in the ventral attentional stream for the Chiari group.
Email: Philip A. Allen, paallen@uakron.edu

(5186)

The Effect of Hidden Facial Expressions in a Rapid Serial Visual Presentation. BIANCA MONACHESI, *Sapienza University - Rome*, BRUNO LAENG, *University of Oslo*, ANNA PECCHINENDA, *Sapienza University - Rome* — Evidence on whether emotional expressions are involuntarily processed even when they are not fully visible and independently of attentional resources is mixed (see Vuilleumier, 2005 and Pessoa, 2005). We used the Rapid Serial Visual Presentation paradigm (Raymond, Shapiro, & Arnell, 1992) to investigate to what extent hidden emotional expression (obtained by using a HSF neutral expression as a mask over an emotional LSF expression) affect temporal selective attention. Participants (N= 27) performed a RSVP task, in which T1 were faces showing neutral, hidden happy or hidden afraid expressions and T2 were neutral faces. They monitored streams of 16 faces (T1 and T2 presented among inverted distractor-faces) and they reported the gender of T1 and T2. Findings showed a lag 1 sparing and an AB at lag 2 for T2 only when T1 had masked-Happy expression ($F(3, 72)= 15.05$, $p= .001$, partial $\eta^2= .38$). In contrast, when T1 had a masked Afraid expression, performance at lags 1 and 2 was enhanced followed by an AB at lag 3 ($F(3, 72) = 11.06$, $p< .001$, partial $\eta^2= .31$). The present findings clearly show that hidden emotional expression modulate temporal selective attention.
Email: Bianca Monachesi, bianca.monachesi@uniroma1.it

(5187)

Attention and Emotions at Crossroads of Psychiatric Diagnoses. ALINA MARIN, DOUGLAS MUNOZ and RACHEL YEP, *Queen's University* — Previous research has enhanced our understanding of the distinctions and overlaps of behavioral and neural correlates of attentional distraction and cognitive reappraisal, and how these functions interplay in supporting emotion regulation. Applying this knowledge to psychiatry would help finding better ways to define biomarkers able to disentangle clinical diagnoses that share attention and emotion regulation dysfunctions. We initiated a pilot study using eye movement paradigms as objective tests to help differentiate the diagnosis in adult patients with Bipolar Disorder (BD) and Attention Deficit Hyperactivity Disorder (ADHD). These are psychiatric illnesses in which attention routines and the architecture of attentional selection are expected to differ in relation to the emotional salience of the stimuli. We manipulated attentional performance during behavioral trials by embedding emotional distracters in the central visual field during instructed fixation. Our results suggest that there are differences in how emotion processing and executive functioning interact in different patient groups. Patients presented with more direction errors than controls and emotional processing appeared to impact processing speed mostly in those with BD. We believe that these findings could be further utilized to improve diagnosis specificity.
Email: Alina Marin, marina@hdh.kari.net

(5188)

The Influence of MAOA Across the Trajectory Development of Reflexive Attention. KATHERINE E. CHRISTENSEN, RACHEL NUTTALL, AMANDA KOCI, TYSON WADE, ALLISON G. KOTTER and REBECCA A. LUNDWALL, *Brigham Young University* — We researched the influence of *MAOA* across the trajectory development of reflexive attention. Previous studies reveal that *MAOA* influences neurotransmitter availability, but its influence on attentional development remains largely unknown. In our longitudinal study, we tested 195 infants (2-5 months) on a moving bar task and again in childhood (9-16 years), at which time they provided a saliva sample. Coders recorded eye movement direction and latency (RT). We determined participants' positions in a distribution of scores by Z-scoring infant and child scores. Multilevel modeling associated genetic markers on eleven genes to changes in participants' positions from infancy to childhood. *MAOA* predicted a poorer attentional developmental course in RT with girls who had the CC genotype. Future research can monitor young girls with the CC genotype to determine the need for intervention. Examining potential genetic influences on the development of reflexive attention may help answer why children experience different trajectories.
Email: Rebecca A. Lundwall, rebecca_lundwall@byu.edu

(5189)

Visual Activity Prolongs Perceived Duration in Naturalistic Scenes. HAUKE S. MEYERHOFF, *Leibniz-Institut fuer Wissensmedien, Tuebingen*, FRANK PAPENMEIER and MARKUS HUFF, *University of Tuebingen* — Many everyday activities such as acting and scheduling implicitly involve duration judgments. Two distinct cognitive processes have been proposed to determine the subjective impression of time. Attention-based models have been proposed for prospective paradigms in which participants are aware of the relevance of time whereas memory-based models have been proposed for retrospective paradigms in which participants become aware of the relevance of time only after stimulus presentation. We asked participants to reproduce the duration of brief movie clips in a prospective paradigm. Most importantly, the visual activity (i.e., the amount of perceptual change) varied between the movie clips. Whereas memory-based models predict a

subjective dilation of time with increasing visual activity of the clips, attention-based models predict temporal contraction. Despite the prospective nature of our task, our results matched the predictions of the memory-based models. Furthermore, we extended our findings to semantic-free versions of the same video clips. In sum, our results show that the cognitive processes of time estimation for naturalistic scenes are not as exclusive as suggested by the dichotomy of attention- and memory-based models.
Email: Hauke S. Meyerhoff, h.meyerhoff@iwm-kmrc.de

(5190)

Can Priming Affect an Implicit Colour Responding Memory Task? DINKAR SHARMA, *University of Kent* — The Stroop paradigm has been widely used to study attention whilst its use to explore implicit memory have been mixed. Using the study-test procedure two studies are reported that investigate whether priming from words that had previously been studied would cause interference during test when responding to the printed colour. Study 1 replicated MacLeod (1996) who showed no difference in response latencies in a mixed block of studied and unstudied words. However, presence of priming was indicated by longer response latencies in a mixed block (studied and unstudied words) than a pure block (unstudied words only). Study 2 extended this research using drug-related words in a group of drug-users and non-users. The results from study 1 were replicated in non-users. In users there was evidence of an attentional bias to the drug-related words. We explore the role of carryover effects and task conflict.
Email: Dinkar Sharma, d.sharma@kent.ac.uk

(5191)

Multi-Level Response Coding in Stimulus-Response Bindings: Irrelevant Distractors Retrieve Both Semantic and Motor Response Codes. CARINA GIESEN and KLAUS ROTHERMUND, *University of Jena* — Stimulus-response (S-R) episodes are formed whenever a response is executed in close temporal proximity to a stimulus. Subsequent stimulus repetition will retrieve the episode from memory, re-activating the previous response. Whereas many research findings attest to the flexibility of representing stimulus features, only little is known about the way responses are coded within transient S-R episodes, that is, whether the retrieved response is represented in terms of specific motor codes, abstract/semantic codes, or both. To differentiate between these accounts, we employed an approach/avoidance task in which semantic meanings (i.e., moving a word "towards" or "away from" a manikin on screen) and motor codes of responses (i.e., pulling or pushing a joystick) were manipulated orthogonally. Results of two experiments indicated that stimulus repetitions retrieve both, semantic as well as motor code representations, indicating multiple and independent levels of response coding. We conclude that response representation in S-R episodes follows similar binding principles as are known from stimulus integration.
Email: Carina Giesen, carina.giesen@uni-jena.de

(5192)

Questioning the Necessity for Rehearsal in Auditory Distraction Effects During Serial Recall. COREY I. MCGILL and EMILY M. ELLIOTT, *Louisiana State University* (Sponsored by Arend Van Gemmert) — Irrelevant auditory stimuli can impair serial recall. Empirically-supported explanations propose that auditory stimuli changing appreciably from item to item interfere with the sub-vocal rehearsal of the visual stimuli. Importantly, the deleterious effect of changing irrelevant sounds is reduced by eliminating order information from the recall task (e.g., a missing item task). However, despite a common assumption in the literature, the conflict of order maintenance between the visual stimuli and the to-be-ignored auditory channel may or may not implicate interference with sub-vocal rehearsal. Across two experiments, rehearsal was severely limited using silent articulatory suppression and rapid serial visual presentation. Results indicated that while silent articulatory suppression eliminated the effects of irrelevant sounds, rapid serial visual presentation did not. This difference implicated order processes other than rehearsal as the possible cause of auditory distraction, suggesting that current theoretical explanations for auditory distraction effects are incomplete.
Email: Corey McGill, cmcgil1@lsu.edu

(5193)

The Effect of Red on Performance in an Achievement Task: A Second Attempt. KENNETH M. STEELE, JUSTIN FISHER, AMANDA NOVACHEK, JENNIFER RETARIDES, ALEX VERNON, WILL ORR and ZACHARY MARTIN, *Appalachian State University* — Elliot, Maier, Moller, Friedman, and Meinhardt (2007) hypothesized that exposure to the color red would impair performance in an achievement task. They reported that a brief exposure to the color red reduced the number of correctly-solved anagrams. Steele et al. (2015) were unable to replicate the result. The purpose of the current experiment was to replicate the Elliot et al. result using a different red. Participants (N = 266) were asked to solve as many 5-letter anagrams as possible in a 5-min period, briefly exposed to either red, green, or gray, and then asked to solve as many anagrams as possible in a second 5-min period. Luminance, chroma, and hue values were similar to those used by Elliot et al. Pre-color solution performance predicted post-color solution performance but there was no difference among the color conditions on post-color solution performance. The results suggest the original effect may not be reliable.
Email: Ken Steele, steelekm@appstate.edu

(5194)

Meta-Analysis of Inhibition of Return: Assessing Discrimination Tasks in Speed-Accuracy Space. RALPH S. REDDEN, *Dalhousie University*, JASON IVANOFF, *Saint Mary's University*, JOHN CHRISTIE and RAYMOND M. KLEIN, *Dalhousie University* — Inhibition of return (IOR) is usually viewed as an inhibitory aftermath of visual orienting typically seen in the form of slower responses to targets presented in a previously oriented to location. Since first reported in a discrimination task over 20 years ago, many studies have demonstrated IOR in non-spatial choice tasks. A recent theory

has proposed two forms of IOR: one nearer the input end of the information processing continuum and one nearer the output end. The input form is assumed to decrease the salience of recently attended objects in a salience map whereas the output form biases orienting behaviours against previously attended locations in a priority map. There are specific predictions for the effect vectors for each of these forms when considering performance in speed-accuracy space. The input form ought to be manifest as a cost in both reaction time and accuracy and the output form as a cost in reaction time corresponding with a benefit in accuracy. We evaluate the literature on IOR - specifically in non-spatial choice tasks - to assess and quantify the experimental factors that may contribute to generating one form or the other.
Email: Ralph Redden, rredden@dal.ca

JUDGMENT

(5195)

Self-Appraisal: Estimates of Intellectual Performance for Persons With Acquired Brain Injury. GRACE-ANNA S. CHANEY and RICK PARENTE, *Towson University* — Acquired Brain Injury (ABI) limits a survivor's ability to appraise their task performance. There are, however, few measures of self-appraisal. This study developed a technique for measuring self-appraisal originally proposed by Wilbur, Wilk, Silver, and Parente (2008). A multivariate model of self-appraisal that includes measures of predicted performance as well as measures of over/under-estimation of performance was evaluated with ABI survivors, participants with diagnosed learning disabilities, and others with emotional impairments to determine which measures were the most sensitive to the differences among the groups. This model provided a more accurate assessment of self-appraisal than the one previously proposed by Wilbur et al. (2008). The two measures of self-appraisal measure different psychological processes, and the overall model measures aspects of performance that are unrelated to an individual's IQ. A measure of over/under-estimation was the most sensitive. The findings corroborate previous literature suggesting that persons with ABI have difficulty accurately assessing their task performance resulting in inflated performance judgments. This self-appraisal technique can be applied to most assessments of performance.
Email: Grace-Anna Chaney, gchane2@students.towson.edu

(5196)

Learning Rate of Simple Decision Heuristics. ÖZGÜR SIMSEK and MARCUS BUCKMANN, *Max Planck Institute for Human Development* (Sponsored by Konstantinos Katsikopoulos) — Simple decision heuristics are models of human and animal behavior that use few pieces of information—perhaps only a single piece of information—and integrate the pieces in simple ways, for example, by considering them sequentially or by giving them equal weight. Despite their simplicity, such heuristics make accurate inferences under diverse settings. This work examines how quickly such heuristics can be learned from experience. We show, analytically and empirically, that only a few training samples lead to substantial progress in learning. We focus on three families of heuristics: single-cue decision making, lexicographic decision making, and tallying. Our empirical analysis is extensive, employing 63 natural data sets on diverse subjects.
Email: Özgür Simsek, ozgur@mpib-berlin.mpg.de

(5197)

Harm to Myself Is Not Intentional: Effects of Causal Structure and Probability on the Knobe Effect. KUNINORI NAKAMURA, *Seijo University* — Knobe (2003) demonstrated that people's intentionality judgments of side-effects depend on whether the consequence is positive or negative. This indicates that people's judgments of intentionality of action depend not only on their perception of the intention of the actor but also on the results of the action. The current study examines the Knobe effect in terms of causal structure and probability. To address these issues, this study employed almost the same experimental procedure as Knobe's original experiment (2003). We also added a condition where participants were required to consider the intentionality of an action whose side effect also affected the actor. In addition, this condition required intentionality and probability judgments about outcomes. The results demonstrated that both causal structure and probability play an important role in the Knobe effect.
Email: Kuninori Nakamura, knaka@seijo.ac.jp

(5198)

Evaluation Prompts Deliberative Thinking. DANA L. CHESNEY, *St. John's University*, NATALIE OBRECHT, *William Paterson University*, RYAN SALIM, *St. John's University* — Previous research indicates that evaluating arguments about the usefulness of base-rate and/or stereotype data increases subsequent use of base-rates in a group membership judgment task (Obrecht & Chesney, 2016). We hypothesized that this is because evaluating arguments induces deliberative thinking which in turn supports base-rate use while, in contrast, stereotype use supported by default intuitive thinking. To test this, we recorded participant's RTs when making group membership judgments in three different conditions: 1) After evaluating arguments supporting base-rate and/or stereotype use; 2) After evaluating recollections of base-rate and/or stereotype information; 3) After no evaluations. Participants took longer to make group membership judgments after they had evaluated argument and recollection statements, compared to the no-evaluation condition. This suggests that evaluation prompted participants to deliberate more when making subsequent judgments. This work supports the contention that reasoning failures often result from overreliance on intuitive cognition, while deliberation increases the rate of normative judgments. It specifically supports the hypothesis that evaluating statements can induce deliberation.
Email: Dana Chensey, dlchesney@gmail.com

(5199)

It's About the Stereotype Until It's Not: Confirmatory Evidence From Eye Movements on Base-Rate Neglect Judgments. ALEXANDER B. SWAN, MEGAN C. SPEARS, RYAN S. ZAMANZADEH and RUSSELL REVLIN, *University*

of California, Santa Barbara — Eye-tracking methods have recently been utilized in dual process investigations. This study incorporated this methodology within the classic base-rate neglect task to determine if eye movements indicated cognitive processing. Participants completed base-rate problems via a desktop computer while their eye movements were tracked. It was predicted that participants would generally spend more time observing problems where the base-rates and stereotype conflict than they would for problems of no conflict or when no stereotype was given (neutral). It was also predicted that problem type observations would correspond directly to base-rate or stereotype areas of interest (AOI). Results show that participants spent more time fixating on the stereotype AOI on no-conflict problems and the base-rate AOI on neutral problems. These results suggest some confirmatory evidence that the stereotype is utilized more often to make judgments on these problems rather than the base-rate, unless there is no stereotype information given.
Email: Alexander Swan, alexbswan@gmail.com

(5200)

Mechanisms of Stimulus Discrimination: Temporal Order Effects and the Internal Reference Model. RUBEN ELLINGHAUS, *University of Tübingen* — Perceiving differences is a fundamental component of human performance. To investigate the mechanisms underlying this ability, researches have tried to understand the processes that occur when people compare and discriminate two stimuli, e.g. a person indicates which is the brighter of two successively presented light patches. Most theories of stimulus discrimination proposed in the literature are based on Thurstone's original difference model, according to which a person's decision in such a scenario is the result of a comparison between the internal representations of the two stimuli. However, these models fail to account for the observation that discrimination performance is usually better when a constant standard stimulus precedes rather than follows a variable comparison stimulus; a result often obtained in duration discrimination experiments. This so-called Type-B order effect can be explained by a psychological model which assumes that participants compare the second stimulus against an internal standard which is dynamically updated from trial to trial. I will present experiments designed to shed light on the question whether the Type-B order effect is restricted to the domain of duration perception or rather a general phenomenon across a range of modalities and stimulus attributes.
Email: Ruben Ellinghaus, ruben.ellinghaus@uni-tuebingen.de

(5201)

The Influence of Decision Content Comparability on Gain Loss Asymmetry. ALEX COOKE and PETKO KUSEV, *Kingston University London* — Whether positive and negative affects exist independently (Cacioppo & Berntson, 1994) or coexist (Russel, 1980) has been heavily debated in psychological research. Recent work by McGraw et al. (2010) has supported the view of independent positive and negative utilitarian decision functions. Specifically that gain and loss expected judgements, in response to a mixed monetary gamble, are processed in isolation (bipolar scales) and do not induce decision biases. However, when the judgement options are forced into the same contextual space (unipolar scales), prompting direct comparisons, they induce loss-averse judgements. In contrast, we propose an alternative explanation based on decision-content comparability. Specifically, comparable decision attributes fuel the gain and loss comparisons (inducing loss averse judgements). Moreover, our results showed that facilitating decision content comparability (DCC) (monetary gamble-monetary worth evaluation) produces loss aversion regardless of whether gains and losses are considered in isolation. Accordingly, impeding DDC produces a decline in loss aversion.
Email: Alex Cooke, k1002593@kingston.ac.uk

(5202)

Communicating Climate Change Effectively. RAONI F.G. DEMNITZ and SUSAN JOSLYN, *University of Washington-Seattle* — Although there is near-unanimous consensus among scientists about the fact of climate change the general public, especially in the US, remains insufficiently concerned and somewhat skeptical. This may be due in part to how climate change is communicated. The abstract nature of most climate change projections, describing increases in average global temperature and precipitation may fail to generate concern. In addition, many climate projections fail to describe inherent uncertainties, which may decrease trust. In this experiment we tested whether climate change projections describing concrete events (increase in the number of heat waves and floods) led to greater concern than projections describing abstract events (increase in average temperature and precipitation) and whether adding a 90% predictive interval increased trust over omitting it. The results add to our understanding of climate change apathy and have the potential for practical applications.
Email: Raoni Demnitz, rfgd@uw.edu

(5203)

How and Why is 9 > 221? Evoked Reference Sets and Rating Scale Interpretations. LIM M. LEONG, CRAIG R.M. MCKENZIE and JOHANNES MÜLLER-TREDE, *University of California, San Diego*, SHLOMI SHER, *Pomona College* — Previous research has demonstrated the surprising finding that 9 is judged larger than 221 when these numbers are evaluated by different participants. The speculation for this effect was that judging 9 evokes a reference set of single-digit numbers, which makes 9 relatively large, while judging 221 evokes a reference set of triple-digit numbers, which makes 221 relatively small. In a series of experiments, we tested this speculation and provided quantitative and qualitative evidence for the evoked reference set account. Additionally, we extended the finding by conceptually replicating it using a different set of stimuli, and we tested the robustness of the original effect by manipulating how ratings are elicited. Taken together, a single stimulus without immediate context can generate particular reference sets for comparison both from the stimulus itself and from the provided rating scale, and this can explain surprising findings when subjective judgments are made between-subjects.
Email: Lim M. Leong, lmleong@ucsd.edu

(5204)

Implications of the Testing Effect, Retrieval Practice, and Episodic Memory for Understanding Biases in Probability Judgments. ROSALIND NGUYEN, MICHAEL DOUGHERTY and DANIEL BUTTACCIO, *University of Maryland* — People often show probability judgments that violate the principle of additivity, with the lion share of the data indicating subadditivity. Although recent work suggests that the degree to which people show subadditivity is related to both working memory and memory retrieval variables, few studies have evaluated the degree to which subadditivity is causally related to episodic memory. In this paper, we examined the relation between subadditivity, episodic memory, and retrieval practice. Not only do the findings reveal a critical dependence of judgment on memory, but they also suggest that so-called violations of axiomatic probability theory derive not from the judgment process itself, but from biases in the input to the judgment process. At the same time, our data indicate that research on the testing effect has implications for understanding phenomena outside of educational contexts.
Email: Rosalind Nguyen, rhnguyen@umd.edu

(5205)

Iterated Learning Fails to Recover Strong Inductive Biases in Multiple Cue Judgment. ARTHUR KARY, BEN R. NEWELL and *CHRIS DONKIN, *University of New South Wales* — "Iterated learning" is a procedure in which the data produced by one participant is used to generate the training stimuli for the next participant, and its aim is to recover the inductive biases of the learning population. Iterated learning has been successfully applied to single cue function learning, with the procedure recovering a positive linear bias; application to categorization also recovers a bias toward linear category boundaries. We extend these results to a multiple cue judgment paradigm (MCJ), with the expectation that the procedure will recover an additive linear rule bias. Across 7 conditions, manipulating starting function, length of training, and number of training stimuli, we failed to find a consistent bias, with participants producing a mixture of one cue rules, multiple cue additive rules, and even rules containing configural cues. Our results suggest that there is heterogeneity in the biases of the learning population with respect to MCJ.
Email: Arthur Kary, a.kary@unsw.edu.au

(5206)

Our Moral Judgments Are Foreign to Us. JOANNA D. COREY, *Universitat Pompeu Fabra*, SAYURI HAYAKAWA, *University of Chicago*, ALICE FOUCART, *Universitat Pompeu Fabra*, MELINA APARICI, *Universitat Autònoma de Barcelona*, JUAN BOTELLA, *Universidad Autónoma de Madrid*, BOAZ KEYSAR, *University of Chicago*, ALBERT COSTA, *Universitat Pompeu Fabra, ICREA* — We present evidence that the use of a foreign language, compared to a native one, leads to moral judgments that are consistent with prioritizing outcomes over means. In moral dilemmas, this leads to an increased willingness to sacrifice the life of one person to save many when using a foreign language compared to a native one. When judging the deserved punishment for causing harm, the intention behind the action has a reduced effect on judgment when using a foreign language compared to a native one. We investigated potential explanations for the effect of language on moral judgment. Our findings are consistent with the use of a foreign language increasing psychological distance and decreasing emotional reactivity.
Email: Joanna D. Corey, joannacorey@gmail.com

(5207)

Priming Moral Reasoning Using Text. EYAL SAGI, *University of St. Francis* — Many of the important decisions we make have moral implications. Moral Foundations Theory (Haidt & Joseph, 2004) identifies 5 distinct styles of moral reasoning that may be applied to such decisions. A study explores how reading text that emphasizes one of these styles might affect our reasoning. In particular, after participants read a series of tweets that emphasized the Fairness/Cheating foundation they exhibited an increase reliance on this style compared to when they read tweets emphasizing the Care/Harm foundation. This affected participants' answers to a questionnaire designed to measure the perceived importance of the different foundations, as well as in their rating of the foundations evident in other tweets. Interestingly, this effect was short lived and was not observed for the Care/Harm foundation. These results suggest that exposure to the moral reasoning of others might temporarily influence what moral arguments we are likely to employ.
Email: Eyal Sagi, esagi@stfrancis.edu

(5208)

Explicit and Implicit Learning Contributions to Base-Rate Sensitivity. ANDREW WISMER and COREY BOHIL, *University of Central Florida* — This work assessed the contributions of implicit and explicit learning to base-rate sensitivity. Using a factorial design that included both implicit and explicit learning disruptions, we tested the hypothesis implicit learning underlies base-rate sensitivity from experience (and explicit learning contributes little). Participants classified simple stimuli (bar graph heights) with a 3:1 base-rate ratio. Participants learned from either "observational" training known to disrupt implicit learning or "response" training which supports implicit learning. Category label feedback was followed either immediately or after a 2.5 second delay by a working memory task designed to disrupt explicit reasoning about feedback. Decision criterion values were more conservative after observational training, suggesting that implicit learning underlies base-rate sensitivity. Disrupted or intact explicit learning had no effect on base-rate sensitivity. These results suggest base-rate sensitivity develops primarily through implicit learning, consistent with the assumptions of the COVIS theory of categorization (Ashby et al., 1998).
Email: Corey Bohil, corey.bohil@ucf.edu

(5209)

The Value-Weight Illusion: Can Value Bias Weight Estimates? VERONICA U. WESER and DENNIS R. PROFFITT, *University of Virginia* — In a classic demonstration of beliefs altering perception, individuals who experience the size-weight illusion invariably believe that the smaller of two equally-weighted

items weighs more than the larger item. Since the discovery of the size-weight illusion in the 1700s, similar illusions such as the material-weight illusion and the color-weight illusion have been documented. These illusions arise from people's expectations about the correspondence between object weight and some visually perceptible feature, such as size, material, or color. If people have strong expectations about associations between object value and weight, then weight estimates might be biased by value perception. In two studies, the weights of 5 vases that differed in aesthetics and perceived monetary value were made identical. After undergoing a priming procedure designed to evoke an association between value and weight, participants gave weight and value estimates of each of the vases. A value-weight illusion was found: participant weight judgments of equally-weighted vases varied depending on the prime.
Email: Veronica Weser, vuw3nb@virginia.edu

(5210)

The Effects of Race and Gender on Facial Perception and Trustworthiness in Chinese and African Populations. DANA BASNIGHT-BROWN, *United States International University-Africa* — People often make trustworthiness judgments of others at first sight, a process which can have positive or negative outcomes. It is known that certain facial cues can also affect trustworthiness judgments. Previous research has focused on the influence of a single cue on trustworthiness, however, recent research suggests that facial perception involves processing multiple cues simultaneously, and indicates that these cues may even interact with one another when making these judgments (Dong et al. 2015). The current study examined the role of two of these cues, face race and gender, and their effect on trustworthiness judgments in Chinese and African individuals. Participants were presented with faces where each cue was manipulated, and completed a two-alternative forced choice task. Gender-salient pairs included a female and male face with the same race (i.e., Chinese or Black), while the race-salient pairs included a Chinese and a Black face with the same gender. For Chinese participants, Chinese female faces were the most trustworthy when gender was salient, while Black male faces were selected as more trustworthy when race was salient. For African participants, Chinese faces were also more trustworthy when gender was salient; but for race salient blocks, both Black male and female faces were perceived as more trustworthy. The results examine the different facial cues that people from different races and cultures use when judging others.
Email: Dana Basnight-Brown, dana.basnightbrown@gmail.com

(5211)

ROCs Show That Shooter Bias Is Response Bias. EVAN HEIT and LAURA J. KELLY, *University of California, Merced*, CAREN M. ROTELLO, *University of Massachusetts Amherst* — Police officers sometimes make difficult decisions under time pressure: is that suspect holding a gun or not? Shooter bias experiments have shown that errors are systematically biased: more "gun" errors occur with Black suspects, and more "non-gun" errors with White suspects. Process dissociation (PDP) analysis has attributed such errors to automatic processes that associate Black suspects with guns. Rotello, Heit, and Dubé (2015) recently argued that ROCs (receiver operating characteristics) are required to understand whether the effects of race influence decision accuracy, response biases, or both. We present four replications of classic shooter bias tasks (Payne, 2001; Correll et al., 2002), with minor modifications so that ROCs could be generated. All ROCs were strongly curved and inconsistent with the assumptions of process dissociation analyses and the typically-reported ANOVA on error rates. The effects of suspect race, including those on error rates and PDP estimates, are best understood as response bias.
Email: Evan Heit, eheit@ucmerced.edu

(5212)

Context Effects on Beauty Ratings of Painted Artworks: Contrast, Contrast, Everywhere! CODY TOUSIGNANT and GLEN E. BODNER, *University of Calgary* — We explored how the perceived beauty of a target painting is influenced by the relative beauty of a context painting. Average-beauty target paintings were paired with low-beauty or high-beauty context paintings. This context beauty manipulation was crossed with whether the target and context paintings were of similar or different styles, were presented sequentially or simultaneously, and whether 1 or 5 painting pairs were rated. Target paintings were consistently rated as more beautiful when paired with low-beauty context paintings. This contrast effect did not interact with our other manipulations. This pattern better supported a selective accessibility model over a range-frequency model, but collecting target-context similarity ratings would help clarify the process by which target evaluations are influenced by context.
Email: Glen E. Bodner, bodner@ucalgary.ca

STATISTICS AND METHODOLOGY

(5213)

Assessing Parameter Validity and Practical Usage for Diffusion Models of Conflict. COREY N. WHITE, *Syracuse University*, MATHIEU SERVANT and GORDON D. LOGAN, *Vanderbilt University* — Recent variants of drift-diffusion models have been developed for conflict tasks, but these models have not been validated for measuring processing in practical situations. Using a parameter-recovery study, we assessed the validity of the Dual-Stage Two-Phase model (Hubner et al., 2010), the Shrinking Spotlight model (White et al., 2011), and the Diffusion Model for Conflict Tasks (Ulrich et al., 2015). The models were fit to simulated data to assess their ability to recover the true parameter values with varying numbers of trials. Each model had difficulty in recovery, however constraints could be applied to improve estimation in certain situations. The results reveal practical constraints for using these models to make inferences about underlying cognitive processes, but show that they can be confidently employed for some experimental designs. The advantages of and practical concerns for implementing and using these models are discussed.
Email: Corey White, cnwhite@syr.edu

(5214)

Approaching Individual Differences Questions in Cognition: A Case Study of the AX-CPT. SHELLY R. COOPER and TODD S. BRAVER, *Washington University in St. Louis* — Investigating individual differences (ID) in cognition requires addressing questions not often thought about in standard experimental designs, especially those regarding the psychometrics of the task. Using the AX-CPT cognitive control task as a representative case study example, we illustrate four concerns that one may encounter when approaching ID questions. First, we demonstrate the importance of a task's true score variance (TSV) for evaluating potential failures to replicate predicted ID effects. Second, we show evidence that internet-based studies (e.g., MTurk) can exhibit comparable, or even higher TSV than those conducted in the laboratory, suggesting the potential advantages of such data. Third, we highlight the need to constrain psychometric evaluations to a particular population by demonstrating differences in TSV in a schizophrenia cohort compared to matched and non-matched controls. Finally, we demonstrate the relative advantages of theoretically-derived vs. raw behavioral measures, through comparison of internal consistency and test-retest reliability patterns.
Email: Shelly Cooper, shelly.cooper@wustl.edu

(5215)

Identifying Discrete Serial Decisions in Multi-Stage Decisions. PETER J. CASSEY and GORDON D. LOGAN, *Vanderbilt University* — Arriving at a decision is typically the result of multiple discrete decisions, for example, deciding whether that is a sparrow or a finch in the pine tree. The outcome of the decision is the result of not only deciding between the two species of bird but also deciding on the species of tree. Identifying the cognitive mechanisms underlying the component decisions within the overall decision can be problematic, not least because there is only one behavioral outcome to measure. Our goal is to identify the latent cognitive mechanisms underlying discrete stages of a simple dual perceptual decision, where participants make component decisions about size and orientation features of a stimulus in order to make an overall decision. We modify two successful computational decision making models in an effort to describe each decision through the estimation of parameters for each component decision from the one behavioral outcome of the overall decision.
Email: Pete Cassey, peter.cassey@vanderbilt.edu

(5216)

Strength in Numbers: Testing the Fidelity of Multidimensional Scaling for Large Datasets. ARRYN ROBBINS, *New Mexico State University*, CORBIN A. CUNNINGHAM, *Johns Hopkins University*, JUSTIN MACDONALD and MICHAEL C. HOUT, *New Mexico State University* — Multidimensional scaling (MDS) is a statistical technique that is used to model the psychological similarity among stimuli. In a set of simulations, we tested the fidelity of MDS to quantify the similarity of large stimulus sets (i.e. up to 1000 items), as this technique is more commonly used with smaller sets (e.g., 30 items). Hypothetical "true" MDS spaces were created, along with error-perturbed data from simulated "participants." We examined the degree to which spaces resulting from our "participants" captured the organization of the "true" spaces. The higher set sizes decreased model fit (i.e., they produced increased "stress"), but increased the determinacy (i.e., the extent to which the model recovered the true organization) of the MDS spaces. When the data were scaled using the appropriate number of dimensions, the results were consistent across different MDS scaling algorithms, and across thousands of simulated iterations (but determinacy deteriorated with incorrect estimation of dimensionality). We argue that it is not only reasonable to adopt large stimulus set sizes when using MDS, but it is advantageous to do so.
Email: Arryn Robbins, arobbins@nmsu.edu

(5217)

Using Adaptive Design Optimization (ADO) to Identify the Psychological Bases of Uncertainty and Information. MATTHIAS HOFER, *Max Planck Institute for Human Development*, MARK PITT and JAY MYUNG, *Ohio State University*, JONATHAN D. NELSON, *Max Planck Institute for Human Development* — Many entropy measures from mathematics, physics, and philosophy of science (e.g., Shannon, Bayes's error, Arimoto, and Tsallis) are special cases of the Sharma-Mittal family of entropy functions. We ask whether Adaptive Design Optimization (ADO) can be used to infer which entropy functions best predict people's information-seeking behavior. ADO is a computational technique that optimizes the informativeness of experiments to discriminate among models, given results of previous experiments. The high-dimensional nature of our experimental task makes exhaustive exploration of the design space infeasible, underlining the importance of effective optimization strategies. We report results from computer simulations using both Differential Evolution and heuristic strategies to identify the most useful experiments. We further elucidate conditions under which the ADO procedure converges on the correct model of simulated subjects.
Email: Matthias Hofer, hofer@mpib-berlin.de

(5218)

Assessing Self-Selection Bias as a Function of Experiment Title and Description: The Effect of Personality and Emotion. TINA M. SUTTON, *Rochester Institute of Technology* — Research has indicated that self-selection bias serves as a threat to external validity when the title of an experiment directly influences the dependent variables being measured. The goal of the current study was to investigate mood and personality differences between groups of individuals who signed up for a study that varied on the type of emotion focused on as part of the study description, as well as whether the study was purportedly conducted in a group or individual setting. The results indicated that participants who participated in the negative version of the study reported higher levels of negative affect and displayed mood-congruent judgment in a word fragment completion task. Participants who signed up for the positive version of the study showed the typical correlation between positive affect

and extraversion reported in the literature. The current work provides converging evidence that a self-selection bias can impact the results of an experiment.
Email: Tina M. Sutton, tmsgsh@rit.edu

(5219)

Crowdsourcing Priors to Improve Planning and Analysis of Psychological Studies. JEFFREY CHRABASZCZ, JOE TIDWELL and MICHAEL DOUGHERTY, *University of Maryland, College Park* — Prior information about a study's effect size, however minimal, would aid in both planning data collection and maximizing the efficiency of Bayesian analysis. We propose a method for estimating effect sizes by eliciting continuous probability forecasts from naive participants. Even when prior means are near-zero, this method provides a principled way to estimate dispersion and produce shrinkage, reducing the occurrence of overestimated effect sizes and minimizing the effect of multiple comparisons on false discovery rate. We demonstrate this method with a number of published studies and compare the effect of different prior elicitation methods.
Email: Jeffrey Chrabaszcz, jchrabaszcz@gmail.com

(5220)

Breathe Easy EDA: A MATLAB Toolbox for Psychophysiology Data Management, Cleaning, and Analysis. JOHN C. KSANDER, CHRISTOPHER R. MADAN, SARAH M. KARK and ELIZABETH A. KENSINGER, *Boston College* (Sponsored by Angela Gutchess) — Electrodermal activity (EDA) methods evaluate fluctuations in skin electrical conductance, providing a measure of sympathetic nervous system arousal. Respiration influences EDA, such that irregular breathing causes EDA fluctuations which cannot be unambiguously distinguished from changes related to psychophysiological arousal. Thus, it is crucial to control for respiration-induced EDA artifacts. Here we developed a MATLAB toolbox for eliminating EDA respiration artifacts and analyzing EDA data, which we freely distribute: Breathe Easy EDA or 'BEEDA'. BEEDA's artifact removal GUI allows users to quickly clean EDA data, greatly facilitating EDA analysis. Additionally, BEEDA's analysis functions allow users to seamlessly analyze the cleaned data. The EDA analysis capabilities include tonic and phasic EDA measurements, following from standard methodological implementations. The toolbox is suitable for any experiment recording both EDA and respiration data, and flexibly adjusts to experiment-specific parameters (e.g., trial structure and desired analysis parameters).
Email: John Ksander, jksander@brandeis.edu

(5221)

Interaction Effects in Detection and Recognition: Choice of Sensitivity Measure and Type I Error Rate. STEPHEN RHODES, *University of Missouri*, MARIO A. PARRA, *Heriot-Watt University*, NELSON COWAN, *University of Missouri*, ROBERT H. LOGIE, *University of Edinburgh* (Sponsored by Alan Baddeley) — Performance in detection and recognition tasks is influenced not only by the sensitivity of the observer, but also by their bias towards a particular response option. In order to separate out these two contributory factors a model of the underlying process is needed. These models, and their associated measures (e.g. *d'*, P_r), make different predictions as to how false-alarm and hit rate should co-vary. Previous simulations have shown that use of an unprincipled sensitivity measure can lead to an inflated type I error rate for tests of main-effects, provided conditions differ in response bias. The present simulations focus on two by two interaction-effects (e.g. group by condition). In the absence of variation in bias, choice of an unprincipled measure leads to an uncontrollable type I error rate, provided there are true main-effects on sensitivity. Variation in bias confounds this problem further and we provide concrete suggestions to minimise errors.
Email: Stephen Rhodes, srhodes@exseed.ed.ac.uk

(5223)

Estimating the Variance of d' from the Hits and False Alarm Rates With Heterogeneous Participants. JUAN BOTELLA and MANUEL SUERO, *Universidad Autonoma de Madrid*, JESUS PRIVADO, *Universidad Complutense de Madrid* — Meta-analyses of primary studies that originally analyzed their results with parametric indices from Signal Detection Theory (SDT) encounter some important barriers. One of them is that the studies sometimes do not provide the variance of d' and bias indices (or standard deviations) of the percentages of hits and false alarms. Given that those variances often exceed the expectations from the assumption of homogeneous sensitivity and bias, the variance of d' cannot be estimated with the procedures proposed by Gourevitch and Gallanter (1968) or Miller (1996). We ran several simulation studies with heterogeneous assumptions and checked adaptations of those procedures to this scenario. The results show reasonably good adjustments, providing a way to save the data from primary studies for meta-analyses that do not provide the basic statistics of the SDT indices.
Email: Juan Botella, juan.botella@uam.es

(5225)

The Center for Data on the Mind: Using Big Data to Answer Questions About Cognition. ALEXANDRA PAXTON and TOM GRIFFITHS, *University of California, Berkeley* — Today, more data about human activity is tracked, recorded, and shared than ever before. The rapidly growing availability of these massive datasets is being tapped by governments, nonprofit organizations, and companies, but psychologists have been slower to take advantage of the power of big data. To that end, the Center for Data on the Mind has been created to promote the adoption of a big-data mindset specifically within psychology. We see this perspective as a new frontier to explore human behavior and cognition at a larger scale and in more naturalistic settings than laboratory experiments often afford. By highlighting rich datasets and powerful techniques to analyze them, we strive to help researchers acquire the keen eye and appropriate techniques needed to delve into existing large-scale datasets for insight into the behavioral and cognitive dynamics that created them.
Email: Alexandra Paxton, paxton.alexandra@berkeley.edu

(5226)

A Bayesian Perspective on the Reproducibility Project: Psychology. ALEXANDER ETZ and JOACHIM VANDEKERCKHOVE, *University of California, Irvine* (Sponsored by Eric-Jan Wagenmakers) — We revisit the results of the recent Reproducibility Project: Psychology. We compute Bayes factors—a quantity that can be used to express comparative evidence for an hypothesis but also for the null hypothesis—for a large subset (N = 72) of the original papers and their corresponding replication attempts. In our evaluation, we take into account the likely scenario that publication bias had distorted the originally published results. Overall, 75% of studies gave qualitatively similar results in terms of the amount of evidence provided. However, the evidence was often weak. The majority of the studies (64%) did not provide strong evidence for either the null or the alternative hypothesis in either the original or the replication, and no replication attempts provided strong evidence in favor of the null. We conclude that the apparent failure of the Reproducibility Project to replicate many target effects can be adequately explained by overestimation of effect sizes (or overestimation of evidence against the null hypothesis) due to small sample sizes and publication bias in the psychological literature.
Email: Alexander Etz, etz.alexander@gmail.com

DECISION MAKING III

(5227)

Comparing Rule-Based and Sequential Sampling Models of Deferred Decision Making. JARED M. HOTALING, JÖRG RIESKAMP and SEBASTIAN GLUTH, *University of Basel* — Deferred decision making (DDM) refers to scenarios in which an individual must choose between two or more risky or uncertain alternatives, but can also defer their final choice in favor of collecting more information. We conducted two medical diagnosis DDM experiments to investigate how and when people decide to stop sampling. Participants could purchase up to twenty independent observations about two mutually exclusive diagnoses before making a final choice. Their goal was to make accurate choices, while minimizing sampling costs. Our results show sensitivity to sampling costs—participants purchased more tests when sampling costs were low—and risk—participants purchased more tests when rewards and punishments were large. We also tested the ability of several competing models to predict participants' choices. Our findings suggest that a sequential sampling model with collapsing decision bounds gave the best account, however substantial individual differences lead to some individuals being best fit by heuristic or rule-based models. These findings challenge the predictions of prominent normative theories, and lay the groundwork for further investigation into the cognitive mechanisms underlying DDM.
Email: Jared M. Hotaling, jaredhotaling@gmail.com

(5228)

A Parallel Constraint Satisfaction Model of Risky Choice. FELIX HENNINGER, *University of Koblenz-Landau*, ANDREAS GLÖCKNER, *FernUniversität in Hagen*, BENJAMIN E. HILBIG, *University of Koblenz-Landau*, MARC JEKEL, *FernUniversität in Hagen* — Recent investigations of risky choice have found choice phenomena, particularly coherence shifts, as well as process tracing data in line with qualitative predictions derived from the class of Parallel Constraint Satisfaction (PCS) models. These findings suggest that this framework may provide a promising foundation for a process model of risky choice. Although the current evidence is favorable, candidate models have not yet been fully specified, and quantitative investigations of these models are lacking. We extend earlier model sketches by fully specifying a process model of risky choice based on PCS, and examine its quantitative predictions. In particular, we show that the model can approximate choices prescribed by expected value and predicted by cumulative prospect theory, thereby extending a normative and a successful paramorphic model by a process component that can be examined with regard to process predictions. Through simulations, we demonstrate that the model's predictions correspond to commonly found data patterns. Based on these results, we argue that single-mechanism accounts in general, and PCS in particular, offer a promising potential description of the processes underlying risky choices.
Email: Felix Henninger, henninger@uni-landau.de

(5229)

Understanding Factors That Influence the Decision to Text and Driving Using the Delay Discounting Method. PAUL ATCHLEY, ASHLEIGH V. TRAN and MOHAMMAD A. SALEHINEJAD, *University of Kansas* — Despite the reported and known dangers of texting while driving, people still text and drive regardless of knowledge of risk. To understand this risky decision, research has examined why individuals choose to text and drive. Using the delay discounting method, participants were asked to indicate preference between responding to a text message immediately for a smaller reward opposed to responding to the message later and receiving a larger reward. Four scenarios were presented in either sunny conditions or winter storm conditions and were presented either using the handheld phone or the vehicle's voice response system as mediums of responding. Overall, people could not wait to respond to a message while driving in sunny conditions and showed an inability to wait to respond to a message received through the vehicle system. These results show that people's decisions to respond to a message is valued differently given informational medium and external conditions.
Email: Ashleigh Tran, ashleigh.tran@ku.edu

(5230)

The Influence of Emotion and Framing on Preferential Choice. ANDREA M. CATALDO, ANDREW L. COHEN, LINDA M. ISBELL and JEFFREY J. STARNS, *University of Massachusetts - Amherst* — Emotion can affect preferential choice. This study uses modeling to examine the effects of particular emotional states on the underlying mechanisms of preferential choice. Specifically, we used the MDFT and the MLBA to investigate whether angry or fearful participants would exhibit differences in attention or accumulation threshold

compared to controls in a task designed to elicit the similarity effect. Attention to stimulus features was examined using a novel manipulation in which features were framed positively or negatively by comparison to a "currently-owned" alternative. Angry and fearful participants were expected to attend more to negatively framed features. Further, angry participants were expected to have the lowest information threshold, and fearful participants the highest. Emotion had equivocal effects on choices. However, both models correctly predicted a large effect of emotion on RT: angry participants were fastest and fearful participants were slowest. There was also a large and surprising effect of framing in all conditions: the similarity effect reversed when all features were framed negatively. A simple modification of the MDFT accounts for this reversal, but a corresponding modification to the MLBA does not.
Email: Andrea M. Cataldo, amcataldo@psych.umass.edu

(5231)

Aging and the Usage of a Frequency Heuristic in Decision Making. BO PANG and KAILEIGH BYRNE, *Texas A&M University* — Gain-loss frequency plays a critical role in decision-making. This work examined the lifespan trajectory of gain-loss frequency usage in decision-making by asking young, middle-aged, older adults to perform a gambling task where gain-loss frequency is a salient factor. Much work indicates that older adults favor heuristics in decision-making. One possibility is thus that reliance on a frequency heuristic would increase in older, and perhaps middle-aged, adults. However, other work found that reliance on a frequency heuristic is working-memory-demanding. Hence older adults might use it less often given age-related cognitive decline. Behavioral results did not reveal significant differences in performance. Cognitive modeling, however, indicated that older and middle-aged adults relied more on gain-loss frequency compared to young adults, although they were less consistent in their responses. Together, this work suggests that people tend to utilize heuristics, such as a reliance on the frequency of gains versus losses, more often as they age.
Email: Bo Pang, pangbo@tamu.edu

(5232)

Spatial Dependency in Local Resource Distributions. VALAREE BEDELL, JOSIE LYDICK, JORDAN TREAT, TAYLOR DAWLEY, MADISON COLLINS and ANDREAS WILKE, *Clarkson University* — We investigated the presence and absence of different local resources to determine their underlying spatial distributions. Past psychological research has typically focused on empirical resource distributions of equal base rates—such as a 10x10 grid with resource spots that have 50 resources/tokens in it—to compute alternation probabilities that are indicative of how clumpy, random or dispersed the distribution types are. The current methodology focuses on an ecological point pattern analysis to overcome this limitation. During the past semesters, we observed and coded various resource domains at our university campus, such as seats taken at a café, in a restaurant and by hockey arena audiences, as well as used spots on a parking lot. We discuss our results in light of claims that our ancestral human cognitive evolution selected for specific reasoning mechanisms to detect resources that are distributed in clumps or patches in space and time.
Email: Andreas Wilke, awilke@clarkson.edu

(5233)

Configural Learning of Co-Occurring Non-Salient Cues Increases Their Chances of Overcoming the Competition With a Salient Cue. VSEVOLOD KAPATSINSKI and ZARA HARMON, *University of Oregon* — Several studies examined cue competition in human learning by testing learners on a combination of conflicting cues rooting for different outcomes, with each cue perfectly predicting its outcome. A common result has been that learners faced with cue conflict choose the outcome associated with the rare cue (the Inverse Base Rate Effect, IBRE). Here, we investigate cue competition including IBRE with sentences containing cues to meanings in a visual world. We do not observe IBRE. Instead we find that position in the sentence strongly influences cue salience. Faced with conflict between an initial cue and a non-initial cue, learners choose the outcome associated with the initial cue, whether frequent or rare. However, a frequent configuration of non-initial cues that are not sufficiently salient on their own can overcome a competing salient initial cue rooting for a different meaning. This provides a possible explanation for certain recurring patterns in language change.
Email: Zara Harmon, zforough@uoregon.edu

(5234)

On the Contribution of Time, Executive Control, and Metacognition to Effort Avoidance. TIMOTHY L. DUNN and EVAN F. RISKO, *University of Waterloo* — The notion that we adapt our behaviors in ways that avoid effort is considered by many to be a fundamental principle of human behavior. Nonetheless, we lack a deep understanding of how this process unfolds. The goal of the current investigation was to directly contrast three recent accounts of the information on which individuals base their effort-based decisions: (1) time demands, (2) demands placed on executive control (EC), and (3) a novel cue-utilization account that hypothesizes that this information consists of inferences generated over available effort cues. Across a series of experiments, we utilized a variant of the demand selection task where individuals gained experience with two lines of action and subsequently attempted to generate a least-effortful preference for one option. We demonstrate that effort avoidance can be dissociated from both demands on time and EC in a manner predicted by the cue-utilization account.
Email: Timothy L. Dunn, timothy.l.dunn1@gmail.com

(5235)

Emergence of Regularity and Structure in Group Learning. CHRISSY M. CHUBALA and RANDALL K. JAMIESON, *University of Manitoba* — Humans are social animals and rarely learn in isolation. Nevertheless, learning theorists have traditionally made analyses and derivations of learning principles from experiments in which each learner is a single individual. It remains an open question whether an analysis of learning by isolated individuals reflects how people learn in

groups. We present data from a group-level function-learning experiment. Results show patterns of learning, generalization, and re-learning that are consistent with learning by single individuals. The data also reveal evidence for the spontaneous emergence of complicated group-level organizations: without any communication or explicit coordination, participants take on needed decision roles within their group. We discuss our results in relation to distributed cognition, and emphasize the value of considering scale-invariance for a general understanding of perception, learning, and memory.
Email: Chrissy M. Chubala, umchubal@myumanitoba.ca

(5236)

Why Free Choices Take Longer Than Forced Choices. CHRISTOPH NAEFGEN, *University of Tuebingen*, MICHAEL DAMBACHER, *University of Leicester*, MARKUS JANCZYK, *University of Tuebingen* (Sponsored by Hartmut Leuthold) — RTs for free choice tasks are consistently slower than those for forced choice tasks. We examined the cause for this difference in a color discrimination study with intermixed free and forced choice trials, and adopted the rationale of sequential sampling frameworks to test two alternative accounts: Slower RTs in free choices are caused (1) by more (complex) operations that lower the rate of information accumulation, or (2) by cognitive processes that delay the start of information accumulation. In three experiments, we made these accounts empirically discriminable by manipulating decision thresholds via time pressure and frequency of catch trials. Our results supported the second account, suggesting a temporal delay of information accumulation between the tasks, while the accumulation rate remains unchanged. We propose that response execution in both tasks relies on information accumulation towards a specific goal (i.e., response). While in forced choice tasks, this goal is externally determined by the stimulus, in free-choice tasks it needs to be generated internally, which requires additional time.
Email: Christoph Naefgen, christoph.naefgen@uni-tuebingen.de

(5237)

The Perils of Proximity: The Influence of Spatial Distance on Decision Difficulty. IRIS K. SCHNEIDER, *Vrije Universiteit Amsterdam*, NORBERT SCHWARZ, *University of Southern California*, SANDER L. KOOLE, *Vrije Universiteit Amsterdam* — In physical reality, two objects cannot occupy the same space at the same time. Hence, spatial distance between objects is a key feature of the world. To date, spatial distance has primarily received attention in the context of construal level theory, which addresses the distance between a perceiver and a target. In contrast, the physical distance *between choice alternatives* (rather than between the *self* and choice alternatives) has received limited attention. However, choice options are often presented in a spatial manner, be it on shelves, forms, or computer screens. This work investigates this influence of spatial distance on decision difficulty. In all studies, participants chose between two choice options presented on a computer-screen. Crucially, choice options were presented physically close together or far apart. Decision-time was recorded as an indicator of decision-difficulty. Physically close (vs. far) choice options increase decision-difficulty (experiment 1 - 4), but only when choice options are comparable (e.g. two words, or two pens). When choice options are incomparable (e.g. hat and a lamp) physically close (vs. far) choice options lead to less decision-difficulty (experiment 5).
Email: Dr. Iris K. Schneider, schneider.ik@gmail.com

(5238)

Modeling 2-Alternative Forced-Choice Decisions. CHELSEA VOSKUILEN and ROGER RATCLIFF, *The Ohio State University* — We examine performance in a perceptual 2-alternative forced-choice (2AFC) task and discuss possible ways of modeling the effects observed in this task. In this task, subjects are presented with two flickering patches of black and white pixels and asked to make a comparative judgment (e.g., which of the two patches contains more white pixels). This type of task differs from the more general 2-choice task in that evidence for one response option is not necessarily evidence against the other response. In this task, differences in the brightness of the two patches produce typical RT and accuracy effects (i.e., subjects respond more quickly and more accurately when there is a larger difference between the two patches). However, the overall brightness of the pair of stimuli also affects RT and accuracy. We discuss how the diffusion model can be adapted to handle these results and potential implications for the Weber-Fechner law.
Email: Chelsea Voskuilen, voskuilen.2@osu.edu

(5239)

A Bayesian Method for Inferring Decision Strategies Based on the Path to a Choice. JUN FANG and LAEL SCHOOLER, *Syracuse University* — The simple heuristic framework proposes that people are equipped with a toolbox of decision strategies. Luan, Schooler and Gigerenzer (2014) investigated the theoretical properties of Δ-inference, a simple heuristic that ranks alternatives (e.g., banks) according to a criterion of interest (e.g., risk of failure) based on cues (e.g., loan to capital ratio). It makes a decision when the value on a cue exceeds those of other alternatives by a threshold Δ. One question is under what conditions, if any, do people adopt Δ-inference? A methodological challenge is to recover the strategy used by a decision maker to make a choice. Scheibehenne, Rieskamp & Wagenmakers (2013) developed a Bayesian method to estimate the probability that a decision maker used a particular strategy based on the decision maker's final choice. Building on their work, we present a Bayesian approach that considers not only the final choice but also the steps taken on the path to that choice. We conduced computer simulations to investigate whether our path-based approach effectively recovers the strategies decision makers use to make their choices.
Email: Jun Fang, jfang100@syr.edu

(5240)

The Role of Experience in Explaining People's Financial Choices. KATARZYNA SEKŚCIŃSKA, *University of Warsaw* — Existing knowledge about the impact of the experience prior to financial choices has been limited almost exclusively to single risky choices. Moreover, the results obtained in

these studies have not been entirely consistent. The results of the two experimental studies presented in this paper provide evidence for the hypothesis that the experience of success or failure influences people's financial choices, but the effect of the success or failure depends on the type of task (financial and non-financial) preceding a financial decision. The experience of success in financial tasks increased participants' tendency to invest and make risky investment choices, while it also made them less prone to save. While, the experience of failure heightened the amount of money that participants decided to save, and lowered their tendency to invest and make risky investment choices. However, the effects of the experience of success or failure in non-financial tasks were exactly the opposite.
Email: Katarzyna Sekścińska, ks@psych.uw.edu.pl

(5241)

Investigating Individual Differences in Risk-Taking Preferences Among Preschoolers. EMILY S. SUMNER, MICHAEL D. LEE and BARBARA W. SARNECKA, *University of California - Irvine* (Sponsored by Martin Buschkuehl) — Although there is a large academic literature on adult and adolescent decision making, little is known about how decision making develops through childhood. Only a handful of studies have looked at preschool-aged children's decision making, and the tasks used in those studies fail to take into account children's cognitive limitations (e.g., limited working memory). The present study used a novel gambling paradigm with spinner wheels to investigate the individual decision-making strategies of 39 preschoolers (mean: 54.07 range: 34.8 - 76.3 months). In the study, children made several choices between two spinner wheels to win sticker prizes — one more risky; the other less risky. Using a latent-mixture model and Bayesian methods of inference, we classified each child's decision-making strategy as risk-seeking, risk-averse, or perseverating. The most common strategy used was risk-seeking, followed by perseveration, and risk-averse. However, fewer children used the risk-seeking strategy when the expected value of the risky wheel was lower than that of the safer one. We discuss the advantages of our approach to analysis, including the possibility of investigating what variables determine the strategies children use.
Email: Emily Sumner, sumnere@uci.edu

FUNDING FROM US DEPARTMENT OF EDUCATION

(5242)

Funding Opportunities for Cognitive Psychologists Through the Institute of Education Sciences. ERIN HIGGINS, *Institute of Education Sciences* — The Institute of Education Sciences provides funding support for researchers to apply theories and recent findings from psychological science to education practice through the National Center for Education Research and the National Center for Special Education Research. For example, through the Cognition and Student Learning topic within the Education Research Grants program, the Institute supports research that capitalizes on our understanding of how the mind works to inform and improve education practice in reading, writing, mathematics, science, and study skills. Erin Higgins, the program officer for the Cognition and Student Learning topic, will be available to answer questions and talk to attendees about their proposed work at the Friday night and Saturday at noon poster sessions.
Email: Erin Higgins, Erin.Higgins@ed.gov

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y

Z

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

Z