



**The PSYCHONOMIC SOCIETY**

*Founded 1959: More Than 50 Years of Psychological Research*

# Abstracts of the Psychonomic Society

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## 52ND ANNUAL MEETING

VOLUME 16 ■ NOVEMBER 2011

**SHERATON SEATTLE HOTEL  
SEATTLE, WASHINGTON**

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**Thursday, November 3  
through  
Sunday, November 6, 2011**

### REGISTRATION

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**Grand Ballroom Prefunction Area**

Thursday, November 3: 3:00 p.m. – 8:00 p.m.  
Friday, November 4: 7:30 a.m. – 1:00 p.m.  
Friday, November 4: 4:30 p.m. – 6:00 p.m.  
Saturday, November 5: 10:00 a.m. – 1:00 p.m.

### BUSINESS MEETING

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**Grand Ballroom AB**

Saturday, 4:30 p.m. – 5:45 p.m.

Funding Opportunities: “Behavior at NIH’s OBSSR  
and NCCAM”

Presentation of APA Division 3 New Investigator  
Awards

Business of the Psychonomic Society

### POSTER SESSIONS

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**Washington State Convention &  
Trade Center Rooms 6ABC**

Session I: Thursday, 6:00 p.m. – 7:30 p.m.  
Session II: Friday, Noon – 1:30 p.m.  
Session III: Friday, 6:00 p.m. – 7:30 p.m.  
Session IV: Saturday, Noon – 1:30 p.m.  
Session V: Saturday, 6:00 p.m. – 7:30 p.m.

### KEYNOTE ADDRESS FOLLOWED BY WELCOME RECEPTION

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**Grand Ballroom AB**  
Thursday, 8:00 p.m.

### Psychonomic Society 2011 Best Article Awards

**Keynote Address: Developing an Integrated  
Mind**

Nora Newcombe  
Temple University

### Welcome Reception:

Foyer outside the Grand Ballroom AB

### SYMPOSIA

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**Grand Ballroom AB**

**Psychocinematics: Exploring Cognition at the  
Movies**

Friday Morning, 9:45 a.m. – 11:55 a.m.

**Wayfinding in the Seattle Public Library:  
What Can We Learn About Navigational  
Styles?**

Saturday Afternoon, 2:00 p.m. – 4:10 p.m.

### FUTURE MEETINGS

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2012 – Minneapolis, MN, November 15–18

2013 – Toronto, ON, November 14–17

2014 – Long Beach, CA, November 20–22

2015 – Chicago, IL, November 19–22

## PSYCHONOMIC SOCIETY KEYNOTE ADDRESS

Nora Newcombe  
Temple University

**Developing an Integrated Mind**  
8:00 p.m., Thursday, November 3, 2011  
Grand Ballroom AB

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### WELCOME RECEPTION

The Governing Board welcomes all attendees to the Welcome Reception, hosted by the PS Governing Board and Springer, held on November 3 from 8.30-10.00 p.m., immediately following the Key Note address in Grand ballroom AB. Reception location to be announced at registration.

### NOTICE

#### Information on Funding Opportunities during the BUSINESS MEETING and Poster Sessions

John Glowa from NIH/NCCAM will talk about funding opportunities at NIH in his talk “Behavior at NIH's OBSSR and NCCAM” during the Business Meeting at 4:30 p.m. on Saturday, November 5, in Grand Ballroom AB.

Other representatives of funding agencies will be available during the poster sessions. Please stop by poster boards 150-154 during the poster sessions for an opportunity to pick up information and/or speak with representatives from various funding agencies. The schedule for agency poster sessions will be available at Registration and on the poster boards.

## GENERAL INFORMATION (2011)

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### HOTEL

The Sheraton Seattle Hotel is situated in the city's vibrant core. It provides a gateway to the diverse sights and sounds of the Pacific Northwest and is steps away from exciting nightlife, restaurants, shopping, and entertainment. Walk to Seattle's famed attractions like Pike Place Market, the Seattle Waterfront, Seattle Center, Space Needle, Seattle Art Museum, and Seattle Aquarium. The hotel and adjacent Washington State Convention Center will be the site for all meetings, including meetings of affiliate groups held in conjunction with the Psychonomic Society Meeting. The hotel is located in downtown Seattle at 1400 Sixth Avenue.

We are able to have the meeting space at no charge based on the number of rooms attendees occupy in the hotel. To maintain our practice of no registration fee, it is essential that all rooms reserved for the conference be identified as such. To guarantee space and price, please make your reservation no later than October 3. The Web site to make reservations can be reached via a link from the Psychonomic Annual Meeting page, <http://www.psychonomic.org/annual-meeting.html>. You may also call 206-621-9000 to use the hotel's telephone reservation system. When calling, please be sure to identify yourself as a person attending the Psychonomic Society meeting. The room rate is \$186/night plus tax. Be sure to obtain a confirmation number from the hotel for your room. For events in Seattle during the conference, go to [www.seattleweekly.com](http://www.seattleweekly.com).

### TRAVEL IN SEATTLE

A taxi from the airport is approximately \$35-\$40 one way. A shared ride (Shuttle Express) is \$15.00 one way, and a town car is \$110. Parking at the hotel is \$38 per night. An inbound train is available at the transit station at the North side of North Parking structure at the airport. The train terminates at the Nordstrom Building at 6<sup>th</sup> and Pike – one block from the Sheraton Seattle Hotel on Sixth Avenue for \$2.50 one way.

### REGISTRATION

Registration is free and will be held outside the Grand Ballroom in the Prefunction area on the 2<sup>nd</sup> floor, Thursday through Saturday as specified on the cover of the program. You are encouraged to preregister through our Web site, [www.psychonomic.org](http://www.psychonomic.org); just click on the "Annual Scientific Meeting" link in the menu to access preregistration. Preprinted name tags will be available for all up to date dues-paying members and associate members, life members, presenters, and co-authors. Please check your membership status at [www.psychonomic.org](http://www.psychonomic.org) if you are not sure if your dues are current. If you choose not to preregister, please fill out a registration card at the registration desk outside the Grand Ballroom so the Society may obtain an accurate count of attendees.

### PROGRAMS

Programs will be mailed to all current members of the Psychonomic Society. Please bring your program with you. Additional programs will be available at the registration desk for \$20.

### MEETING ROOMS

The meeting rooms for spoken papers are on one level on the 2<sup>nd</sup> floor (Grand Ballroom A-D and Willow A-B) in the Sheraton Seattle Hotel. The poster sessions will be in the Washington State Convention & Trade Center rooms 6ABC. Exhibitors will be in the foyer area of the Grand Ballroom on the 2<sup>nd</sup> floor.

### PSYCHONOMIC TIME

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

### AUDIOVISUAL EQUIPMENT FOR TALKS

LCD projectors (e.g., for PowerPoint presentations) will be provided in all rooms where spoken sessions are scheduled; however, computers will NOT be provided. Rather, presenters must bring their own computers and set them up BEFORE the start of the session in which they are presenting. Presenters are strongly encouraged to visit the speaker preparation room well in advance of their talks so that they know how to set up their equipment. Information on the location of the speaker preparation room will be available at registration. Session Chairs are also encouraged to solicit papers from individuals in their sessions prior to the meeting and load the presentations onto a computer that can be used by everyone in the session.

Slide projectors and overhead projectors for transparencies will NOT be provided unless the speaker has specifically requested such equipment.

## GENERAL INFORMATION (2011)

### HOSPITALITY

On Thursday, November 3, there will be a general reception with a cash bar between 5:00 p.m. and 7:00 p.m. in the poster session area at the Washington State Convention Center rooms 6ABC. A reception with cash bar will be held in the same area from 5:00 p.m. to 7:00 p.m. on Friday and from 5:30 p.m. to 7:30 p.m. on Saturday. Note that the reception is combined with the poster session on each evening.

Complimentary coffee and tea will be available from 7:30 a.m. to 9 a.m. each morning near the registration area.

### THE PROGRAM

There were 1,046 submissions. Of the 1,037 papers that were accepted, 304 are spoken papers and 733 are posters.

### POSTER SESSIONS

**NOTE:** The Governing Board has decided to reduce the size of posters to 4 ft. x 4 ft. to accommodate all of the submissions. This means that you will be sharing an 8 ft. x 4 ft. board with another presenter. Please plan accordingly. Visit [www.psychonomic.org/sugg.html](http://www.psychonomic.org/sugg.html) for suggestions on preparing your poster.

The poster sessions will be held in the Washington State Convention Center rooms 6ABC. The use of the space at the convention center must be paid for by the Society, and in order to help pay this cost, a \$4 per night rebate from each room night paid by attendees will be applied toward the rental of the convention center. The three evening sessions will be held in conjunction with the general reception (hospitality). The authors of posters are urged 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	10:00 a.m.–1:30 p.m.	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	10:00 a.m.–1:30 p.m.	Noon – 1:30 p.m.
Saturday Evening	4:00 p.m. – 7:30 p.m.	6:00 p.m. – 7:30 p.m.

It is hoped that the extended viewing time will allow all interested persons to see posters of their choice and reduce the crowded conditions we have sometimes had at the poster sessions. As usual, the author(s) are required to be present only during the official times shown in the program. Posters should be taken down at the end of the actual session. Please do NOT leave your poster behind at the end of your session.

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., 001–120).

### PROGRAM HISTORY

Year – Site	Submissions	Accepted
2010 – St. Louis	928	928
2009 – Boston	1,230	1,229
2008 – Chicago	1,040	950
2007 – Long Beach	936	928
2006 – Houston	905	883
2005 – Toronto	966	940

### PROGRAM AND CONFERENCE ORGANIZATION

The Secretary/Treasurer, Ruth Maki, has the responsibility for organizing the program, and the Convention Manager, Roger Mellgren, has the responsibility for arranging facilities at the meeting. They do so with the indispensable help of Kathy Kuehn, of The Rees Group and the Executive Director of the Society, and with the help of our meeting planning organization, the Scarritt Group, with Lauren Wilson on site for the meeting. In addition, John Hofmann, Linda Potchoiba, Jane Shepard, and Amy Bayer assisted with the organization of the program, which was printed by Springer.

### OTHER MEETINGS

#### APCAM–Auditory Perception, Cognition, and Action 9th Annual Meeting

Thursday, November 3, Aspen  
Visit [apcam.us](http://apcam.us) for more information.

#### CCS–Comparative Cognition Society Fall Meeting

Thursday, November 3, Metropolitan B  
Keynote address by Sheri Mizumori  
For more information and registration (free), visit [www.comparativecognition.org](http://www.comparativecognition.org).

#### OPAM–Workshop in Object Perception, Attention, and Memory

Thursday, November 3, 8:30 a.m. – 4:00 p.m., Metropolitan A  
The 17th annual OPAM meeting is a one-day workshop dedicated to issues in object perception, attention, memory and other areas of visual cognition. This year's keynote address will be given by Dr. Brian Scholl, Yale University. For more information visit [www.opam.net](http://www.opam.net) or contact one of this year's organizers:

## GENERAL INFORMATION (2011)

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Brian Levinthal ([b-levinthal@northwestern.edu](mailto:b-levinthal@northwestern.edu)), Timothy Vickery ([timothy.vickery@yale.edu](mailto:timothy.vickery@yale.edu)), Carly Leonard ([cjleonard@ucdavis.edu](mailto:cjleonard@ucdavis.edu)), or Melissa Vö ([mlvo@search.bwh.harvard.edu](mailto:mlvo@search.bwh.harvard.edu)).

### SCiP–Society for Computers in Psychology

Thursday, November 3, Cedar, Willow and Grand Ballroom Prefunction Area

For more information, visit [www.scip.ws](http://www.scip.ws).

### Tactile Research Group

Thursday, November 3, 8:00 a.m.–5:25 p.m., Issaquah

Invited speakers include Soledad Ballesteros, Morton Heller, Mark Hollins, John Kennedy, Allan Smith, and Steve Hsiao.

Contact Mounia Ziat ([mziat@wlu.ca](mailto:mziat@wlu.ca)) or Torø Teigum Graven ([graven@oslo.online.no](mailto:graven@oslo.online.no)) for more information.

### WICS–Women in Cognitive Science 9th Annual Meeting

Thursday, November 3, 4:00 p.m. – 6:00 p.m., Willow B

For more information, visit [www.albany.edu/~lf503/wics](http://www.albany.edu/~lf503/wics).

### SJDM–Society for Judgment and Decision Making Annual Meeting

Saturday, Sunday, and Monday, November 5–7, Washington State Convention Center; East Lobby, 608-614, 6ABC. For more information, visit [www.sjdm.org](http://www.sjdm.org).

### OFFICERS OF THE SOCIETY

Past Chair: Brian H. Ross (2010)

Current Chair: R. Reed Hunt (2011)

Chair-Elect: Jeff Zacks (2012)

Secretary/Treasurer: Ruth Maki (2011–2013)

Convention Manager: Roger L. Mellgren (2002–2011)

### Word of Welcome

The members of the Governing Board and the Officers of the Society welcome you to the 52<sup>nd</sup> annual meeting of the Psychonomic Society. As has always been the case, the program for this year's meeting represents the latest work of our contributing members and offers detailed analyses of issues across an array of areas. A total of 1037 papers will be presented during the meeting, coupled with the interesting programs assembled by our satellite organizations which meet on Thursday and Sunday. If you have any questions or comments concerning the conference, please pass them on to a member of the Governing Board. We trust that you will enjoy this year's conference and wish you the best with your ongoing work.

### GOVERNING BOARD 2011

Nelson Cowan (2006–2011)

Judith F. Kroll (2006–2011)

D. Stephen Lindsay (2007–2012)

Robert M. Nosofsky (2007–2012)

R. Reed Hunt (2008–2013)

Jeffrey M. Zacks (2008–2013)

Michael C. Anderson (2009–2014)

Helene Intraub (2009–2014)

Colin M. MacLeod (2010–2015)

Jeremy M. Wolfe (2010–2015)

Cathleen Moore (2011–2016)

Lynne Reder (2011–2016)

The names of two new members elected to the Governing Board for 2012–2017 will be announced at the Business Meeting on Saturday, November 5.

Ruth Maki, *Secretary/Treasurer*

Adjunct Professor, University of Arizona

2785 E. Posse Court

Green Valley, AZ 85614

[rmaki@email.arizona.edu](mailto:rmaki@email.arizona.edu)

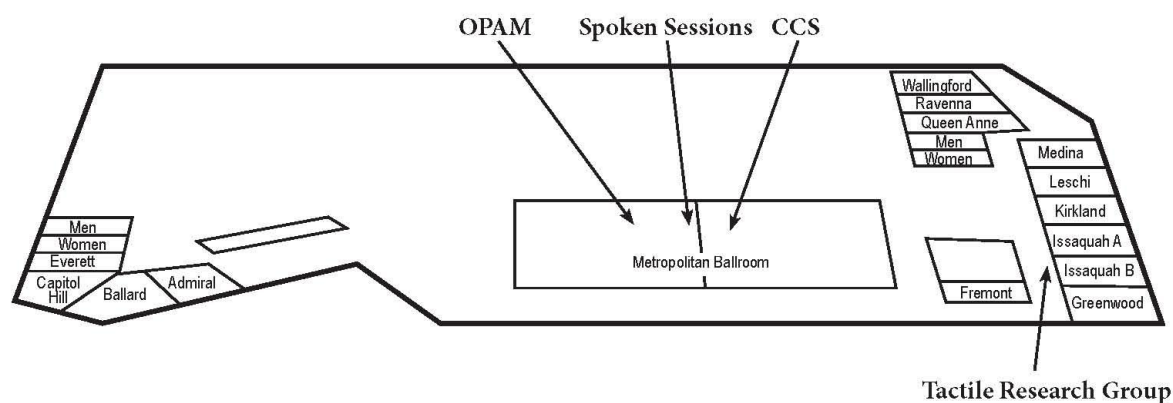
## SEATTLE SHERATON HOTEL

Keynote Address, Spoken Sessions, Other Meetings at Seattle Sheraton Hotel.

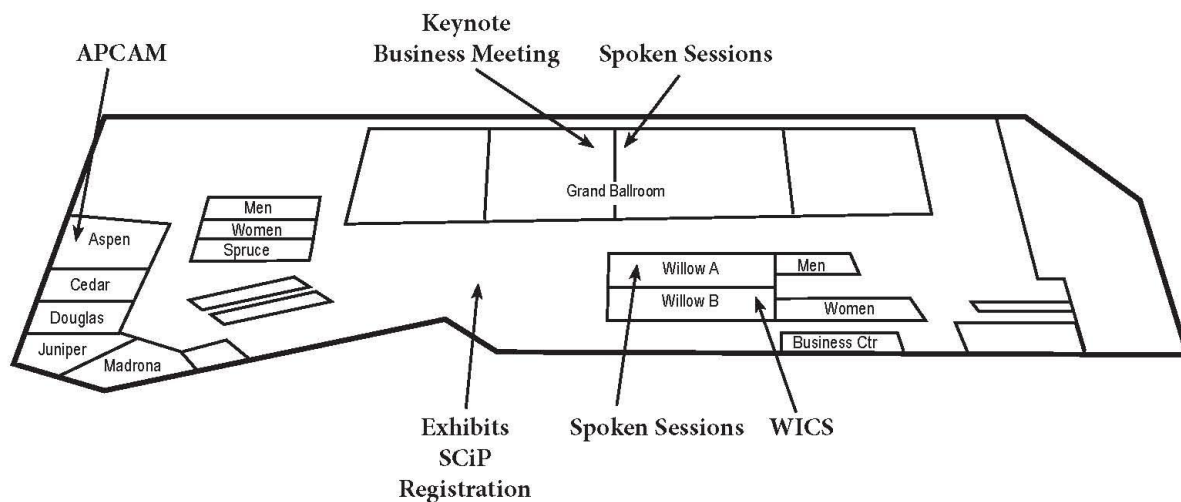
Posters at Washington State Convention & Trade Center Rooms 6ABC.

SJDM at Convention Center Rooms 608-614, 6ABC.

### THIRD FLOOR



### SECOND FLOOR



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## The Psychonomic Society Announces the Winners of the 2011 Best Article Awards

The Publications Committee of the Psychonomic Society asked each Editor of a Psychonomic journal to select a Best Article of the Year Award winner. Potential winners were the first authors of all articles published or slated to be published in 2011. Editors used whatever criteria and procedure they deemed best to select the winning paper. The winners (who also will be identified in a brief announcement immediately preceding Nora Newcombe's keynote address at the annual meeting on Thursday, November 3, 2011) are:



### *Attention, Perception, & Psychophysics* (Editor Jeremy M. Wolfe)

David E. Irwin

"Where does attention go when you blink?"

DOI 10.3758/s13414-011-0111-0

### *Behavior Research Methods* (Editor Gregory Francis)

Marjan Bakker and Jelte M. Wicherts

"The (mis)reporting of statistical results in psychology journals"

DOI 10.3758/s13428-011-0089-5



Marjan Bakker



### *Cognitive, Affective, & Behavioral Neuroscience* (Editor Deanna Barch)

Annmarie MacNamara, Jamie Ferri, and Greg Hajcak

"Working memory load reduces the late positive potential and this effect is attenuated with increasing anxiety"

DOI 10.3758/s13415-011-0036-z

### *Learning & Behavior* (Editor Geoffrey Hall)

Monique A. R. Udell, Nicole R. Dorey, and Clive D. L. Wynne

"Can your dog read your mind? Understand the causes of canine perspective taking"

DOI 10.3758/s13420-011-0034-6



Monique A.R. Udell



### *Memory & Cognition* (Editor James Nairne)

Daniel Bajic and Timothy C. Rickard

"Toward a generalized theory of the shift to retrieval in cognitive skill learning"

DOI 10.3758/s13421-011-0114-z

### *Psychonomic Bulletin & Review* (Editor Cathleen Moore)

Xingshan Li and Alexander Pollatsek

"Word knowledge influences character perception"

DOI 10.3758/s13423-011-0115-8



Xingshan Li

*Please join the Publications Committee in congratulating these authors.*



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## **The 11<sup>th</sup> Annual Meeting of Women in Cognitive Science**

**Thursday, November 3, 2011**  
**Sheraton Seattle Hotel, Seattle**  
WICS Meeting: 4-6 pm  
WICS Social Hour: 6-7 pm

### ***When Women Do Ask: The Science of Negotiation***

**Keynote speaker:** Vandra Huber  
University of Washington

**Panelists will include:**

Viorica Marian Northwestern University	Mary Peterson University of Arizona
David Rosenbaum Pennsylvania State University	Moderator: Laurie Feldman University of Albany, SUNY

**Acknowledgments:**

WICS is supported by funds from the Perception, Action and Cognition Program at the National Science Foundation.

**Organizers:**

Laurie Feldman ([lf503@albany.edu](mailto:lf503@albany.edu))  
Janet van Hell ([jgv3@psu.edu](mailto:jgv3@psu.edu))  
Judith Kroll ([jfk7@psu.edu](mailto:jfk7@psu.edu))  
Suparna Rajaram ([suparna.rajaram@sunysb.edu](mailto:suparna.rajaram@sunysb.edu))

For more information visit: <http://www.albany.edu/~lf503/wics/>  
Women in Cognitive Science is affiliated with the Psychonomic Society





[www.comparativecognition.org](http://www.comparativecognition.org)

***Fall Meeting of the Comparative Cognition Society***

**November 3 – Sheraton Seattle Hotel**

All are Welcome – Registration is Free (Please Register to Receive Updates)

**Paper Sessions**

- 8:15 - Memory and Metacognition
- 9:20 - Associative Processes and Relational Learning
- 10:30 - Choice Behavior
- 1:00 - Space and Quantity
- 2:00 - Categories, Concepts, & Ordinal Knowledge
- 3:10 - Attention, Perception, and Recognition
- 4:00 - Keynote Address – Sheri Mizumori (University of Washington)



**19<sup>th</sup> Annual International Conference  
on Comparative Cognition**  
Melbourne, FL March 7 - 11, 2012

**Call for Papers will be Posted on the CCS  
Website in September**

**COMPARATIVE  
COGNITION & BEHAVIOR  
REVIEWS**

The online journal of the  
Comparative Cognition Society

**Check out these resources on the CCS website**

- **ComparativePsych News Feed:** Reports from the media related to animal behavior and comparative cognition may be viewed on the website or emailed directly to you as they are posted
- **CCS YouTube Channel:** videos from laboratories, documentary footage, etc gathered by category. Post videos from your lab and let us know to be included
- **Job Postings and Student Opportunities** in comparative cognition (check them out and/or fill out the web form to post yours)

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



*Society for Computers in Psychology*

41<sup>st</sup> Annual Meeting of SCiP  
Seattle, WA

Thursday November 3, 2011

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The 41<sup>st</sup> annual meeting of the Society for Computers in Psychology will be held at Sheraton Seattle Hotel, on **Thursday, November 3, 2011**. SCiP will run from 8am-5pm before the opening of the annual meeting of the Psychonomic Society. The program will include papers, posters, tutorials, and symposia dealing with the use of computers in all areas of psychological research, including (but not limited to):

- New techniques for data collection and analysis by computer
- Computational modeling of human cognition and perception
- Novel computational techniques for analysis of neuroimaging data
- Data collection techniques for web-based research
- Advanced computer-based instructional systems
- New software to support psychological experiments
- Computational techniques to support clinical decision making

This year's conference will feature:

**Keynote Address:** **Dr. Susan Dumais**, *Microsoft Research*.

"Understanding in situ search behavior using large-scale log analysis and web-based experiments"

**Presidential Symposium:** "Natural language processing applications in education: The computer-based analysis of student constructed responses" organized by **Dr. Joe Magliano**, *Northern Illinois University*

The SCiP conference registration fee and annual membership is US \$75 for members and \$60 for student members.

For more information and online registration, visit our web site: [www.scip.ws](http://www.scip.ws)

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# **Society for Judgment and Decision Making**

## **32<sup>nd</sup> Annual Conference**

**November 5 – 7, 2011**

**Sheraton Seattle Hotel & Washington State Convention Center**

**Seattle WA**

### **Welcome Reception/Early Registration**

Fri. Nov. 4 - 5:00 - 7:00 pm Rooms 606 & 607 (Convention Center)

### **Tribute to Robyn Dawes**

Fri. Nov. 4 - 8:00 - 10:00 pm Willow Ballroom (2<sup>nd</sup> Floor, Sheraton Hotel)

### **Keynote Address by Ed Diener**

Sun. Nov. 6 - 1:30 - 2:30 pm Rooms 608 & 609 (Convention Center)

### **Presidential Address by Eldar Shafir**

Sun. Nov. 6 - 4:45 - 5:30 pm Rooms 608 & 609 (Convention Center)

For more information visit [www.sjdm.org](http://www.sjdm.org)



**Held yearly at the same location as Psychonomics Annual Meeting**

### THURSDAY EVENING

Hospitality . . . . .	5:30 p.m.-7:30 p.m., Convention Center Ballroom 6 ABC
Poster Session 1. . . . .	4:30 p.m.-7:30 p.m. (Author Present between 6:00 p.m.-7:30 p.m.), Convention Center Ballroom 6 ABC
Vision I (1001-1006)	Human Learning and Instruction I (1079-1088)
Perception I (1007-1014)	Selective Attention I (1089-1102)
Action and Perception I (1015-1020)	Cognitive Control I (1103-1110)
Embodied Cognition (1021-1028)	Speech Perception (1111-1118)
Spatial Cognition I (1029-1038)	Psycholinguistics I (1119-1127)
Cognitive Skill Acquisition I (1039-1048)	Concepts and Categories I (1128-1137)
Explicit Memory I (1049-1056)	Letter and Word Processing I (1138-1148)
Working Memory I (1057-1068)	Grant Funding Agencies (1150-1154)
Metamemory/Metacognition I (1069-1078)	
Keynote Address . . . . .	8:00 p.m., Grand Ballroom AB
Welcome Reception . . . . .	Location to be announced at registration

### FRIDAY MORNING

Concepts and Categories I (1-5) . . . . .	8:00 a.m.-9:35 a.m., Metropolitan A
Human Learning and Instruction I (6-10) . . . . .	8:00 a.m.-9:35 a.m., Grand Ballroom C
Priming (11-16) . . . . .	8:00 a.m.-9:55 a.m., Metropolitan B
Cognitive Control I (17-21) . . . . .	8:00 a.m.-9:35 a.m., Willow AB
Selective Attention I (22-25) . . . . .	8:00 a.m.-9:15 a.m., Grand Ballroom AB
Recognition Memory (26-31) . . . . .	8:00 a.m.-9:55 a.m., Grand Ballroom D
SYMPOSIUM I:	
Psychocinematics: Exploring Cognition at the Movies (32-37) . . . . .	9:45 a.m.-11:55 a.m., Grand Ballroom AB
Perception I (38-43) . . . . .	10:00 a.m.-11:55 a.m., Willow AB
Psycholinguistics I (44-48) . . . . .	10:20 a.m.-11:55 a.m., Grand Ballroom D
Metamemory I (49-54) . . . . .	10:00 a.m.-11:55 a.m., Metropolitan A
Working Memory I (55-60) . . . . .	10:00 a.m.-11:55 a.m., Grand Ballroom C
Reasoning and Judgment (61-65) . . . . .	10:20 a.m.-11:55 a.m., Metropolitan B

### FRIDAY NOON

Poster Session II . . . . .	10:30 a.m.-1:30 p.m. (Author Present between 12:00 p.m.-1:30 p.m.) Convention Center Ballroom 6 ABC
Perception II (2001-2007)	Selective Attention II (2073-2084)
Spatial Cognition II (2008-2014)	Cognitive Control II (2085-2098)
Cognitive Skill Acquisition II (2015-2019)	Speech Perception II (2099-2108)
Eyewitness Memory (2020-2029)	Psycholinguistics II (2109-2118)
Recognition Memory (2030-2042)	Bilingualism I (2119-2128)
Implicit Learning and Memory (2043-2047)	Reasoning and Problem Solving (2129-2136)
Working Memory I (2048-2061)	Animal Cognition and Learning (2137-2145)
Testing Effects (2062-2072)	Grant Funding Agencies (2150-2154)

### FRIDAY AFTERNOON

Animal Cognition (66-70) . . . . .	1:30 p.m.-3:05 p.m., Grand Ballroom D
Action and Perception I (71-75) . . . . .	1:30 p.m.-3:05 p.m., Grand Ballroom C
Judgment and Decision Making I (76-80) . . . . .	1:30 p.m.-3:05 p.m., Willow AB
Spatial Cognition (81-85) . . . . .	1:30 p.m.-3:05 p.m., Metropolitan B
Letter and Word Processing I (86-91) . . . . .	1:30 p.m.-3:25 p.m., Metropolitan A
Explicit Memory I (92-97) . . . . .	1:30 p.m.-3:25 p.m., Grand Ballroom AB
Visual Attention (98-103) . . . . .	3:30 p.m.-5:25 p.m., Grand Ballroom C
Perceptual Organization (104-108) . . . . .	3:30 p.m.-5:05 p.m., Grand Ballroom D
Judgment and Decision Making II (109-114) . . . . .	3:30 p.m.-5:25 p.m., Willow AB
Working Memory II (115-119) . . . . .	3:50 p.m.-5:25 p.m., Metropolitan A
Cognitive Aging (120-125) . . . . .	3:30 p.m.-5:25 p.m., Metropolitan B
Explicit Memory II (126-130) . . . . .	3:50 p.m.-5:25 p.m., Grand Ballroom AB

### FRIDAY EVENING

Hospitality . . . . .	5:30 p.m.-7:30 p.m., Convention Center Ballroom 6 ABC
Poster Session III . . . . .	4:00 p.m.-7:30 p.m. (Author Present between 6:00 p.m.-7:30 p.m.) Convention Center Ballroom 6 ABC
Vision II (3001-3009)	Metamemory/Metacognition II (3074-3086)
Action and Perception II (3010-3016)	Human Learning and Instruction II (3087-3101)
Spatial Memory (3017-3023)	Selective Attention III (3102-3114)
Social Aspects of Memory (3024-3034)	Discourse Processes I (3115-3124)
Recognition Memory (3035-3048)	Language Production/Writing I (3125-3134)
Cognitive Aging I (3049-3058)	Judgment/ Decision Making I (3135-3149)
Explicit Memory II (3059-3073)	Grant Funding Agencies (3150-3154)

### SATURDAY MORNING

Implicit Learning and Memory (131-135) . . . . .	8:00 a.m.-9:35 a.m., Metropolitan A
Social and Emotional Aspects of Attention (136-140) . . . . .	8:00 a.m.-9:35 a.m., Willow AB
Event Cognition (141-146) . . . . .	8:00 a.m.-9:55 a.m., Grand Ballroom C
Memory Models (147-151) . . . . .	8:00 a.m.-9:35 a.m., Grand Ballroom AB
Perception II (152-156) . . . . .	8:00 a.m.-9:35 a.m., Grand Ballroom D
Bilingualism (157-162) . . . . .	8:00 a.m.-9:55 a.m., Metropolitan B
Human Learning and Instruction II (163-168) . . . . .	10:00 a.m.-11:55 a.m., Grand Ballroom AB
Animal Learning and Cognition (169-173) . . . . .	10:20 a.m.-11:55 a.m., Metropolitan B
Task Switching (174-177) . . . . .	10:00 a.m.-11:15 a.m., Willow AB
Embodied Cognition (178-183) . . . . .	10:00 a.m.-11:55 a.m., Metropolitan A
Speech Perception I (184-190) . . . . .	10:00 a.m.-11:55 a.m., Grand Ballroom D
Judgment and Decision Making III (191-195) . . . . .	10:20 a.m.-11:55 a.m., Grand Ballroom C

### SATURDAY NOON

Poster Session IV . . . . .	10:30 a.m.-1:30 p.m. (Author Present between 12:00 p.m.-1:30 p.m.), Convention Center Ballroom 6 ABC
Action and Perception III (4001-4008)	Divided Attention (4085-4093)
Spatial Cognition III (4009-4013)	Cognitive Control III (4094-4102)
Associative Learning (4014-4020)	Letter/Word Processing II (4103-4113)
Face Processing and Memory (4021-4028)	Psycholinguistics III (4114-4121)
Explicit Memory II (4029-4044)	Discourse Processes II (4122-4131)
Working Memory II (4045-4056)	Language Production/Writing II (4132-4142)
Metamemory/Metacognition III (4057-4065)	Motor Control (4143-4145)
Selective Attention IV (4066-4084)	Grant Funding Agencies (4150-4154)

### SATURDAY AFTERNOON

Word Recognition (196-199) . . . . .	1:30 p.m.-2:45 p.m., Metropolitan A
Language Production (200-203) . . . . .	1:30 p.m.-2:45 p.m., Grand Ballroom D
Causal Reasoning (204-207) . . . . .	1:30 p.m.-2:45 p.m., Willow AB
Metamemory II (208-211) . . . . .	1:30 p.m.-2:45 p.m., Metropolitan B
Working Memory III (212-215) . . . . .	1:30 p.m.-2:45 p.m., Grand Ballroom C
SYMPOSIUM II:	
Wayfinding in the Seattle Public Library: What Can We Learn About Navigational Styles? (216-222) . . . . .	2:00 p.m.-4:10 p.m., Grand Ballroom AB
Letter and Word Processing II (223-226) . . . . .	3:10 p.m.-4:25 p.m., Metropolitan A
Psycholinguistics II (227-230) . . . . .	3:10 p.m.-4:25 p.m., Metropolitan B
Eyewitness Memory (231-234) . . . . .	3:10 p.m.-4:25 p.m., Grand Ballroom D
Reasoning and Problem Solving (235-238) . . . . .	3:10 p.m.-4:25 p.m., Willow AB
Visual Search (239-242) . . . . .	3:10 p.m.-4:25 p.m., Grand Ballroom C

### SATURDAY EVENING

Business Meeting . . . . .	4:30 p.m.-5:45 p.m., Grand Ballroom AB
NIH Funding Opportunities . . . . .	4:35 p.m.-4:55 p.m., Grand Ballroom AB
Presentation of APA Division 3 New Investigator Awards . . . . .	4:55 p.m.-5:15 p.m., Grand Ballroom AB
Business of the Psychonomic Society . . . . .	5:15 p.m.-5:45 p.m., Grand Ballroom AB
Hospitality . . . . .	5:30 p.m.-7:30 p.m., Convention Center Ballroom 6 ABC
Poster Session V. . . . .	4:00 p.m.-7:30 p.m. (Author Present between 6:00 p.m.-7:30 p.m.), Convention Center Ballroom 6 ABC
Action and Perception IV (5001-5009)	Cognitive Control IV (5079-5088)
Music Perception (5010-5013)	Letter/Word Processing III (5089-5098)
Event Cognition (5014-5024)	Concepts and Categories II (5099-5113)
Associative Learning II (5025-5032)	Bilingualism II (5114-5123)
Memory and Emotion (5033-5043)	Reasoning and Problem Solving (5124-5131)
Cognitive Aging II (5044-5053)	Judgment/ Decision Making II (5132-5147)
Explicit Memory IV (5054-5070)	Grant Funding Agencies (5150-5154)
Automatic Processing (5071-5078)	

### SUNDAY MORNING

Cognitive Control II (251-254) . . . . .	8:00 a.m.-9:15 a.m., Willow AB
Methodological and Analytical Innovations for Choice Tasks (255-258) . . . . .	8:00 a.m.-9:15 a.m., Grand Ballroom C
Concepts and Categories II (259-264) . . . . .	8:00 a.m.-9:55 a.m., Metropolitan A
Face Perception and Recognition (265-270) . . . . .	8:00 a.m.-9:55 a.m., Grand Ballroom D
Speech Perception II (271-275) . . . . .	8:00 a.m.-9:35 a.m., Metropolitan B
Explicit Memory III (276-279) . . . . .	8:00 a.m.-9:15 a.m., Grand Ballroom AB
Selective Attention II (280-284) . . . . .	10:20 a.m.-11:55 a.m., Metropolitan A
Action and Perception II (285-290) . . . . .	9:40 a.m.-11:35 a.m., Willow AB
Reading Processes (291-295) . . . . .	10:00 a.m.-11:35 a.m., Metropolitan B
Letters and Word Processing III (296-301) . . . . .	9:40 a.m.-11:35 a.m., Grand Ballroom C
Working Memory IV (302-306) . . . . .	10:20 a.m.-11:55 a.m., Grand Ballroom D
Cognitive Skill Acquisition (307-311) . . . . .	9:40 a.m.-11:35 a.m., Grand Ballroom AB

Date	Grand Ballroom AB	Grand Ballroom C	Grand Ballroom D
<b>Thursday Evening, November 3, 2011</b>	Keynote Address: Developing an Integrated Mind, Nora Newcombe 8:00 p.m.		
<b>Friday Morning, November 4, 2011</b>	Selective Attention I 8:00 a.m. - 9:15 a.m.  SYMPOSIUM I: Psychocinematics: Exploring Cognition at the Movies 9:45 a.m.-11:55 a.m.	Human Learning and Instruction I 8:00 a.m. - 9:35 a.m.  Working Memory I 10:00 a.m. - 11:55 a.m.	Recognition Memory 8:00 a.m. - 9:55 a.m.  Psycholinguistics I 10:20 a.m. - 11:55 a.m.
<b>Friday Afternoon, November 4, 2011</b>	Explicit Memory I 1:30 p.m. -3:25 p.m.  Explicit Memory II 3:50 p.m.-5:25 p.m.	Action and Perception I 1:30 p.m.-3:05 p.m.  Visual Attention 3:30 p.m. -5:25 p.m.	Animal Cognition 1:30 p.m.-3:05 p.m.  Perceptual Organization 3:30 p.m. - 5:05 p.m.
<b>Saturday Morning, November 5, 2011</b>	Memory Models 8:00 a.m.-9:35 a.m.  Human Learning and Instruction II 10:00 a.m.-11:55 a.m.	Event Cognition 8:00 a.m.-9:55 a.m.  Judgment and Decision Making III 10:20 a.m.-11:55 a.m.	Perception II 8:00 a.m.-9:35 a.m.  Speech Perception I 10:00 a.m.-11:55 a.m.
<b>Saturday Afternoon, November 5, 2011</b>	SYMPOSIUM II: Wayfinding in the Seattle Public Library: What Can We Learn About Navigational Styles? 2:00 p.m.-4:10 p.m.  Business Meeting 4:30 p.m.-5:45 p.m.	Working Memory III 1:30 p.m.-2:45 p.m.  Visual Search 3:10 p.m.-4:25 p.m.	Language Production 1:30 p.m.-2:45 p.m.  Eyewitness Memory 3:10 p.m.-4:25 p.m.
<b>Sunday Morning, November 6, 2011</b>	Explicit Memory III 8:00 a.m.-9:15 a.m.  Cognitive Skill Acquisition 9:40 a.m.-11:35 a.m.	Methodological and Analytical Innovations for Choice Tasks 8:00 a.m.-9:15 a.m.  Letter and Word Processing III 9:40 a.m.-11:35 a.m.	Face Perception and Recognition 8:00 a.m.-9:55 a.m.  Working Memory IV 10:20 a.m.-11:55 a.m.



Condensed Schedule B

Metropolitan A	Metropolitan B	Willow AB	Convention Center Ballroom 6 ABC
			Hospitality 5:30 p.m.-7:30 p.m.
			Poster Session I 6:00 p.m.-7:30 p.m.
Concepts and Categories I 8:00 a.m.-9:35 a.m.	Priming 8:00 a.m.-9:55 a.m.	Cognitive Control I 8:00 a.m.-9:35 a.m.	
Metamemory I 10:00 a.m.-11:55 a.m.	Reasoning and Judgment 10:20 a.m.-11:55 a.m.	Perception I 10:00 a.m.-11:55 a.m.	
			Poster Session II 12:00 noon-1:30 p.m.
Letter and Word Processing I 1:30 p.m.-3:25 p.m.	Spatial Cognition 1:30 p.m.-3:05 p.m.	Judgment and Decision Making I 1:30 p.m.-3:05 p.m.	
Working Memory II 3:50 p.m.-5:25 p.m.	Cognitive Aging 3:30 p.m.-5:25 p.m.	Judgment and Decision Making II 3:30 p.m.-5:25 p.m.	
			Hospitality 5:30 p.m.-7:30 p.m.
			Poster Session III 6:00 p.m.-7:30 p.m.
Implicit Learning and Memory 8:00 a.m.-9:35 a.m.	Bilingualism 8:00 a.m.-9:55 a.m.	Social and Emotional Aspects of Attention 8:00 a.m.-9:35 a.m.	
Embodied Cognition 10:00 a.m.-11:55 a.m.	Animal Learning and Cognition 10:20 a.m.-11:55 a.m.	Task Switching 10:00 a.m.-11:15 a.m.	
			Poster Session IV 12:00 noon-1:30 p.m.
Word Recognition 1:30 p.m.-2:45 p.m.	Metamemory II 1:30 p.m.-2:45 p.m.	Causal Reasoning 1:30 p.m.-2:45 p.m.	
Letter and Word Processing II 3:10 p.m.-4:25 p.m.	Psycholinguistics II 3:10 p.m.-4:25 p.m.	Reasoning and Problem Solving 3:10 p.m.-4:25 p.m.	Hospitality 5:30 p.m.-7:30 p.m.
			Poster Session V 6:00 p.m.-7:30 p.m.
Concepts and Categories II 8:00 a.m.-9:55 a.m.	Speech Perception II 8:00 a.m.-9:35 a.m.	Cognitive Control II 8:00 a.m.-9:15 a.m.	
Selective Attention II 10:20 a.m.-11:55 a.m.	Reading Processes 10:00 a.m.-11:35 a.m.	Action and Perception II 9:40 a.m.-11:35 a.m.	

**THURSDAY EVENING, NOVEMBER 3, 2011**

**6:00 P.M. - 7:30 P.M.**

**POSTER SESSION I (1001-1148), CONVENTION CENTER BALLROOM 6 ABC**

**Vision I**

(1001) Asano, Kadowaki, Yokosawa, Schloss, Palmer  
(1002) Friedenber, Spooner, Rivera, Wasilewski, McBride  
(1003) Lagroix, Yanko, Spalek, Read  
(1004) Higgins, Pomplun, Tran, Rayner  
(1005) Panis, Wagemans  
(1006) Wasserman, Soto

**Perception I**

(1007) Palomares, Smith, Pitts  
(1008) Orsten, Portillo, Pomerantz  
(1009) Roy-Charland, Boulard, Perron  
(1010) Yu, Kubovy  
(1011) Roye, Jacobsen, Schröger  
(1012) Vilinsky, Pastore  
(1013) Bennett, Giudice, Klatzky, Loomis  
(1014) Yokosawa, Nagai, Asano

**Action and Perception I**

(1015) Goldfarb, Simen, Caicedo, Holmes, Leonard, Cohen  
(1016) Buetti, Burra, Kerzel, de Gelder, Pegna  
(1017) Kahan, Schriger  
(1018) Ziat, Hayward, Servos, Ernst  
(1019) Stephen, Hajnal  
(1020) Yamamoto, Muschter

**Embodied Cognition**

(1021) Halvorson, Hazeltine  
(1022) Davoli, Brockmole, Goujon  
(1023) Buss, Wifall, Schoener, Hazeltine, Spencer  
(1024) Casteel  
(1025) Gagnon, Geuss, Rueckert, Stefanucci  
(1026) Faulkenberry  
(1027) Schuil, Coppens, Zwaan  
(1028) Bauernschmidt, Taylor, Karpicke

**Spatial Cognition I**

(1029) Rothlein, Chaisilprungraung, McCloskey  
(1030) Munger, Keller, Ness  
(1031) Riecke, Hastings  
(1032) Zhao, Warren  
(1033) Tarampi, Creem-Regehr, Bakdash, Thompson  
(1034) Wang, Taylor, Wolford, Brunyé  
(1035) Chrastil, Warren  
(1036) Kramer, Philbeck, Dopkins, Sargent  
(1037) Chen, McNamara  
(1038) Vecchi, Merabet, Monegato, Pece, Cattaneo

**Cognitive Skill Acquisition I**

(1039) Was  
(1040) Phillips, Braun, Workman, Horan, Schunn, Schneider  
(1041) Schwarb, McKinley, Nail, Sultan, Schumacher  
(1042) Kallai, Schunn, Fiez

(1043) Rattley  
(1044) Wilkins, Rawson  
(1045) Rubinsten  
(1046) Hagadone, Pereira, Miller, Cokely  
(1047) Jaeggi, Buschkuhl, Jonides  
(1048) Moore, Rudig, Ashcraft

**Explicit Memory I**

(1049) Carlson  
(1050) Deffler, Marsh, Brown  
(1051) Weatherford, Carlson  
(1052) Smith, Roediger  
(1053) Szpunar, Addis, Schacter  
(1054) Lyle, Cole  
(1055) Lohnas, Kahana  
(1056) Fogler, LaVoie

**Working Memory I**

(1057) Fernandes, Saunders  
(1058) Magnotti, Katz  
(1059) Anderson, Kludt, Bavelier  
(1060) Fischer-Baum, McCloskey  
(1061) Ricker, Cowan, Hebert  
(1062) Klein, Pavel  
(1063) Dickinson, Morin, Poirier  
(1064) Hays, Boals  
(1065) Rutherford, Mewaldt  
(1066) Glanc, Greene  
(1067) Jones, Farrell, Lewandowsky  
(1068) Loaiza, Hurford, McCabe, Rhodes

**Metamemory/Metacognition I**

(1069) LaVan, Pagano, Toppino  
(1070) Hines, Hertzog, Touron  
(1071) Lee, Thomas, Bulevich  
(1072) Clark, Myers, Link  
(1073) Kahan  
(1074) Tauber, Dunlosky  
(1075) Cook, Merritt, Lyle  
(1076) Isingrini, Perrotin, Souchay, Taconnat, Bouazzaoui  
(1077) Sitzman, Rhodes  
(1078) Soderstrom, McCabe

**Human Learning and Instruction I**

(1079) Garland, Sanchez  
(1080) Maloney, Waechter, Soliman, Risko, Fugelsang  
(1081) Clement, Atkins, Mann, Bond, Price, Neuschatz  
(1082) Birnbaum, Bjork, Bjork  
(1083) Clark, Bjork, Bjork  
(1084) Olson, Carpenter  
(1085) Butler, Dennis, Marsh  
(1086) Clark, Bjork  
(1087) Meyer, Logan  
(1088) Kang, Lindsey, Mozer, Pashler

**Selective Attention I**

- (1089) Lee, Mather
- (1090) Anderson, Risko, Bischof, Kingstone
- (1091) Mills, Van der Stigchel, Hollingworth, Dodd
- (1092) Pitts, Martinez, Hillyard
- (1093) Parmentier, Ljungberg
- (1094) Ljungberg, Parmentier
- (1095) Schneider, Weeks, Hillyard, McDonald
- (1096) Vo, Smith, Henderson
- (1097) Ghirardelli, Marcus, Cosgrove-Davies, Lawson, Matthews
- (1098) Gozli, Pratt
- (1099) Wang, Satel, Klein
- (1100) Dixon
- (1101) Kunar, Watson
- (1102) Antonelli, Williams

**Cognitive Control I**

- (1103) Hall-Ruiz, Dagenbach
- (1104) Jones, Bai, Moss, Doane
- (1105) Worsham, Jennings, Dagenbach
- (1106) Tapp, Logan
- (1107) Nestojko, Schilling, Storm
- (1108) Nestojko, Bjork, Bjork
- (1109) Hakun, Ravizza
- (1110) Weldon, Sohn

**Speech Perception**

- (1111) Wasylyshyn
- (1112) Olsen, Connine
- (1113) Gordon, Ancheta
- (1114) Viswanathan, Dorsi, George
- (1115) Hunter, Luce
- (1116) Flaherty, Sawusch
- (1117) Apfelbaum, McMurray
- (1118) Geer, Luce

**Psycholinguistics I**

- (1119) Yee, Lupyan, Thompson-Schill
- (1120) Lai, Poletiek
- (1121) Toscano, Anderson, McMurray
- (1122) Weingartner, Eiter, Brown, Gorfein
- (1123) Angele, Slattery, Chaloukian, Schotter, Rayner
- (1124) Li, Lin, Jiang
- (1125) Scaltritti, Peressotti
- (1126) Plummer, Rayner
- (1127) Patson, George, Warren

**Concepts and Categories I**

- (1128) Austerweil, Griffiths
- (1129) Dumesnil, Cousineau
- (1130) Treat, Viken, Farris, Smith
- (1131) Tullis, Benjamin, Ross
- (1132) Higgins, Ross
- (1133) Giguere, Love
- (1134) Lacroix, Howell
- (1135) Higgins, Ross
- (1136) Carvalho, Goldstone
- (1137) Jung, Hummel

**Letter and Word Processing I**

- (1138) Bennett, Burnett, Siakaluk, Pexman
- (1139) Yates
- (1140) Angele, Tran, Rayner
- (1141) Park-Diener, Simpson
- (1142) Zhao, Gupta
- (1143) Dimitropoulou, Carreiras, Duñabeitia
- (1144) Tat, Azuma
- (1145) Rauwerda, Robidoux, Besner, Max
- (1146) Desroches, Europa, McNorgan, Minas, Booth
- (1147) Brooks, Sailor
- (1148) Still, Morris, Jones

**FRIDAY MORNING, NOVEMBER 4, 2011**  
**8:00 A.M. - 11:55 A.M.**  
**SPOKEN SESSIONS (1-130)**

**Concepts and Categories I (1-5), Metropolitan A**

8:00 a.m.-8:15 a.m.	Love, Giguère
8:20 a.m.-8:35 a.m.	Dunn, Newell, Kalish
8:40 a.m.-8:55 a.m.	Kurtz, Levering
9:00 a.m.-9:15 a.m.	Hayes, Heit
9:20 a.m.-9:35 a.m.	Sloutsky, Deng

**Human Learning and Instruction I (6-10), Grand Ballroom C**

8:00 a.m.-8:15 a.m.	Whitten, Rabinowitz, Whitten
8:20 a.m.-8:35 a.m.	Casale, Pashler
8:40 a.m.-8:55 a.m.	Carvalho, Goldstone
9:00 a.m.-9:15 a.m.	McMurray, Apfelbaum, Hazeltine
9:20 a.m.-9:35 a.m.	Chariker, Naaz, Pani

**Priming (11-16), Metropolitan B**

8:00 a.m.-8:15 a.m.	Christianson, Luke
8:20 a.m.-8:35 a.m.	Perea, Comesaña, Soares, Moret-Tatay
8:40 a.m.-8:55 a.m.	Forster, Wu
9:00 a.m.-9:15 a.m.	Lupker, Acha, Davis, Perea
9:20 a.m.-9:35 a.m.	Andrews, Lo
9:40 a.m.-9:55 a.m.	Morris, Still

**Cognitive Control I (17-21), Willow AB**

8:00 a.m.-8:15 a.m.	Kan, Teubner-Rhodes, Drummey, Novick
8:20 a.m.-8:35 a.m.	Strobach, Frensch, Müller, Schubert
8:40 a.m.-8:55 a.m.	Bertenthal, Boyer
9:00 a.m.-9:15 a.m.	Verbruggen, Adams, Chambers
9:20 a.m.-9:35 a.m.	Kiesel, Waszak, Pfister

**Selective Attention I (22-25), Grand Ballroom AB**

8:00 a.m.-8:15 a.m.	Soetens, Henderickx, Deroost, Maetens
8:20 a.m.-8:35 a.m.	Klein, Hilchey, Wang
8:40 a.m.-8:55 a.m.	Dalton, Fraenkel
9:00 a.m.-9:15 a.m.	Curby, Goldstein, Blacker

**Recognition Memory (26-31), Grand Ballroom D**

8:00 a.m.-8:15 a.m.	Mewhort, Johns, Gerriets, Gabler
8:20 a.m.-8:35 a.m.	Humphreys
8:40 a.m.-8:55 a.m.	Craik, Rose, Gopie
9:00 a.m.-9:15 a.m.	Cox, Shiffrin
9:20 a.m.-9:35 a.m.	Criss, Malmberg, Shiffrin
9:40 a.m.-9:55 a.m.	Chechile

**SYMPOSIUM I: Psychocinematics: Exploring Cognition at the Movies, (32-37), Grand Ballroom AB**

9:45 a.m.-9:50 a.m.	Shimamura
9:50 a.m.-10:10 a.m.	Shimamura

10:15 a.m.-10:35 a.m.	Smith
10:40 a.m.-11:00 a.m.	Zacks, Magliano
11:05 a.m.-11:25 a.m.	Levin, Hymel
11:30 a.m.-11:50 a.m.	Cutting, Brunick, Iricinschi, Candan, Delong

**Perception I (38-43), Willow AB**

10:00 a.m.-10:15 a.m.	Bridgeman, Bacon
10:20 a.m.-10:35 a.m.	Witt, Sugovic
10:40 a.m.-10:55 a.m.	Matsukura, Vecera
11:00 a.m.-11:15 a.m.	Depowski, Flynn, Baart, Bortfeld
11:20 a.m.-11:35 a.m.	Wu, Lin, Chang, Tzeng
11:40 a.m.-11:55 a.m.	Norman, Bartholomew

**Psycholinguistics I (44-48), Grand Ballroom D**

10:20 a.m.-10:35 a.m.	Traxler, Foss, Zirnstein
10:40 a.m.-10:55 a.m.	de Vries, Geukes, Zwitserlood, Petersson, Christiansen
11:00 a.m.-11:15 a.m.	Lowder, Gordon
11:20 a.m.-11:35 a.m.	Chen, O'Seaghdha, Liang, Huang
11:40 a.m.-11:55 a.m.	Campbell, Raney

**Metamemory I (49-54), Metropolitan A**

10:00 a.m.-10:15 a.m.	Bernstein, Aujla, Erdfelder, Peria
10:20 a.m.-10:35 a.m.	Higham, Neil, Bernstein
10:40 a.m.-10:55 a.m.	Buchanan, Maki
11:00 a.m.-11:15 a.m.	Mitchum, Kelley
11:20 a.m.-11:35 a.m.	Weinstein, Roediger
11:40 a.m.-11:55 a.m.	Hertzog, Fulton, Sinclair, Dunlosky

**Working Memory I (55-60), Grand Ballroom C**

10:00 a.m.-10:15 a.m.	Logie, Trawley, Law
10:20 a.m.-10:35 a.m.	Franklin, Swets, Ring, Wright, Greenstein, Viccellio, Plataras
10:40 a.m.-10:55 a.m.	Pecher
11:00 a.m.-11:15 a.m.	Redick, Hambrick, Shipstead, Harrison, Hicks, Engle
11:20 a.m.-11:35 a.m.	Gibson, Gondoli, Johnson, Steeger, Morrissey
11:40 a.m.-11:55 a.m.	Morey, Morey, van der Reijden, Holweg

**Reasoning and Judgment (61-65), Metropolitan B**

10:20 a.m.-10:35 a.m.	Reyna, Wilhelms, Brust, Sui, Pardo
10:40 a.m.-10:55 a.m.	Luhmann
11:00 a.m.-11:15 a.m.	Kusev, van Schaik, Juliusson, Kiley
11:20 a.m.-11:35 a.m.	Rehder
11:40 a.m.-11:55 a.m.	Taylor

**FRIDAY NOON, NOVEMBER 4, 2011**

**12:00 noon - 1:30 p.m.**

**POSTER SESSION II (2001-2144), CONVENTION CENTER BALLROOM 6 ABC**

**Perception II**

- (2001) Alards-Tomalín, Leboe, Leboe-McGowan
- (2002) Overvliet, Wagemans, Krampe
- (2003) Abney, Wagman
- (2004) Yildiz, Özsaltık, Güclü
- (2005) Boltz
- (2006) Kanaya, Matsushima, Yokosawa
- (2007) Wilson, Barath

**Spatial Cognition II**

- (2008) Musseler, Tiggelbeck
- (2009) Tosun, Vaid
- (2010) Mou, Nankoo, Spetch
- (2011) Doyle, Voyer
- (2012) Schmitz, May
- (2013) Sturz, Eastman, Bodily
- (2014) Blasko, Hodge

**Cognitive Skill Acquisition II**

- (2015) Meier
- (2016) Anderson, Healy, Schneider, Barshi
- (2017) Schneider, Healy, Barshi
- (2018) Colzato, Band, Hommel
- (2019) Ingvalson, Wong

**Eyewitness Memory**

- (2020) Dobolyi, Dodson
- (2021) Terrell
- (2022) Mickes, Hwe, Carlisle, McElfresh, Wixted
- (2023) Holliday, Humphries
- (2024) Slaten, Hinze, Horton, Rapp
- (2025) Gerrie, Huthwaite, Haigh, Majer
- (2026) Parra, Weaver
- (2027) Kohlhepp, Rapp
- (2029) Chrobak, Groves

**Recognition Memory**

- (2030) Muntean, Kimball
- (2031) Bancroft, Hockley
- (2032) Quamme, Tremble, Rhodes
- (2033) Koen, Kroll, Yonelinas
- (2034) Picker, Parks
- (2035) McCullough, Yonelinas
- (2036) Hemmer, Criss, Wyble
- (2037) Sheridan, Reingold
- (2038) Kostic, Cleary
- (2039) Singer
- (2040) Pazzaglia, Staub, Rotello
- (2041) Guerin, Robbins, Gilmore, Schacter
- (2042) Henkel

**Implicit Learning and Memory**

- (2043) Imai, Ishii
- (2044) Johnson, Chiarella
- (2045) Wang, Yonelinas
- (2046) Mathis, Kahan
- (2047) Merrill, Yang

**Working Memory I**

- (2048) Goolkasian, Yarbrough
- (2049) Mathias, Palmer, Pfordresher, Anderson
- (2050) Sengupta, Verhaeghen, Hearons
- (2051) Zhang, Yonelinas
- (2052) McCormick, Healy
- (2053) Tsubomi, Fukuda, Vogel
- (2054) Kool, Conway, Turk-Browne
- (2055) Elliott, Barideaux, Briganti
- (2056) Anderson, Vogel, Awh
- (2057) Minear, Brasher
- (2058) Ruppel, Purdy
- (2059) Lurquin, Miyake
- (2060) Harrison, Engle
- (2061) Lloyd, Hartman, Miller

**Testing Effects**

- (2062) Grison, Luke, Shigeto, Watson
- (2063) Peterson, Mulligan, Ornstein
- (2064) Callender, Roberts
- (2065) Vaughn, Rawson, Dunlosky
- (2066) Pu, Tse
- (2067) Pierce, Willhite, McMinn
- (2068) Coppens, Schuil, Van Strien, Verkoeijen, Rikers
- (2069) Putnam, Roediger
- (2070) Nairne, VanArsdall, Pandeirada, Blunt
- (2071) Rowland, DeLosh
- (2072) Blunt, Karpicke

**Selective Attention II**

- (2073) Burnham, Kim, Bruno
- (2074) Kitchell, Parada, Emerick, Busey
- (2075) Tan, Wyble
- (2076) Nakashima, Maeda, Yoshikawa, Matsuda, Miki, Yokosawa
- (2077) Graham, Johnson, MacKay, Burke
- (2078) Block, Manley
- (2079) van Lamsweerde, Beck, Lohrenz, Tran
- (2080) Buttaccio, Hahn, Lange
- (2081) Onyper, Searleman, Derby
- (2082) Newman, Sears
- (2083) Prinzmetal, Rokem, Silver
- (2084) Yanko, Spalek

**Cognitive Control II**

(2085) Dowman, Carey, Dorchies  
(2086) Reimer, Radvansky, Lorsbach, Armendarez  
(2087) Forrest, Monsell, McLaren  
(2088) Braem, Verguts, Roggeman, Notebaert  
(2089) Stevens, Johnson, Carlson  
(2090) Rieter, Miyake  
(2091) van't Wout, Monsell  
(2092) Weywadt, Butler  
(2093) Zakrzewski, Church, Smith  
(2094) Sakaki, Gorlick, Mather  
(2095) Lawrence, Johnson, Klein  
(2096) Hutcheon, Spieler  
(2097) Risko  
(2098) Dreisbach, Wenke

**Speech Perception II**

(2099) Szostak, Pitt  
(2100) Kaakinen, Hyona  
(2101) Jesse, Janse  
(2102) Kim, Bradlow  
(2103) Farris-Trimble, McMurray  
(2104) Trude, Duff, Brown-Schmidt  
(2105) Alexander, Blankenship, Mills  
(2106) Kempe, Thoresen, Kirk, Brooks, Schaeffler  
(2107) Bowles, Silbert, Jackson, Doughty  
(2108) Kirkby, Pye, Riddell, Liversedge

**Psycholinguistics II**

(2109) Brouwer, Bradlow  
(2110) Belanger, Mayberry, Slattery, Rayner  
(2111) Leininger, Rayner  
(2112) Ledoux, Brothers, Gordon  
(2113) Chen, Tseng, Chen  
(2114) Brothers, Ledoux, Gordon

(2115) Battinich, Levine  
(2116) Benatar, Clifton, Staub  
(2117) Caplan, Levy, Vancelette, Michaud  
(2118) Sanvido, de Rose, Chen

**Bilingualism I**

(2119) Luo, Sullivan, Latman, Bialystok  
(2120) Tse, Altarriba  
(2121) Prior  
(2122) Weissberger, Gollan, Wierenga, Bondi  
(2123) Tare, Linck  
(2124) Shook, Marian, Krizman, Kraus  
(2126) Nakayama, Sears, Hino, Kusunose, Lupker  
(2127) Presson, MacWhinney  
(2128) Ben-Artzi, Grossman, Babkoff

**Reasoning and Problem Solving**

(2129) Chin, Fu, Stine-Morrow  
(2130) Park, Kim  
(2131) Berens, Berens, Smaliy, George, Cook, Haarmann  
(2132) Guillemette, Blanchette  
(2133) Pennycook, Trippas, Handley, Thompson  
(2134) Anderson  
(2135) Smith, Huber, Vul  
(2136) Markant, Gureckis

**Animal Cognition and Learning**

(2137) Perdue, Snyder, Maple  
(2138) Grant  
(2139) Santi, Simmons, Mischler  
(2140) Nakajima  
(2141) Bell  
(2142) Sumra, Ghaznavi, Stahlman  
(2143) Sawa, Murota, Miyata  
(2144) Miguez, Cham, Miller

**FRIDAY AFTERNOON, NOVEMBER 4, 2011**  
**1:30 P.M. - 5:25 P.M.**  
**SPOKEN SESSIONS (66-130)**

**Animal Cognition (66-70), Grand Ballroom D**

1:30 p.m.-1:45 p.m.	Brown, Bisbing, Sayde, Batterman
1:50 p.m.-2:05 p.m.	Crystal, Zhou, Alford
2:10 p.m.-2:25 p.m.	Wong, Blaisdell
2:30 p.m.-2:45 p.m.	Kirkpatrick, Clarke, Cain
2:50 p.m.-3:05 p.m.	Parameswaran, Gallant, Tavorieri, Cohen

**Action and Perception I (71-75), Grand Ballroom C**

1:30 p.m.-1:45 p.m.	McAuley, Nave, Walters, Wiggins
1:50 p.m.-2:05 p.m.	Witt, Brockmole
2:10 p.m.-2:25 p.m.	Mitroff, Appelbaum, Schroeder, Cain
2:30 p.m.-2:45 p.m.	Gong, Rosenbaum
2:50 p.m.-3:05 p.m.	Wright, Acosta

**Judgment and Decision-Making I (76-80), Willow AB**

1:30 p.m.-1:45 p.m.	Wang, Wang
1:50 p.m.-2:05 p.m.	White, Poldrack
2:10 p.m.-2:25 p.m.	Whitney, Hinson, Rosen
2:30 p.m.-2:45 p.m.	Scheibehenne, Rieskamp, Wagenmakers
2:50 p.m.-3:05 p.m.	Stevens

**Spatial Cognition (81-85), Metropolitan B**

1:30 p.m.-1:45 p.m.	Kozhevnikov, Zhong
1:50 p.m.-2:05 p.m.	Roskos, McKeen
2:10 p.m.-2:25 p.m.	Taylor, Hutton
2:30 p.m.-2:45 p.m.	Wedell, Hutcheson
2:50 p.m.-3:05 p.m.	Wang

**Letter and Word Processing I (86-91), Metropolitan A**

1:30 p.m.-1:45 p.m.	McCloskey, Wilson, Fischer-Baum, Mathis, Glasser, Ghodasara
1:50 p.m.-2:05 p.m.	Morris, Grainger, Holcomb
2:10 p.m.-2:25 p.m.	Finkbeiner
2:30 p.m.-2:45 p.m.	Keuleers, Lacey, Rastle, Brysbaert
2:50 p.m.-3:05 p.m.	Grieve, Tehan
3:10 p.m.-3:25 p.m.	Armony-Sivan, Galanti, Elijah, Elazar, Erel, Babkoff

**Explicit Memory I (92-97), Grand Ballroom AB**

1:30 p.m.-1:45 p.m.	Roediger, Sanches, Agarwal
1:50 p.m.-2:05 p.m.	Abel, Bauml
2:10 p.m.-2:25 p.m.	MacLeod, Pottruff, Forrin
2:30 p.m.-2:45 p.m.	Patterson, Low
2:50 p.m.-3:05 p.m.	Uttl, McDouall, Leonard
3:10 p.m.-3:25 p.m.	Peterson, Mulligan

**Visual Attention (98-103), Grand Ballroom C**

3:30 p.m.-3:45 p.m.	Horowitz
3:50 p.m.-4:05 p.m.	Di Lollo
4:10 p.m.-4:25 p.m.	Tsal, Avital
4:30 p.m.-4:45 p.m.	Sawaki, Luck
4:50 p.m.-5:05 p.m.	van Zoest, Hickey
5:10 p.m.-5:25 p.m.	Vroomen, Schellekens

**Perceptual Organization (104-108), Grand Ballroom D**

3:30 p.m.-3:45 p.m.	Hillstrom, Scholey, Wakefield, Tull
3:50 p.m.-4:05 p.m.	Moore, Skow, Lanagan-Leitzel, Attarha
4:10 p.m.-4:25 p.m.	Long, Batterman
4:30 p.m.-4:45 p.m.	Poljac, de-Wit, Wagemans
4:50 p.m.-5:05 p.m.	Cragin, Sparck, Pomerantz

**Judgment and Decision-Making II (109-114), Willow AB**

3:30 p.m.-3:45 p.m.	Wolfe, Fisher
3:50 p.m.-4:05 p.m.	Eidels, Williams
4:10 p.m.-4:25 p.m.	Joslyn, Savelli
4:30 p.m.-4:45 p.m.	Shanteau
4:50 p.m.-5:05 p.m.	Katsikopoulos, Schooler, Hertwig
5:10 p.m.-5:25 p.m.	Pleskac

**Working Memory II (115-119), Metropolitan A**

3:50 p.m.-4:05 p.m.	Camos, Corbin
4:10 p.m.-4:25 p.m.	Service, Ferrari, Palladino
4:30 p.m.-4:45 p.m.	Tolan, Lusic, Tehan
4:50 p.m.-5:05 p.m.	AuBuchon, Cowan
5:10 p.m.-5:25 p.m.	Farrell, Oberauer, Greaves, Pasiecznik, Lewandowsky, Jarrold

**Cognitive Aging (120-125), Metropolitan B**

3:30 p.m.-3:45 p.m.	Naveh-Benjamin, Chen
3:50 p.m.-4:05 p.m.	Ballesteros, Julia, Reales, Sebastián, Toril,
4:10 p.m.-4:25 p.m.	Forstmann, Tittgemeyer, Wagenmakers, Derrfuss, Imperati, Brown
4:30 p.m.-4:45 p.m.	Sutherland, Mather
4:50 p.m.-5:05 p.m.	Fostick, Babkoff
5:10 p.m.-5:25 p.m.	Brainerd, Reyna, Kenney, Gross, Taub

**Explicit Memory II (126-130), Grand Ballroom AB**

3:50 p.m.-4:05 p.m.	Chalmers,
4:10 p.m.-4:25 p.m.	Broder, Schütz, Rohrmeier
4:30 p.m.-4:45 p.m.	Wixted, Mickes
4:50 p.m.-5:05 p.m.	Hintzman
5:10 p.m.-5:25 p.m.	Garcia-Marques, Garrido, Hamilton, Ferreira



**FRIDAY EVENING, NOVEMBER 4, 2011**

**6:00 P.M. - 7:30 P.M.**

**POSTER SESSION III (3001-3149), CONVENTION CENTER BALLROOM 6 ABC**

**Vision II**

- (3001) Chubb, Wright, Shamshiri, Wang
- (3002) Kaiser, Adelstein, McCann, Beutter, Anderson
- (3003) Glaholt, Rayner, Reingold
- (3004) Angelone, Beck, Levin
- (3005) Fisk, Haase
- (3006) Ross, Deroche, Palmeri
- (3007) Steele, Thorstenson, Sugg, Gurgainous, Stecher, Putnam
- (3008) Papenmeier, Huff, Schwan
- (3009) Ferguson, Homa, Saed

**Action and Perception II**

- (3010) Koch, Broughal
- (3011) Hsu
- (3012) Pruitt, Pfordresher
- (3013) Bloesch, Davoli, Roth, Brockmole, Abrams
- (3014) Creekmur, Vu
- (3015) Vinson, Jordan
- (3016) Livingstone, Palmer, Wanderley, Thompson

**Spatial Memory**

- (3017) Han, Becker
- (3018) Kelly, Sturz
- (3019) Varner, Dopkins
- (3020) Greenauer, Mello, Avraamides, Kelly
- (3021) Richard, Waller
- (3022) Marchette, Yerramsetti, Shelton
- (3023) Thrash, Waller

**Social Aspects of Memory**

- (3024) Harada, Kitagami, Miyashiro, Takahashi, Suto
- (3025) Handy, Angello, Nichols, Smith
- (3026) Toglia, Wilde, Leedy
- (3027) Eslick, Marsh
- (3028) Albuquerque, Carvalho, Oliveira, Capeloi
- (3029) Kole, Healy
- (3030) Greenstein, Franklin, Martins, Maier
- (3031) Thomas, McBride, Zimmerman
- (3032) Coane, Caron, Broder
- (3033) Kelley, Reysen, Ahlstrand, Pentz
- (3034) Rush, Clark

**Recognition Memory**

- (3035) Starns, Hicks
- (3036) Kantner, Lindsay
- (3037) Papesh, Goldinger
- (3038) Ryals, Cleary
- (3039) Lanska, Olds, Westerman
- (3040) Selmeczy, Dobbins
- (3041) Huff, Bodner
- (3042) Alban, Kelley
- (3043) Oakes, Yee, Osborne

- (3044) Collins, Armstrong, Burggraf, Boucher
- (3045) Jang, Mickes, Wixted
- (3046) Voskuilen, Intermaggio, Ratcliff
- (3047) Watson, Blair, Kozik, Akins, Enns
- (3048) Dube, Starns, Rotello, Ratcliff

**Cognitive Aging I**

- (3049) Frank, Touron, Hertzog
- (3050) Kelly, Smith
- (3051) Shin, Simmons
- (3052) Umanath, Marsh
- (3053) Endo
- (3054) Moser, Einstein, Mullet
- (3055) Gerlach, Dornblaser, Schacter
- (3056) Blumen, Stern
- (3057) Hughes, Miller, Geraci
- (3058) Aslan, Bäuml

**Explicit Memory II**

- (3059) Landon, Kimball, Mann
- (3060) Arndt, Hyatt, Dethier, Whitaker, Hommel, Boxwala
- (3061) Eraltan, Mungan
- (3062) Thomas, McDaniel
- (3063) Morton, Polyn
- (3064) Kilic, Criss, Howard
- (3065) Aue, Criss
- (3066) Kim, Johnson
- (3067) Johnson
- (3068) Ball, DeWitt, Knight, Brewer
- (3069) Martin, Hicks
- (3070) Lourenco, Maylor
- (3071) Toga
- (3072) Pyc, Balota, McDermott, Roediger
- (3073) St. Jacques, Schacter

**Metamemory/Metacognition II**

- (3074) Kuhlmann, Rummel, Touron
- (3075) Nichols, Smith
- (3076) Brown, Croft
- (3077) Reid, Eakin
- (3078) Huelser, Metcalfe
- (3079) Michael, Sungkhasettee, Castel
- (3080) Miele, Son
- (3081) Meacham, Berry, Barr, Cash, Youngblood, Price
- (3082) Cohen, Halamish, Bjork
- (3083) McGillivray, Castel
- (3084) Kornell
- (3085) Miller, Geraci
- (3086) Litke, Toppino

**Human Learning and Instruction II**

(3087) Palmer-Landry, Christianson  
(3088) Grounds, Bassok  
(3089) Wagner Cook, Duffy, Fenn  
(3090) Fazio, Barber, Rajaram, Ornstein, Marsh  
(3091) Grimaldi, Poston, Karpicke  
(3092) Little, Bjork  
(3093) Bies-Hernandez, Snyder, Copeland  
(3094) Ackerman  
(3095) Arnold, McDermott  
(3096) Brusnighan, Folk  
(3097) Nokes, Levine, Belenky, Gadgil  
(3098) Flores, Serra, Marsh  
(3099) Erickson, Estep  
(3100) Williams, Lombrozo  
(3101) Smith, Gentner

**Selective Attention III**

(3102) Jefferies, Yantis  
(3103) Vogt, De Houwer, Liefoghe  
(3104) Avital, Tsal  
(3105) Max, Tsal  
(3106) Dodd, Mills  
(3107) Chisholm, Bischof, Kingstone  
(3108) Farshid, Katz, McGlynn, Barker  
(3109) Gaspar, Jannati, McDonald  
(3110) Jannati, Wright, McDonald  
(3111) Lahav, Tsal  
(3112) Anderson, Laurent, Yantis  
(3113) Leonard, Luck  
(3114) Savine, Livingston, Braver

**Discourse Processes I**

(3115) Gunawan, Copeland, Schroeder, Bies-Hernandez  
(3116) Centeno, Khanna  
(3117) Bohn-Gettler, Daniel, Mueller, McGee  
(3118) Iseki, Kusumi  
(3119) Wolfe, Kurby, Taylor  
(3120) Moss  
(3121) Sparks, Kendeou, Senior, Rapp  
(3122) Liu, Fox Tree  
(3123) Shears, Sorenson, Ung, Green, Baker, McGowan  
(3124) Daniel, Collins, Phillips, Mockler, Sawh

**Language Production/Writing I**

(3125) Kacinik, El-Haddad, Rodriguez  
(3126) Paucke, Oppermann, Jescheniak  
(3127) Berlove, Goldberg  
(3128) Geng, Schnur  
(3129) White, Frame, Abrams  
(3130) Farrell, Abrams, White  
(3131) Kawamoto, Liu, von Moos  
(3132) Kutta, Kaschak  
(3133) Schotter, Ferreira, Rayner  
(3134) Pardo, Jordan, Mallari, Scanlon, Lewandowski, Ode

**Judgment/Decision Making I**

(3135) Eerland, Zwaan  
(3136) Hotaling, Busemeyer, Shiffrin  
(3137) Michael, Newman, Kantner, Bernstein, Lindsay, Garry  
(3138) Ketels, Healy, Wickens, Buck-Gengler, Bourne  
(3139) Gross, Bayen  
(3140) Hoffmann, von Helversen, Rieskamp  
(3141) Vickery, Kleinman, Zhang, Lee, Chun  
(3142) Vachon, Hervet, Tremblay  
(3143) Hawthorne, Tochkov  
(3144) Ozuru, Kaufman, Doggett  
(3145) Cousineau, Laurencelle  
(3146) von Helversen, Karlsson, Rasch, Rieskamp  
(3147) Balci, Simen, deSouza  
(3148) Fabre, Pesciarelli, Cacciari  
(3149) Lachter, Corrado, Johnston, McClelland

## SATURDAY, NOVEMBER 5, 2011

8:00 A.M. - 11:55 A.M.

## SPOKEN SESSIONS (131-195)

**Implicit Learning and Memory (131-135),****Metropolitan A**

8:00 a.m.-8:15 a.m.	Jamieson
8:20 a.m.-8:35 a.m.	Glicksohn, Cohen
8:40 a.m.-8:55 a.m.	Muntean, Kimball
9:00 a.m.-9:15 a.m.	Hyman, Burland, Duskin, Gotz, Cook, Roundhill
9:20 a.m.-9:35 a.m.	Hall, Garcia, Gonzalez

**Social and Emotional Aspects of Attention (136-140),****Willow AB**

8:00 a.m.-8:15 a.m.	Most, Kennedy
8:20 a.m.-8:35 a.m.	Blanchette, Langlois
8:40 a.m.-8:55 a.m.	Kristjánsson, Óladóttir, Most
9:00 a.m.-9:15 a.m.	van Steenberghe, Band, Rombouts, Nieuwenhuis, Hommel
9:20 a.m.-9:35 a.m.	Cole, Smith, Billing

**Event Cognition (141-146), Grand Ballroom C**

8:00 a.m.-8:15 a.m.	Radvansky, Tamplin, Krawietz, Thompson
8:20 a.m.-8:35 a.m.	Kersten
8:40 a.m.-8:55 a.m.	Altmann, Hindy, Kalenik, Kamide, Joergensen, Thompson-Schill
9:00 a.m.-9:15 a.m.	Harvey, Twyman, Speekenbrink
9:20 a.m.-9:35 a.m.	Harris, Peoples, Willimon
9:40 a.m.-9:55 a.m.	Gulgoz, Oztop

**Memory Models (147-151), Grand Ballroom AB**

8:00 a.m.-8:15 a.m.	Polyn, Kragel, McCabe, McCluey, Morton
8:20 a.m.-8:35 a.m.	Schneider, Anderson
8:40 a.m.-8:55 a.m.	Nosofsky, Denton
9:00 a.m.-9:15 a.m.	Ratcliff, Starns
9:20 a.m.-9:35 a.m.	Jang, Wallsten, Huber

**Perception II (152-156), Grand Ballroom D**

8:00 a.m.-8:15 a.m.	Hubbard, Ruppel
8:20 a.m.-8:35 a.m.	Castelhano
8:40 a.m.-8:55 a.m.	Huff, Schwan
9:00 a.m.-9:15 a.m.	Palmer, Langlois, Tsang, Schloss, Levitin
9:20 a.m.-9:35 a.m.	Liu, Church, Mercado

**Bilingualism (157-162), Metropolitan B**

8:00 a.m.-8:15 a.m.	Paap, Imai, Urtecho, Alcaine, Keenan
8:20 a.m.-8:35 a.m.	Tuninetti, Tokowicz, Warren
8:40 a.m.-8:55 a.m.	Schwartz, Areas Da Luz Fontes
9:00 a.m.-9:15 a.m.	Duyck, Lagrou, Hartsuiker
9:20 a.m.-9:35 a.m.	Frenck-Mestre, Carrasco, Elisa
9:40 a.m.-9:55 a.m.	Frost, Narkiss, Afek, Siegelman

**Human Learning and Instruction II (163-168),****Grand Ballroom AB**

10:00 a.m.-10:15 a.m.	Spirgel, Delaney
10:20 a.m.-10:35 a.m.	Sahakyan, Hendricks
10:40 a.m.-10:55 a.m.	Carpenter
11:00 a.m.-11:15 a.m.	Baggett, Ehrenfeucht, Main
11:20 a.m.-11:35 a.m.	Logan, Avci
11:40 a.m.-11:55 a.m.	Bouwmeester, Verkoeijen

**Animal Learning and Cognition (169-173),****Metropolitan B**

10:20 a.m.-10:35 a.m.	Cook, Qadri
10:40 a.m.-10:55 a.m.	Katz, Magnotti, Wright
11:00 a.m.-11:15 a.m.	Beran, Evans, Bramlett, McIntyre, Addressi, Paglieri
11:20 a.m.-11:35 a.m.	Sanabria, Mazur
11:40 a.m.-11:55 a.m.	Miller, Miguez, Laborda, McConnell, Polack

**Task Switching (174-177), Willow AB**

10:00 a.m.-10:15 a.m.	Mayr, Kuhns, Berns
10:20 a.m.-10:35 a.m.	van't Wout, Lavric, Monsell
10:40 a.m.-10:55 a.m.	Stoet, O'Connor, Conner
11:00 a.m.-11:15 a.m.	Vandierendondck, Liefvooghe

**Embodied Cognition (178-183), Metropolitan A**

10:00 a.m.-10:15 a.m.	Pexman, Hargreaves, Leonard, Siakaluk, Goodyear
10:20 a.m.-10:35 a.m.	Reed, Brekke, Leland, Hartley
10:40 a.m.-10:55 a.m.	Tversky
11:00 a.m.-11:15 a.m.	McBeath, Miller, Zautra
11:20 a.m.-11:35 a.m.	Senkfor
11:40 a.m.-11:55 a.m.	Lu, Kosito, Kotturu, Bailey

**Speech Perception I (184-190), Grand Ballroom D**

10:00 a.m.-10:15 a.m.	Rastle, McCormick, Bayliss, Davis
10:20 a.m.-10:35 a.m.	Sidaras, Nygaard
10:40 a.m.-10:55 a.m.	Remez, Thomas, Dubowski, Koinis, Porter, Paddu
11:00 a.m.-11:15 a.m.	Sanders, Astheimer
11:20 a.m.-11:35 a.m.	Staub, Abbott
11:40 a.m.-11:55 a.m.	Mattys, Stefansdottir

**Judgment and Decision-Making III (191-195),****Grand Ballroom C**

10:20 a.m.-10:35 a.m.	Wilke, von Helversen, Johnson
10:40 a.m.-10:55 a.m.	Usher, Tsestos
11:00 a.m.-11:15 a.m.	Marewski, Schooler
11:20 a.m.-11:35 a.m.	McClelland, Usher, Gao
11:40 a.m.-11:55 a.m.	Stevenson, Gim

**SATURDAY NOON, NOVEMBER 5, 2011**

**12:00 NOON - 1:30 P.M.**

**POSTER SESSION IV (4001-4145), CONVENTION CENTER BALLROOM 6 ABC**

**Action and Perception III**

- (4001) Vandeberg, Zwaan
- (4002) Liepelt, Stenzel, Chinellato, Tirado Bou, del Pobil, Lappe
- (4003) Pfister, Janczyk, Heinemann, Thomaschke, Kiesel
- (4004) Haering, Nolden, Kiesel
- (4005) Wifall, Hazeltine
- (4006) Boeckler, Knoblich, Sebanz
- (4007) Chen, Proctor
- (4008) Miles, Proctor

**Spatial Cognition III**

- (4009) Dopkins, Pyoun
- (4010) Gozli, Chasteen, Pratt
- (4011) Carlson, Skubic, Miller, Huo, Li
- (4012) Matlock, Matthews
- (4013) Brunye, Gagnon, Gardony, Noordzij, Mahoney, Taylor

**Associative Learning**

- (4014) Otsuka, Nishiyama, Nakahara, Kawaguchi
- (4015) Walker, Fowler, Simonyi, Schachtman
- (4016) Ruenger, Gaschler, Ashby
- (4017) Walk, Conway
- (4018) Barenholtz, Heine
- (4019) Patterson, Stevens, Naliboff, Craske, Fanselow, Knowlton
- (4020) Ece-Usta, Gulgoz

**Face Processing and Memory**

- (4021) Garrett, Stanford, Sanders, Anastasi
- (4022) Knuycky, Cavrak, Kleider
- (4023) Quinlan, Taylor
- (4024) Hourihan, Fraundorf, Benjamin
- (4025) Andre, Niziurski
- (4026) Blagrove, Watson
- (4027) Jung, Gaspelin, Keller, Ruthruff
- (4028) Laidlaw, Risko, Kingstone

**Explicit Memory II**

- (4029) Higgins, Johnson, Johnson
- (4030) Cary
- (4031) Wahlheim, Jacoby
- (4032) Cardwell, Newman, Foster, Henkel, Garry
- (4033) Berger
- (4034) Fujita
- (4035) Fraundorf, Benjamin
- (4036) Nunes, Sommers, Garcia-Marques, Marques
- (4037) Azad, Lindsay, Brimacombe
- (4038) Rummel, Meiser
- (4039) Ingram, Hwe, McElfresh, Wixted
- (4040) Pastötter, Bäuml
- (4041) Elowe, Mam-Lam-Fook, Berna, Bacon, Vidailhet

- (4042) Jones, Pyc
- (4043) Horton
- (4044) Tobin, Grondin

**Working Memory II**

- (4045) Shipstead, Engle
- (4046) Gade, Druey, Oberauer
- (4047) Atkins, Harbison, Dougherty
- (4048) Davies, Myerson, Hale
- (4049) Meier, Kane
- (4050) Morrison, Conway, Chein
- (4051) Davies, Myerson, Hale
- (4052) Marstaller, Burianová
- (4053) Gustavson, Miyake
- (4054) Alexander, Miyake
- (4055) Huang, Holt
- (4056) Basak, Basu Mallick, Pierre

**Metamemory/Metacognition III**

- (4057) England, Serra
- (4058) Ariel
- (4059) Coburn, Bernstein
- (4060) Murayama, Kitagami
- (4061) Jaeger, Wiley
- (4062) Chiappe
- (4063) Boomer, Couchman, Beran, Smith
- (4064) Newman, Azad, Garry, Lindsay, Grimshaw
- (4065) Yue, Bjork, Castel, Bjork

**Selective Attention IV**

- (4066) Lien, Noesen, Ruthruff
- (4067) Hickey, Van der Burg, Theeuwes
- (4068) Naylor, Lien, Irons, Remington
- (4069) Koch, Lawo, Fels, Vorländer
- (4070) Park, Jung, Cho
- (4071) Llamas, Haerich
- (4072) Botella, Privado, Lillo, Suero
- (4073) Nasiopoulos, Foulsham, Risko, Kingstone
- (4074) Lee, Shomstein
- (4075) Stephan, Koch
- (4076) Tse, Tse, Siu
- (4077) Inukai, Kawahara
- (4078) Anderson, Folk
- (4079) Yamaoka, Michimata
- (4080) Lee, Kim, Cho
- (4081) Thomas, Risom, Lien, Ruthruff, Lachter
- (4082) Johnson, MacKay
- (4083) Plant, Turner
- (4084) Wu, Remington, Folk

**Divided Attention**

- (4085) Seymour, McQueen
- (4086) Ouellet, Viau-Quesnel, Gaudreault, Ellefsen  
Gauthier, Fortin
- (4087) Huestegge, Koch
- (4088) Stokes, Arnell
- (4089) Kawahara
- (4090) Becker, Ravizza
- (4091) Maquestiaux, Ruthruff, Didierjean, Hartley
- (4092) Medeiros-Ward, Sanbonmatsu, Watson, Strayer
- (4093) Khoja, Lien, Ruthruff

**Cognitive Control III**

- (4094) Weaver, Reiman, Arrington
- (4095) Faust, Multhaup, Levons, Abdelnabi, Barakzai, Ross
- (4096) Hughes, Hurlstone, Marsh, Vachon, Jones
- (4097) Kuhns, Viale, Mayr
- (4098) Duthoo, Wuhr, Notebaert
- (4099) Hydock, Sohn
- (4100) Plessow, Fischer, Kirschbaum, Goschke
- (4101) Miller, Strayer, Logan
- (4102) Metzack, Meier, Graf, Woodward

**Letter/Word Processing III**

- (4103) Burgund, Kamps
- (4104) Houpt, Townsend
- (4105) Vergara-Martínez, Perea, Nittur, Swaab
- (4106) Madec, Rey, Courrieu, Grainger
- (4107) James, Oberle
- (4108) Blythe, Liang, Zang, Wang, Yan, Bai, Liversedge
- (4109) Zeelenberg, Bocanegra, Pecher
- (4110) Ferrand, Augustinova
- (4111) Winward, Hutchison, Thomas, Neely
- (4112) Juhasz, Schotter, Rayner
- (4113) Felton, Vazquez, Leonard, Chiarello

**Psycholinguistics III**

- (4114) Cohen-Shikora, Balota
- (4115) Mulatti, Peressotti, Job
- (4116) Hall, Ferreira, Mayberry
- (4117) Partridge, Paap
- (4118) Hammarlund, McDonald
- (4119) Ratiu, Azuma
- (4120) Morett, MacWhinney
- (4121) Rossi, Dussias, Kroll

**Discourse Processes II**

- (4122) Apel, Cangelosi, Ellis, Goslin, Fischer
- (4123) Love
- (4124) Autry, Levine
- (4125) Jones, Hubbard, Swindell, Langston
- (4126) Stiegler-Balfour, Wells
- (4127) Foy, Bezdek, Gerrig
- (4128) Harward, Cook
- (4129) Hussey, Bowes, Leith
- (4130) Loan, Dale
- (4131) Baese-Berk

**Language Production/Writing II**

- (4132) Jescheniak, Oppermann, Schriefers, Klaus, Berwig
- (4133) Oppermann, Jescheniak, Gorges
- (4134) DiBattista, Pearlmutter
- (4135) Heller, Goldrick
- (4136) Wardlow Lane
- (4137) Yoon, Brown-Schmidt
- (4138) Gillespie, Pearlmutter
- (4139) Schmader, Horton
- (4140) Riordan, Kreuz
- (4141) Riordan
- (4142) Faizal, Treiman

**Motor Control**

- (4143) Crump, Logan
- (4144) Kohl
- (4145) Coelho, Rosenbaum, Studenka

**SATURDAY AFTERNOON, NOVEMBER 5, 2011**  
**1:30 P.M. - 4:25 P.M.**  
**SPOKEN SESSIONS (196-242)**

**Word Recognition (196-199), Metropolitan A**

1:30 p.m.-1:45 p.m. Taft  
 1:50 p.m.-2:05 p.m. Allen, Lien, Crawford  
 2:10 p.m.-2:25 p.m. Carreiras, Molinaro, Monahan,  
 Helenius, Duñabeitia  
 2:30 p.m.-2:45 p.m. Besner, O'Malley

**Language Production (200-203), Grand Ballroom D**

1:30 p.m.-1:45 p.m. O'Seaghdha, Frazer  
 1:50 p.m.-2:05 p.m. Gollan, Slaterry, Goldenberg, Van  
 Assche, Duyck, Rayner  
 2:10 p.m.-2:25 p.m. Meyer, Konopka  
 2:30 p.m.-2:45 p.m. Morin, Uttl, Hamper

**Causal Reasoning (204-207), Willow AB**

1:30 p.m.-1:45 p.m. Taylor, Ahn  
 1:50 p.m.-2:05 p.m. Wolff, Ritter, Holmes  
 2:10 p.m.-2:25 p.m. Waldmann, Mayrhofer, Meder  
 2:30 p.m.-2:45 p.m. Spellman, Gilbert, Tenney,  
 Holland

**Metamemory II (208-211), Metropolitan B**

1:30 p.m.-1:45 p.m. Metcalfe  
 1:50 p.m.-2:05 p.m. Bodner, Taikh  
 2:10 p.m.-2:25 p.m. Castro, Wasserman  
 2:30 p.m.-2:45 p.m. Shimamura, Elman

**Working Memory III (212-215), Grand Ballroom C**

1:30 p.m.-1:45 p.m. Vogel, Fukuda  
 1:50 p.m.-2:05 p.m. Barrouillet, Lucidi  
 2:10 p.m.-2:25 p.m. Lehman, Malmberg  
 2:30 p.m.-2:45 p.m. Schweickert, Xi, Viau-Quesnel,  
 Yamaguchi, Fortin

**SYMPOSIUM II: Wayfinding in the Seattle Public  
 Library: What Can We Learn About Navigational Styles  
 (216-222), Grand Ballroom AB**

2:00 p.m.-2:10 p.m. Carlson, Shelton  
 2:10 p.m.-2:30 p.m. Spiers  
 2:30 p.m.-2:50 p.m. Uttal, Yuan  
 2:50 p.m.-3:10 p.m. Hölscher, Dalton, Brösamle  
 3:10 p.m.-3:30 p.m. Carlson  
 3:30 p.m.-3:50 p.m. Shelton  
 3:50 p.m.-4:10 p.m. Hegarty

**Letter and Word Processing II (223-226),  
 Metropolitan A**

3:10 p.m.-3:25 p.m. Burgess, Estep  
 3:30 p.m.-3:45 p.m. Gorfein, Brown, Schweinle  
 3:50 p.m.-4:05 p.m. Hutchison, Balota, Neely, Cortese,  
 Cohen-Shikora, Yap, Tse  
 4:10 p.m.-4:25 p.m. Rey, Courrieu, Madec, Grainger

**Psycholinguistics II (227-230), Metropolitan B**

3:10 p.m.-3:25 p.m. Yi, Koenig, Mauner  
 3:30 p.m.-3:45 p.m. Burke, Erspamer, Graham  
 3:50 p.m.-4:05 p.m. Pollatsek, Bertram, Hyönä  
 4:10 p.m.-4:25 p.m. Tan, Martin, Van Dyke

**Eyewitness Memory (231-234), Grand Ballroom D**

3:10 p.m.-3:25 p.m. Thomas, Bulevich, Gordon  
 3:30 p.m.-3:45 p.m. Loftus, Wells, Stahl  
 3:50 p.m.-4:05 p.m. Gronlund, Clark, Carlson,  
 Goodsell  
 4:10 p.m.-4:25 p.m. Steyvers, Beckage

**Reasoning and Problem Solving (235-238), Willow AB**

3:10 p.m.-3:25 p.m. Chambers, Revlin  
 3:30 p.m.-3:45 p.m. Reinholz, Clark, Ranney  
 3:50 p.m.-4:05 p.m. Petrov, Hayes, Sederberg  
 4:10 p.m.-4:25 p.m. Kershaw, Speer, Ames

**Visual Search (239-242), Grand Ballroom C**

3:10 p.m.-3:25 p.m. Wolfe  
 3:30 p.m.-3:45 p.m. Hollingworth, Matsukura  
 3:50 p.m.-4:05 p.m. Stroud, Menneer, Kaplan, Cave,  
 Donnelly  
 4:10 p.m.-4:25 p.m. Mozer, Pashler, Jones, Lindsey

**SATURDAY EVENING, NOVEMBER 5, 2011**  
**4:30 P.M. - 5:45 P.M.**  
**BUSINESS MEETING, GRAND BALLROOM AB**

**JOHN GLOWA, *BEHAVIOR AT NIH'S OBSSR AND NCCAM***  
**JEREMY WOLFE, *PRESENTATION OF APA DIVISION 3 NEW INVESTIGATOR AWARDS***  
**REED HUNT, *BUSINESS OF THE PSYCHONOMIC SOCIETY***

**6:00 P.M. - 7:30 P.M.**  
**POSTER SESSION V (5001-5147), CONVENTION CENTER BALLROOM 6 ABC**

**Action and Perception IV**

- (5001) Sutter, Müsseler, Schuch
- (5002) Dolk, Liepelt, Hommel, Prinz
- (5003) van der Wel, Knoblich, Sebanz
- (5004) Beasley, Kraus, Pfordresher
- (5005) Ladwig, Sutter, Müsseler
- (5006) Chrysikou, Thompson-Schill
- (5007) Kim, Cambara, Crogman, Kwon, Lai
- (5008) Yang
- (5009) Isham, Banks

**Music Perception**

- (5010) Chiu, Kung, Wu, Hung, Tzeng
- (5011) Stark, Wear
- (5012) MacLean, Blundon, Ward
- (5013) Refaat, Lamberts

**Event Cognition**

- (5014) Okubo, Kobayashi, Ishikawa
- (5015) Sargent, Zacks, Hambrick, Zacks, Eisenberg, Beck
- (5016) Kurby, Zacks
- (5017) Uzer, Lee, Brown
- (5018) Rich, Zaragoza
- (5019) Svob, Brown, Uzer, Lee
- (5020) Otani, Kusumi, Naka, Kato, Migita, Ohta
- (5021) Buetti, Mereu, Lleras
- (5022) Marche, Patkau-Ceh, Briere
- (5023) Behmer, Fournier
- (5024) Herbst, van der Meer, Busch

**Associative Learning II**

- (5025) Simone, Bell
- (5026) Livesey, Satkunarajah
- (5027) Foraker
- (5028) Suzuki, Honma, Suga
- (5029) Nashiro, Lin, Sakaki, Mather
- (5030) Buchanan, Valentine
- (5031) Matsuda, Nakagaki, Kusumi
- (5032) Pauli, Jones

**Memory and Emotion**

- (5033) Gomes, Stein, Brainerd
- (5034) Wear
- (5035) Choi, Kensinger, Rajaram
- (5036) Sekiguchi, Nonaka
- (5037) Nabeta
- (5038) Karam, Lane, Vieira, Butler, Fisher
- (5039) Finn, Roediger
- (5040) Schmidt
- (5041) Oates, Peynircioglu, Hohman
- (5042) Grondin, Bisson, Désautels, Laflamme
- (5043) Bailey, West

**Cognitive Aging II**

- (5044) Chung, Lin
- (5045) Barber, Mather
- (5046) Cyr, Anderson
- (5047) Bangert, Balota
- (5048) Oztekin, Güngör, Badre
- (5049) Jackson, Balota, Duchek, Head
- (5050) Vibert, Boucard, Ros, Bugaiska, Clarys, Jean-Francois
- (5051) Chin, Morrow, Stine-Morrow, Gao, Conner-Garcia, Graulich
- (5052) Ben-Artzi, Grossman, Babkoff
- (5053) Jones, Kaschak

**Explicit Memory IV**

- (5054) Huff, Davis, Meade
- (5055) Crutcher
- (5056) Saunders, Fernandes, Williams
- (5057) Butler, Franks
- (5058) Koppel, Wilson, Jobe, Storm
- (5059) Maddox, Balota
- (5060) Angello, Storm, Bjork, Smith, Yamauchi
- (5061) de Jonge, Tabbers, Rikers
- (5062) Bui, McDonough, Friedman, Castel, Myerson
- (5063) Taconnat, Bouazzaoui, Isingrini, Fay
- (5064) Briere, Marche, Hellsten
- (5065) Lorsche, Reimer, Friehe
- (5066) Lehman, Malmberg
- (5067) Thompson, Taylor
- (5068) Settle, Clawson, Fritsch, Sebrechts
- (5069) Scarf, Gross, Colombo, Hayne
- (5070) Coane, Huff, Hutchison, Blais, Grasser



**Automatic Processing**

(5071) Boyer, Atagi, Bertenthal  
(5072) Tokita, Ishiguchi  
(5073) Marrington, Tolan, de la Piedad Garcia  
(5074) Nishimura, Michimata  
(5075) Stanyar, Merriitt, Sinclair, McCubbin, Cook  
(5076) Yamaguchi, Logan, Li  
(5077) Levin, Tzelgov  
(5078) Wan

**Cognitive Control IV**

(5079) Fischer, Hommel  
(5080) Reiman, Weaver, Arrington  
(5081) Olk, Peschke, Hilgetag  
(5082) Lee, Kim, Cho  
(5083) Altamirano, Gustavson, Johnson, Whisman, Miyake  
(5084) Lenartowicz, Berkman, Poldrack, Knowlton  
(5085) Matzke, Dolan, Logan, Brown, Wagenmakers  
(5086) Bissett, Logan  
(5087) Healey, Ngo, Hasher  
(5088) Benson, Castelhana, Au-Yeung, Rayner

**Letter/Word Processing III**

(5089) Grossi  
(5090) Johnson, Staub, Fleri  
(5091) Law, Su, Mak  
(5092) Yap, Sibley, Balota, Ratcliff, Rueckl  
(5093) Bicknell, Levy  
(5094) Kim, Lee  
(5095) Yang, Rayner  
(5096) Adelman, Sabatos-DeVito, Marquis  
(5097) Schock, Cortese, Yap  
(5098) Jones, Ashby

**Concepts and Categories II**

(5099) Fadler, Lee, Scullin, Cahill, Shelton, McDaniel  
(5100) Clapper  
(5101) Matsuka, Kiyokawa, Honda  
(5102) McDonnell, Gureckis  
(5103) Gagne, Spalding  
(5104) Jones, Foster, Cañas  
(5105) Barr, Maloney, Ansari, Stolz, Fugelsang  
(5106) Shanks, Marsh  
(5107) Martin, Rehder  
(5108) Chen, Murphy, Ross  
(5109) Blok, Harbison, Haarmann, Bloodgood  
(5110) Prabhakaran, Green, Gray  
(5111) Bohil  
(5112) Zivot, Cohen, Kapucu  
(5113) Zaki, Kleinschmidt

**Bilingualism II**

(5114) Pelham, Abrams  
(5115) Linck, Schweiter, Sunderman  
(5116) Pyers, Magid, Emmorey, Gollan  
(5117) Bogulski, Kroll  
(5118) McClain, Guo, Chen, Kroll  
(5119) Teubner-Rhodes, Mishler, Corbett, Sanz-Torrent, Trueswell, Novick  
(5120) Bovee, Morgan-Short, Brill, Raney  
(5121) Schroeder, Marian, Shook, Bartolotti, Chabal  
(5122) Friesen, Rakoczy, Bialystok  
(5123) Vaid, Lopez, Tosun

**Reasoning and Problem Solving**

(5124) Blanc-Goldhammer, Cohen  
(5125) Best  
(5126) Scholz, Mehlhorn, Krems  
(5127) De Alwis, Hale, Myerson  
(5128) Kiyokawa, Hayashi, Matsuka  
(5129) Macnamara, Glucksberg, Conway  
(5130) Salas, Griffin  
(5131) Cushen, Wiley

**Judgment/Decision-Making II**

(5132) Freedman, Broadbent, Francek, Lynch, Gengler  
(5133) McCoy, Wieth  
(5134) Price, Fairchild  
(5135) Nakamura, Yamagishi  
(5136) Worthy, Otto, Maddox  
(5137) Brashier, Multhaup  
(5138) Galotti, Tandler  
(5139) McNair, Feeney  
(5140) Otto, Knox, Davis, Markman, Love  
(5141) Atchley, Hadlock, Lane  
(5142) Hawkins, Brown, Steyvers, Wagenmakers  
(5143) LeClerc, Joslyn  
(5144) Trueblood, Busemeyer  
(5145) Thierman, Sher, McKenzie  
(5146) Cavrak, Knuycky, Kleider  
(5147) Misuraca, Teuscher, Dandeneau, Fryman  
(5148) Spaniol, Wegier

**SUNDAY MORNING, NOVEMBER 6, 2011****8:00 A.M. - 11:55 A.M.****SPOKEN SESSIONS (251-311)****Cognitive Control II (251-254), Willow AB**

8:00 a.m.-8:15 a.m.	Dutilh, Vandekerckhove, Forstmann, Keuleers, Brysbaert, Wagenmakers
8:20 a.m.-8:35 a.m.	Bugg, Hutchison
8:40 a.m.-8:55 a.m.	Logan, Miller, Strayer
9:00 a.m.-9:15 a.m.	Alario, Ostrand, Thoenig, Burle

**Methodological and Analytical Innovations for Choice Tasks (255-258), Grand Ballroom C**

8:00 a.m.-8:15 a.m.	Franco-Watkins, Johnson
8:20 a.m.-8:35 a.m.	Johnson, Koop
8:40 a.m.-8:55 a.m.	Glöckner, Jekel, Fiedler
9:00 a.m.-9:15 a.m.	Fific, Rieskamp

**Concepts and Categories II (259-264), Metropolitan A**

8:00 a.m.-8:15 a.m.	Wills, Longmore, Milton
8:20 a.m.-8:35 a.m.	Mathy, Feldman
8:40 a.m.-8:55 a.m.	Little, Sewell
9:00 a.m.-9:15 a.m.	Rabinowitz, Fialkov, Jackson
9:20 a.m.-9:35 a.m.	Ell, Hutchinson, McCoy
9:40 a.m.-9:55 a.m.	Heit, Nicholson

**Face Perception and Recognition (265-270), Grand Ballroom D**

8:00 a.m.-8:15 a.m.	Carbon
8:20 a.m.-8:35 a.m.	Mestry, Menneer, Wenger, Donnelly
8:40 a.m.-8:55 a.m.	Shyi, Chuan
9:00 a.m.-9:15 a.m.	Prince, Heathcote
9:20 a.m.-9:35 a.m.	Jones, Wang, Graham
9:40 a.m.-9:55 a.m.	Bartlett, Meltzer, Arduengo

**Speech Perception II (271-275), Metropolitan B**

8:00 a.m.-8:15 a.m.	Schechter, Goldrick
8:20 a.m.-8:35 a.m.	Mitterer, Kim, Cho
8:40 a.m.-8:55 a.m.	Bradlow, Brouwer
9:00 a.m.-9:15 a.m.	Samuel, Kraljic
9:20 a.m.-9:35 a.m.	Dumay, Bowers

**Explicit Memory III (276-279), Grand Ballroom AB**

8:00 a.m.-8:15 a.m.	Storm, Angello, Bjork
8:20 a.m.-8:35 a.m.	McLaren, McLaren, Longmore, Monsell
8:40 a.m.-8:55 a.m.	Laurent, Viennet, Mathy
9:00 a.m.-9:15 a.m.	Brewer, Grunfeld, Camp, Baxter, McBeath, Bimonte-Nelson

**Selective Attention II (280-284), Metropolitan A**

10:20 a.m.-10:35 a.m.	Cosman, Vecera
10:40 a.m.-10:55 a.m.	Potter, Wyble, McCourt

11:00 a.m.-11:15 a.m.	Wyble, Folk, Potter
11:20 a.m.-11:35 a.m.	Theeuwes, Van der Burg
11:40 a.m.-11:55 a.m.	McDonald, Hull

**Action and Perception II (285-290), Willow AB**

9:40 a.m.-9:55 a.m.	Kenning, Jordan, Cutting, Clinton, Durtschi
10:00 a.m.-10:15 a.m.	Durgin, Li
10:20 a.m.-10:35 a.m.	Krampe
10:40 a.m.-10:55 a.m.	Enns, Chapman, Gallivan
11:00 a.m.-11:15 a.m.	Reppa, Saunders, Worth
11:20 a.m.-11:35 a.m.	Mordkoff

**Reading Processes (291-295), Metropolitan B**

10:00 a.m.-10:15 a.m.	Liversedge, Wang, Tian, Han, Paterson
10:20 a.m.-10:35 a.m.	Pugh, Preston, Landi, Mencl, Seidenberg, Frost
10:40 a.m.-10:55 a.m.	Drieghe, Fitzsimmons
11:00 a.m.-11:15 a.m.	Bedo, Ribary, Ward
11:20 a.m.-11:35 a.m.	Inhoff, Seymour, Laubrock, Cajar

**Letters and Word Processing III (296-301), Grand Ballroom C**

9:40 a.m.-9:55 a.m.	Kinoshita, Norris
10:00 a.m.-10:15 a.m.	Rothlein, Rapp
10:20 a.m.-10:35 a.m.	Cohen, Warren, Blanc- Goldhammer
10:40 a.m.-10:55 a.m.	Murray, McKague
11:00 a.m.-11:15 a.m.	Tamminen, Merkx, Davis, Rastle
11:20 a.m.-11:35 a.m.	Feldman, O'Connor, Bostwick

**Working Memory IV (302-306), Grand Ballroom D**

10:20 a.m.-10:35 a.m.	Oberauer, Chris, Simon, Stephan
10:40 a.m.-10:55 a.m.	Saiki
11:00 a.m.-11:15 a.m.	Wright, Katz, Ma
11:20 a.m.-11:35 a.m.	Awah, Ester, Anderson, Vogel
11:40 a.m.-11:55 a.m.	Rose, Craik, Buchsbaum

**Cognitive Skill Acquisition (307-312), Grand Ballroom AB**

9:40 a.m.-9:55 a.m.	Kehoe, Yeung, Wood
10:00 a.m.-10:15 a.m.	Stein, Tzeng, Hernandez
10:20 a.m.-10:35 a.m.	Eiriksdottir, Catrambone
10:40 a.m.-10:55 a.m.	Francis, Johnson, Anderson
11:00 a.m.-11:15 a.m.	Linck, Jackson, Silbert, Tare, Bowles, Bunting
11:20 a.m.-11:35 a.m.	Clark

**Concepts and Categories I****Metropolitan A, Friday Morning, 8:00-9:35***Chaired by Bradley C. Love, University of Texas at Austin***8:00-8:15 (1)**

**Idealized Training in Noisy Situations Improves Generalization.** BRADLEY C. LOVE and GYSLAIN GIGUÈRE, *University of Texas at Austin*—Many real-world learning and classification problems involve mastering subtle and noisy distinctions. For example, predicting the winner of a baseball game is challenging due to numerous interactions and inherent noise in outcomes. One common approach in machine learning to reduce overfitting and boost performance (i.e., generalization) on novel test items is to use regularization methods that effectively smooth the training data. One research question is whether human performance can be boosted by effectively regularizing (i.e., idealizing) the training set. In the first two studies, participants learned and were tested on perceptual categories. Idealization was manipulated across conditions in terms distribution variance and feedback type. In the third study, participants predicted the outcome of actual baseball games after training on either actual or idealized game results. In all three studies, participants performed better on generalization tests (involving actual items) when trained on idealized items than on actual items.

Email: Bradley C. Love, [bradley.c.love@gmail.com](mailto:bradley.c.love@gmail.com)**8:20-8:35 (2)**

**The Effect of Feedback Delay and Type on Perceptual Category Learning: Challenges for Multiple-System Accounts.** JOHN C. DUNN, *University of Adelaide*, BEN R. NEWELL, *University of New South Wales*, MICHAEL KALISH, *University of Louisiana at Lafayette*—Evidence that learning rule-based (RB) and information-integration (II) category structures can be dissociated across different variables has been used to support the view that such learning is supported by multiple learning systems. Experiments 1 and 2 confirmed that feedback delay dissociated the learning of RB and II category structures and also met the state-trace criteria for the involvement of multiple latent variables. The same experiments did not confirm a similar effect for feedback type. Experiments 3 and 4 demonstrated that when the similarity of the categorized stimulus to the mask filling the interval between a participant's response and the provision of feedback was reduced, by using a fixed pattern mask, feedback delay did not dissociate RB and II learning and the state-trace criteria were no longer met. These results pose important challenges to models of category learning and we discuss their implications for multiple learning system models and their alternatives.

Email: Ben R. Newell, [ben.newell@unsw.edu.au](mailto:ben.newell@unsw.edu.au)**8:40-8:55 (3)**

**Eliciting Generative Versus Discriminative Modes of Human Category Learning.** KENNETH J. KURTZ, *Binghamton University (SUNY)*, KIMERY LEVERING—Models and theories of category learning have been designed primarily to explain human performance on supervised classification learning tasks. Following a distinction made in the machine learning literature, we note that the traditional laboratory classification task invites a discriminative, as opposed to a generative, mode of category learning. We expect that human category learning, more broadly construed, has a more generative basis. In the present experiments, traditional classification is contrasted with two variations expected to induce more generative learning: supervised observational learning and supervised classification with co-presentation of a same-category comparison item. In order to measure sensitivity to information not necessary for discrimination, categories are defined by a simple unidimensional rule with a second dimension that is less diagnostic. Compared to classification learners, observation and comparison learners were significantly more sensitive to the distributional properties of both the highly diagnostic dimension and the less diagnostic dimension (though classification accuracy at test did not differ). These results offer implications for how categories are learned and challenge leading models.

Email: Kenneth J Kurtz, [kkurtz@binghamton.edu](mailto:kkurtz@binghamton.edu)**9:00-9:15 (4)**

**Flexible Similarity in Inductive Reasoning and Recognition Memory.** BRETT K. HAYES, *University of New South Wales*, EVAN HEIT, *University of California, Merced*—Two experiments examined the relationship between recognition and inductive reasoning involving multiple forms of similarity. A common study set (members of a conjunctive category) was followed by a test set containing old and new category members, as well as items that matched the study set on only one dimension. In recognition, participants memorized study instances and responded positively at test to old items. In induction, a novel property was attached to study items and participants were asked to respond positively to test items that shared this property. The nature of the inductive property varied across conditions. Overall there was a strong relationship between positive responses in recognition and induction, even when meaningful properties were used for induction ( $r = 0.85$ ). When there was no time pressure, patterns of positive responding were strongly affected by property type, indicating that different types of similarity were driving recognition and induction. By comparison, speeded recognition and induction judgments showed weaker property effects and could be explained by generalization based on single similarity metric.

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9:20-9:35 (5)

**The Role of Category Labels in Categorization and Induction.** VLADIMIR M. SLOUTSKY and WEI (SOPHIA) DENG, *Ohio State University*—How do words affect generalization and how do these effects change with development? According to one theoretical position, even early in development linguistic labels are category markers and, as such, they differ from other features. According to another view, labels start out as features, but they may become category markers in the course of development. This issue was addressed in two experiments with 4- to 5-year-olds and adults. In both experiments, participants were presented with either a categorization or induction task and the category label was either consistent with a highly salient feature or was pitted against it. Results indicated that children uniformly relied on the salient feature; whereas, many adults relied on the category label. These results suggest that early in development, labels are no more than features, but they may become category markers in the course of development.

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**Human Learning and Instruction I**  
**Grand Ballroom C, Friday Morning, 8:00-9:35**  
*Chaired by William B. Whitten II, Fordham University*

8:00-8:15 (6)

**Effects of Performing Versus Reading Guided Cognition Tasks on Learning Mathematics.** WILLIAM B. WHITTEN II, MITCHELL RABINOWITZ and SANDRA E. WHITTEN, *Fordham University*—Guided Cognition (GC) improves learning from homework by structuring study tasks to engage students in specific, observable cognitive events that elicit underlying cognitive processes. We identified cognitive events that occur in classrooms and have correlates in the experimental literature, then designed some into homework. Previously, we reported that GC homework improved seventh-grade students' abilities to interpret and work story problems, and also to execute calculations for non-story problems, and that these improvements persisted for six months. In the current experiment, seventh-grade students worked story problems (condition T), or worked story problems and read worked-out samples of GC tasks (condition GC). On a three-day delayed quiz, GC homework improved seventh-grade students' abilities to interpret and work story problems, but did not improve their performance on calculations for non-story problems. A five-month delayed quiz showed no GC advantage. Clearly, extensive and longer-lasting GC benefits require performing tasks, not just reading worked-out samples.

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8:20-8:35 (7)

**Enhancing Perceptual Category Learning through Attentional Control.** MICHAEL CASALE and HAL PASHLER, *Univ of Calif., San Diego* (Read by Hal Pashler)—Category learning research has thus far yielded little practical advice about how people can be most efficiently trained in perceptual categorization. We describe several lines of experiments assessing the effects of interventions designed to focus attention on relevant features, dimensions, or prototypes. Interventions explored here include verbal coaching of various kinds, deliberately exaggerating differences between categories ("fading"), and introducing additional predictor dimensions not expected to be present in test stimuli. Learning was assessed using transfer tests requiring subjects to categorize new exemplars after varying time intervals. Theoretical as well as practical implications will be discussed.

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8:40-8:55 (8)

**Stimulus Similarity Relations Modulate Benefits for Blocking and Interleaving During Category Learning.** PAULO F. CARVALHO and ROBERT L. GOLDSTONE, *Indiana University* (Read by Robert L Goldstone)—Both teachers and learners would like to know how to sequentially present examples of contrasting categories to maximize learning. Previous results have been mixed, with some studies showing a benefit for grouping together examples belonging to a category (blocking), but other studies showing a benefit for sequentially presenting examples belonging to different categories (interleaving). Goldstone (1996) argued that blocking promotes within-category comparisons, which are particularly important when the properties common to all members of a category are hard to detect, whereas interleaving promotes cross-category comparisons, which are important when it is hard to detect features that serve to discriminate between categories. To test this hypothesis, we manipulated the similarity relations among objects to be categorized, and either changed the category of the presented object frequently (75% of the time) or rarely (25%). When all objects were relatively dissimilar, an advantage of blocked over interleaved presentation was found for transfer of category learning. When they were similar, an advantage of interleaved over blocked presentation was found. Implications for education and models of category learning will be discussed.

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9:00-9:15 (9)

**Statistical Learning and Phonics in a Laboratory/Classroom Paradigm: Variability Helps.** BOB MCMURRAY, KEITH S. APFELBAUM and RICHARD E. HAZELTINE, *University of Iowa*—Cognitive science has long studied topics like statistical learning and word reading that could have important implications for education. However, there is ambiguity in linking laboratory studies and computational models to classroom applications. For example, work in statistical learning shows benefits for highly variable stimuli and highly similar stimuli. This study examines this conflict in the context of learning to read. We distilled early phonics acquisition into a short-term classroom-based learning study using a computer-based phonics teaching tool. 225 first grade students were trained over three days on a set of phonics rules (short vowels and digraph vowels) using various tasks. These tasks used word sets with either a large degree of overlap in consonantal frames (similar words) or little overlap in consonants (variable words). Students exposed to variable words outperformed those learning similar words, and this generalized to new words and tasks using these rules. This suggests that in the context of an important real-world domain, learning phonics rules, variability may be the more important principle.  
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9:20-9:35 (10)

**Large Variation in Item Difficulty in Computer-Based Learning of Neuroanatomy.** JULIA H. CHARIKER, FARAH NAAZ and JOHN R. PANI, *University of Louisville* (Read by John R Pani)—Promoting transfer of learning and generalization of knowledge is critical for instruction in advanced disciplines. We show that item difficulty can be related to the degree of transfer and generalization that follows from using an instructional method. Data from computer-based instruction of neuroanatomy were broken down by item in four ways: basic quantitative description, statistical identification and testing of item effects, cluster analysis of item types based on group performance, and analysis of selection behavior during learning. Neuroanatomical structures varied greatly in degree of difficulty. When measurements of transfer and generalization of learning were applied separately to items that differed in their level of difficulty, these measurements diverged by a wide margin. In some cases, easier items were so easy that any instructional method was successful. In other cases, difficult items were so difficult that they masked the overall value of generally effective instruction. With large effects of item difficulty on learning in advanced disciplines, assessment and description of item difficulty will be important to designing and evaluating effective instructional systems.  
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Priming

Metropolitan B, Friday Morning, 8:00-9:55

Chaired by Kiel Christianson, *University of Illinois, Urbana-Champaign*

8:00-8:15 (11)

**SPaM: A Combined Self-paced Reading and Masked-priming Paradigm.** KIEL CHRISTIANSON, *University of Illinois, Urbana-Champaign*, STEVEN G. LUKE, *University of South Carolina*—We describe a novel paradigm that combines Self-Paced reading and Masked-priming (SPaM). The paradigm has advantages over both single-word masked-priming and eye-tracking. SPaM results in far less data loss than fast-priming with an eye tracker (Serenio & Rayner, 1992), and in SPaM the primes are less noticeable than in the single earlier attempt at combining these two paradigms (Trueswell & Kim, 1998). Because it combines features of paradigms used to study the reading of connected text and the recognition of individual words, the paradigm can be used to examine early processes in visual word recognition within the context of a sentence. We discuss the implementation and advantages of SPaM and present data showing that it can be used to examine top-down influences on orthographic and morphological processes in visual word recognition.  
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8:20-8:35 (12)

**On the Role of the Upper Part of Words in Lexical Access: Evidence with Masked Priming.** MANUEL PEREA, *Universitat de València*, MONTSERRAT COMESAÑA and ANA P. SOARES, *Universidade do Minho*, CARMEN MORET-TATAY, *Universidad Católica de Valencia*—More than 100 years ago, Huey (1908) indicated that the upper part of words was more relevant for perception than the lower part. Here we examined whether mutilated words, in their upper/lower portions, can automatically access their word units in the mental lexicon. To that end, we conducted two masked repetition priming experiments with the lexical decision task. Results showed that mutilated primes produced a robust masked repetition priming effect which was similar in size to that from intact primes. Furthermore, the magnitude of the masked repetition priming effect was greater when the upper part of the primes was preserved than when the lower portion was preserved. These findings suggest that the front-end of computational models of visual-word recognition should be modified to provide a more realistic account at the level of letter features.  
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8:40-8:55 (13)

**Masked Priming as a Savings Effect.** KENNETH FORSTER and HONGMEI WU, *University of Arizona*—Is masked priming a function of the prime duration itself, or the interval between prime onset and target onset (SOA)? Normally these variables are confounded, but if a neutral stimulus is inserted between prime and target, SOA can be manipulated independently of prime duration. A savings model of masked priming predicts that priming should be a function of SOA. It also requires that an upper limit is imposed on priming by the SOA, so that priming could never be greater than the SOA. This predicts that the normal superiority of identity priming (contrast-CONTRAST) over form priming (contrast-CONTRAST) would be eliminated when the prime duration is very short, e.g. 30 ms. In contrast, an activation model predicts that the difference between the two forms of priming would be maintained, because priming is solely a function of the degree of orthographic overlap (other things being equal). The results are mixed. There is no difference between identity and form priming with a prime duration of 30 ms (supporting a savings model), but inserting a neutral stimulus between prime and target does not enhance priming, as a savings model would predict.

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9:00-9:15 (14)

**An Investigation of the Role of Grapheme Units in Word Recognition.** STEPHEN J. LUPKER, *University of Western Ontario*, JOANA ACHA, *Basque Center on Cognition, Brain, and Language*, COLIN J. DAVIS, *Royal Holloway, University of London*, MANUEL PEREA, *Universitat de València*—In most models of word recognition, word units are assumed to be activated by letter units. An alternative possibility is that word units are activated by grapheme units. If so, there must be representational units for letter pairs like “ch” and “ph” in the sublexical/lexical system. We examined this idea in four masked priming experiments. Primes were created by transposing, replacing entirely or removing one component of either multi-letter graphemes or two adjacent letters each representing a grapheme, using both English and Spanish stimuli. In none of the experiments was there any evidence of differential priming effects depending on whether the two manipulated letters formed a single grapheme or formed two separate graphemes. These data are most consistent with the idea that multi-letter graphemes have no special status at the earliest stages of word processing and, therefore, that word units are, indeed, activated by units for individual letters.

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9:20-9:35 (15)

**Not All Skilled Readers Have Cracked the Code: Individual Differences In Masked Orthographic Priming.** SALLY ANDREWS and STESON LO, *University of Sydney*—This experiment investigated whether individual differences in written language proficiency modulate the

early stages of lexical retrieval. To separate the contributions of sublexical facilitation and lexical competition to masked form priming, the effects of prime lexicality were directly compared for transposed-letter (TL) primes (e.g., sung SNUG; salb SLAB) and neighbour primes (e.g., snag SNUG; sleb SLAB) in a sample of 100 university students assessed on measures of reading, spelling and vocabulary. The data for the whole sample showed facilitation from nonword primes, but inhibition from word primes. Linear mixed models showed that higher scores on a principal component which captured the shared variance between reading, spelling and vocabulary were associated with both stronger inhibition from TL word primes and stronger facilitation from neighbour nonword primes. These findings support the lexical quality hypothesis’s prediction that skilled readers vary in the extent to which they have developed precisely specified orthographic representations.

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9:40-9:55 (16)

**A Tale of Two Tasks: Why Results from the Lexical Decision and Same-different Matching Tasks Differ.** ALISON L. MORRIS, *Iowa State University*, MARY L. STILL, *Missouri Western State University*—In the development and testing of models of visual word recognition, one of the most frequently-used paradigms is masked priming. One way to investigate the complex processes underlying the standard form of this task and its variants is to examine differences obtained when the same stimuli are used in different masked-priming tasks. We obtained interference using the lexical decision task with “reversed anagram” nonword primes and word targets (e.g., rulb-BLUR); however, when a “reference” word was added to the display (e.g., blur-rulb-BLUR) and the task was to decide whether or not the reference matched the target (the same-different matching task), robust facilitation was obtained. We hypothesized that the reversal in the direction of the effect occurs because in the same-different task, processing of the target is influenced by both the prime and the reference. Results using a modified version of the same-different task were consistent with this hypothesis.

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### Cognitive Control I

Willow AB, Friday Morning, 8:00-9:35

Chaired by Irene P. Kan, Villanova University

8:00-8:15 (17)

**Conflict Adaptation Across Tasks: Evidence for Domain-General Cognitive Control.** IRENE P. KAN, *Villanova University*, SUSAN TEUBNER-RHODES, *University of Maryland*, ANNA B. DRUMMEY, *Villanova University*, JARED M. NOVICK, *University of Maryland*—Cognitive control refers to individuals’ ability to regulate attention and actions appropriate to current goals. According to the Conflict Monitoring Theory, conflict detection triggers sustained cognitive control that supports resolution, indexed



by enhanced responses on subsequent conflict trials (i.e., conflict adaptation). Within-task conflict adaptation is well documented, but its underlying mechanisms remain unclear. In two studies, we examined the proposal that adaptation is mediated by a domain-general cognitive control mechanism. If within-task adaptation reflects engagement of a domain-general mechanism, then conflict detection in one task should also enhance conflict resolution on a different task. We explored cross-task adaptation between a sentence-processing task that requires conflict resolution and the Stroop task (Experiment 1) and between a task that induces perceptual ambiguity (i.e., passive viewing of Necker cube) and the Stroop task. We found significant cross-task adaptation in both studies, providing strong evidence that conflict adaptation is mediated by domain-general cognitive control.

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#### 8:20-8:35 (18)

**Practice-related Acquisition of Dual-task Skills in Younger and Older Adults.** TILO STROBACH, *Ludwig-Maximilians-University Munich*, PETER A. FRENSCH, *Humboldt-University Berlin*, HERMANN J. MÜLLER and TORSTEN SCHUBERT, *Ludwig-Maximilians-University Munich*—Younger and older adults reduce dual-task performance costs when contrasted to single-task performance with extensive practice. In younger adults, there exists evidence for a contribution of dual-task skills to this reduction. These skills improve the coordination of two tasks and are acquired under conditions of dual-task, but not single-task practice. For older adults, however, the contribution of dual-task skills to the reduction of dual-task costs is still an open issue in studies on cognitive aging. Therefore, we practiced groups of younger as well as older adults either under dual-task or under single-task conditions and subsequently performed a test of their dual-task performance level. In this test, dual-task skills should be indicated by improved dual-task performance after dual- in contrast to single-task practice. Our results are consistent with this prediction in both younger and older adults. Thus, dual-task skills contribute to the practice-related reduction of dual-task costs in both aging groups.

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#### 8:40-8:55 (19)

**Is Automatic Imitation Special?** BENNETT I. BERTENTHAL and TY W. BOYER, *Indiana University*—Automatic imitation (matching observed and executed body movements) is often tested with an S-R compatibility paradigm. Recently, Catmur and Heyes (2011) concluded that the mechanisms responsible for this compatibility effect are no different than those responsible for spatial compatibility, but their stimuli were limited to a first-person perspective. In the current study, we tested spatial and imitative compatibility from both first- and third-person perspectives with a two alternative forced choice RT paradigm. Participants responded with either their right

index or middle finger to a discriminative cue appearing between the fingers of a left or right hand at rest. Simultaneous with the appearance of the imperative stimulus the index or middle finger tapped down. Task irrelevant finger movements were either compatible or incompatible with the spatial location and/or anatomical identity of the response finger. Analyses of mean RTs as well as RT distributions revealed independent effects for both spatial and imitative compatibility, but only spatial compatibility interacted with perspective. This difference suggests, contrary to Catmur and Heyes (2011), that imitative and spatial compatibility are dissociable processes.

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#### 9:00-9:15 (20)

**Do Executive Motor-Control Mechanisms Regulate Monetary Choice and Gambling?** FREDERICK VERBRUGGEN, *University of Exeter*, RACHEL ADAMS and CHRIS CHAMBERS, *Cardiff University*—Human decision making often requires the suppression of suboptimal and risky options. A long history of research in psychology shows that such decision-making is impaired under cognitive load, becoming biased toward risky options. Here, however, we show that a cognitive load that is targeted precisely toward inhibition of the motor system can have the opposite effect, reducing monetary risk taking in a novel gambling task. In three experiments we found that preparation for stopping simple finger movements encouraged people to place safer bets, and that a short period of inhibitory training lessened monetary risk-taking later in time. Overall our findings indicate that proactive motor control interacts strongly with seemingly unrelated monetary decision-making in a gambling task. The link we find between inhibitory systems at different cognitive levels might be exploited to develop new methods for rehabilitation of impulse control disorders.

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#### 9:20-9:35 (21)

**Top-down vs. Bottom-up: When Instructions Overcome Automatic Retrieval.** ANDREA KIESEL, *University of Wuerzburg*, FLORIAN WASZAK, *CNRS - Université Paris Descartes, Paris*, ROLAND PFISTER, *University of Wuerzburg*—Research on human action has extensively covered controlled and automatic processes in the transformation of stimulus information into motor action, and how conflict between both systems is solved. However, the question of whether automatic S-R translation per se depends on top-down control states has received little attention. This study addressed this issue by manipulating top-down control state (instructed S-R mapping) and automatic bottom-up processing (retrieval of S-R memory traces) independently from each other. Using a color/shape task-switching paradigm, we compared cross-talk triggered by distractor stimuli, for which the instructed S-R mapping and the S-R associations compiled at the beginning of the



experiment matched, with the cross-talk triggered by distractor stimuli, for which (re)instructed mapping and compiled S-R associations did not match. Interestingly, the latter kind of distractors did not yield any cross-talk, demonstrating that automatic S-R retrieval occurs only if the S-R associations concur with the currently valid S-R mapping.

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### Selective Attention I

**Grand Ballroom AB, Friday Morning, 8:00-9:15**

*Chaired by Eric L. Soetens, Vrije Universiteit Brussel*

**8:00-8:15 (22)**

**Involvement of Low-level Saliency-based Processes in 'Inhibition of Return' with Endogenous Cueing.** ERIC L. SOETENS, DAVID HENDERICKX, NATACHA DEROOST and KATHLEEN MAETENS, *Vrije Universiteit Brussel (VUB)*—People are faster at detecting a visual target at a cued, compared to an uncued location. With exogenous cues only, a reversal of this cost-benefit pattern occurs with cue-target intervals exceeding 250ms (Inhibition of Return = IOR). We suggest that no IOR is found with endogenous cues, because most volitional attention shifts act upon higher processing levels, while IOR may act upon bottom-up saliency-based orienting processes only. To investigate this, participants had to orient to one out of two differently colored salient peripheral cues, indicated by a (preceding) central instruction (endogenous). With sufficient time between instruction and peripheral cues, IOR was observed, demonstrating the effect of endogenous orienting acting upon low-level saliency processes. No IOR was observed when the central cue was presented simultaneously with or after the peripheral cues. These results suggest that the use of saliency-based processes in endogenous orienting is a prerequisite for the appearance of IOR.

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**8:20-8:35 (23)**

**The Generation of Inhibition of Return Is Contingent On Spatial Attentional Control Settings.** RAYMOND M. KLEIN and MATTHEW D. HILCHEY, *Dalhousie University*, ZHIGUO WANG, *Chinese Academy of Sciences*—Generated by activation of the oculomotor system, inhibition of return (IOR) was once thought to be a reflexive phenomenon. In his TICS review of IOR, Klein (2000), implicitly endorsed this view while putting forward the idea that the timecourse of IOR's appearance (but not necessarily its generation, which was later shown to begin with the cue) depended on the intensity or nature of the attentional set put in place to process the target. More recently we have shown that the generation of IOR (much like attentional capture) is contingent upon such spatial attentional control settings: when attention was strongly focused on fixation at the time of the peripheral cue or when

there were never any peripheral targets we found no IOR. Our results cast doubt on several of the findings from one of the most influential (by citations) empirical studies in the IOR literature.

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**8:40-8:55 (24)**

**Sustained Inattentional Deafness To Dynamic Stimuli in Three-Dimensional Auditory Scenes.** POLLY DALTON and NICK FRAENKEL, *Royal Holloway, University of London*—It is now well-known that the absence of attention can leave us 'blind' to visual stimuli that are very obvious under normal viewing conditions (e.g. a person dressed as a gorilla; Simons & Chabris, 1999). However, the question of whether hearing can ever be susceptible to such catastrophic failures of awareness remains open. We present evidence that inattention can leave people 'deaf' to the presence of a range of unexpected auditory stimuli, including an 'auditory gorilla' which remains present for 19 seconds and is clearly noticeable under full attention. This pronounced lack of awareness is all the more surprising because it occurs within a lifelike, three-dimensional auditory scene in which the unnoticed stimulus moves through the middle of several other dynamic auditory stimuli.

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**9:00-9:15 (25)**

**Face Perception In Context: Grouping Cues Modulate Holistic Face Perception.** KIM M. CURBY, REBECCA R. GOLDSTEIN and KARA J. BLACKER, *Temple University*—Face perception is widely believed to involve the integration of facial features into a holistic perceptual unit, but the mechanisms underlying this integration are relatively unknown. We examined whether perceptual grouping cues influence a classic marker of holistic face perception, the "composite face effect". Participants made same/different judgments about a cued part of sequentially presented chimeric faces, and holistic processing was indexed as the degree to which the task-irrelevant face halves impacted performance. Grouping was encouraged or discouraged by adjusting the backgrounds behind the face halves: although the face halves were always aligned, their respective backgrounds could be misaligned and of different colors. Holistic processing of face, but not non-face, stimuli was significantly reduced when the backgrounds were misaligned and of different colors, cues that discouraged grouping of the face halves into a cohesive unit. These results suggest that mechanisms underlying the perception of objecthood also influence the holistic perception of faces.

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**Recognition Memory****Grand Ballroom D, Friday Morning, 8:00-9:55***Chaired by Douglas J. K. Mewhort, Queen's University***8:00-8:15 (26)**

**Tulving's Centrefold Phenomenon: Broader Than We Thought.** DOUGLAS J. K. MEWHORT, ELIZABETH E. JOHNS, LESLEY GERRIETTS and KARYN GABLER, *Queen's University*—In forced-choice recognition, decisions are more likely to be accurate if the target and lure are similar to each other than if they are dissimilar (Tulving, 1981). The effect has been reported exclusively in long-term memory with pictorial stimuli. We demonstrate the phenomenon in several situations frequently thought to represent different memory systems, including long- and short-term memory, pictorial and verbal memory, and episodic and semantic memory. We argue that research on such general phenomena may reveal basic principles of memory and/or decision-making and is needed to balance research on the peculiarities of different memory systems. Email: Douglas J. K. Mewhort, [mewhortd@queensu.ca](mailto:mewhortd@queensu.ca)

**8:20-8:35 (27)**

**The Role of the Parent Pairs in Producing False Alarms in Associative Recognition.** MICHAEL S. HUMPHREYS, *University of Queensland*—In associative recognition a rearranged distractor pair (AD) is constructed out of two parent pairs (AB and CD). I show that strong parent pairs can suppress false alarms to rearranged pairs and similar parent pairs (A is the same as C and D is similar to B) can increase false alarms. In both cases recollection can be ruled out. The significance of these findings for dual process, global matching, and autoassociative theories of associative recognition are discussed. Email: Michael S. Humphreys, [mh@psy.uq.edu.au](mailto:mh@psy.uq.edu.au)

**8:40-8:55 (28)**

**Recognition Without Awareness: Encoding and Retrieval Factors.** FERGUS I. M. CRAIK, NATHAN S. ROSE and NIGEL GOPIE, *Rotman Research Institute*—Can people recognize items correctly while believing that they are simply guessing? After an encoding phase, participants were given a series of 4-alternative forced choice tests of recognition memory for the encoded words. They were informed that only about half of the tests contained a target item, but that nevertheless they must always choose one item. To make sense of this procedure, participants were also asked to give a confidence rating for each choice: 2, 1, or 0, where '0' signified 'pure guess.' The interest is in the proportion of correct choices when a target is present and when confidence is given as 0. Chance is 0.25 yet some proportions are as high as 0.50. In a series of experiments we show that the nature of initial encoding, overall difficulty level, and congruity of context between encoding and retrieval all affect the subjective experience of recognition memory. Email: Fergus I. M. Craik, [fcraik@rotman-baycrest.on.ca](mailto:fcraik@rotman-baycrest.on.ca)

**9:00-9:15 (29)**

**A Dynamic Model for Recognition Memory.** GREG COX and RICHARD M. SHIFFRIN, *Indiana University* (Read by Richard M Shiffrin)—We present a new dynamic model of decision making in recognition memory and apply it to accuracy and response time data from a study using widely varying kinds of stimuli (e.g. word, dot pattern, toaster, face, scene, blob, name, snowflake). Supposing that absolute levels of activation or familiarity vary widely for different materials, how can a criterion for old-new recognition be set properly when there is no opportunity to learn because each stimulus type is studied and tested just once? We depart from standard signal detection models that predict recognition accuracy and propose a model in which the decision is made by accumulating changes in the activation profile as features are successively extracted from the test stimulus. Increases in activation accumulate in one counter and decreases in another. The counters each have a threshold. The first to be reached determines the choice and the response time. Our study shows that participants are remarkably well tuned to differences in stimulus types, having little trouble in producing reasonable judgments for all (hits and false alarms more or less centered) despite large differences in levels of performance. The model accounts for both accuracy and response times. Email: Richard M. Shiffrin, [shiffrin@indiana.edu](mailto:shiffrin@indiana.edu)

**9:20-9:35 (30)**

**Output Interference in Recognition Memory.** AMY H. CRISS, *Syracuse University*, KENNETH J. MALMBERG, *University of South Florida*, RICHARD M. SHIFFRIN, *Indiana University*—Context models assume that interference in recognition memory arises solely from the prior contexts of the test word: Interference does not arise from memory traces of other words (from events prior to the study list or on the study list, and regardless of similarity to the test item). Item noise models assume that interference arises from both similar contexts and similar items. Most tests of these models have focused on the structure of the study lists. We adopt a new approach of evaluating output interference, a decline in accuracy as a function of the words presented during test. Output interference is consistent with models that allow interference from words other than the test word, when each test produces a memory trace, and hence a source of interference. Models positing interference solely from prior contexts of the test word itself predict no effect of items presented during test, without added assumptions. Several new findings characterizing output interference in recognition memory will be presented. Email: Amy H Criss, [acriss@syr.edu](mailto:acriss@syr.edu)

9:40-9:55 (31)

**Hazard and Reverse Hazard Assessment of Memory Foils.** RICHARD A. CHECHILE, *Tufts University*—Hazard and reverse hazard are powerful tools for understanding underlying probability models. Both types of hazard are sensitive methods for detecting the presence of mixtures. These tools are used here to demonstrate that there is a mixture of processes involved in the detection of foils. Although many models of recognition memory concur that the representation of (old) items is as a mixture of processes, these models, nonetheless, assume that the representation for new items is characterized as a single unimodal distribution from a signal detection theory (SDT) framework in order to make the model identifiable. Consequently, the mixture of processes detected for foil recognition is a serious problem for SDT models of recognition memory. Nonetheless, these findings are consistent with some multinomial processing tree models for recognition memory.

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## SYMPOSIUM I

**Psychocinematics: Exploring Cognition at the Movies**  
**Grand Ballroom AB, Friday Morning, 9:45-11:55**

*Chaired by Arthur P. Shimamura, University of California, Berkeley*

9:45-9:50 (32)

**Introduction.** ARTHUR P. SHIMAMURA, *University of California, Berkeley*

9:50-10:10 (33)

**The Perception of Smooth Motion Across Film Cuts.** ARTHUR P. SHIMAMURA, *University of California, Berkeley*—Filmmakers know that smooth transitions are perceived between cuts when they occur in the middle of an action. In this study, subjects viewed brief film clips (a woman drinking from a mug) that included a cut in the middle of the action. The shot before the cut was the same for all of the clips. The shot after the cut was taken from a different angle and either continued the action in real time, jumped the action in time at various increments (i.e., removal of sequential frames of the action), or overlapped the action in time at various increments (i.e., addition of earlier frames of the action). When asked to select the clip with the smoothest transition, subjects selected clips that contained a physical overlap in action (~120 msec). This “overlap” bias is considered with respect to masking effects across film cuts.

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10:15-10:35 (34)

**The Impact of Cinematic Techniques on Visual Attention.** TIM J. SMITH, *Birkbeck, University of London*—A key element of the filmmaking craft is being able to subtly manipulate where a viewer is attending on the screen in order to shape their experience. Cinema has evolved techniques such as editing, shot composition, and camera movements which claim to direct viewer eye movements. However, the efficacy of these techniques has never been directly tested. In this study, eye movements were recorded while participants viewed TV and film clips. Cinematic and low-level visual features such as motion were identified and correlated with eye movement behaviors. The use of extreme visual contrasts such as focus and motion were shown to strongly predict gaze location and resulted in a high degree of coordination of gaze across viewers when combined with cuts, camera movements, and the framing of faces. These results confirm filmmaking heuristics and provide a framework for further investigating the intricate relationship between cinematic techniques and visual experience.

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10:40-11:00 (35)

**Editing and the Perception of Events in Film.** JEFFREY M. ZACKS, *Washington University in Saint Louis* and JOSEPH P. MAGLIANO, *Northern Illinois University*—Movies segment time because they typically consist of a large number of shots joined by edits. However, edits often are largely unnoticed. Does this mean that edits do not affect viewers’ experience of how time is segmented in film? Behavioral and neuroimaging studies suggest that viewers segment narrative films into events based on changes in the situation depicted by the film, rather than to the large surface discontinuities created by edits. Viewers respond to such changes by orienting attention and updating memory representations. This is subjectively experienced as the end of one event and the beginning of another. Thus, edits in commercial film may structure time not because they create a break in the surface structure of the film, but because they provide the opportunity for change in the situation the film depicts.

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11:05-11:25 (36)

**We Know What, Sort-of Know Where, and Don’t Really Know When: Lessons From Naturalistic Perception of Events During Film Viewing.** DANIEL T. LEVIN and ALICIA HYMEL, *Vanderbilt University*—People usually understand the events they perceive, but it is not clear whether this understanding is associated with any specific awareness of the location of actors involved in events, or of the specific timing of events. First, we discuss data showing that television viewers do encode basic location information

about central objects, but that they combine these encodings into a representation of the larger setting only when the views are directionally consistent. We also discuss experiments testing people's ability to perceive the microstructure of events and demonstrate that people a) do not automatically perceive the order of events, and b) that differences in awareness of event order are associated with the ability to effectively process spatial layouts implied in edited films. We argue that research on film viewing makes clear that models of event perception should explicitly account for the consequences of large dynamic variations in awareness of visual information.

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#### 11:30-11:50 (37)

**The Structure of Events, Scenes, and Film.** JAMES E. CUTTING, KAITLIN L. BRUNICK, CATALINA IRICINSCHI, AYSE CANDAN, and JORDAN E. DELONG, *Cornell University*—Both life and film are defined by events. As noted by Alfred Hitchcock, film is life “with the dull bits cut out.” How then is film structured, and how does its structure compare to that of our daily life? We parsed over 200 Hollywood films released between 1935 and 2010 into shots and acts, and a subsample into scenes. We also analyzed their patterns of motion and luminance. We have found that film form integrates a nested, physical hierarchy of events at several scales, and suggest that this form supports a film's narrative. Thus, our findings map well onto event structures revealed elsewhere, while remaining consistent with film theory. Film events, for example, tend to begin and end with longer shots, these shots displaying more motion than those at midscene. In addition, film scenes generally depict a consistent time and place with characterization and content as important modulators.

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#### Perception I

##### Willow AB, Friday Morning, 10:00-10:55

*Chaired by Bruce Bridgeman, University of California Santa Cruz*

#### 10:00-10:15 (38)

**Metacontrast Masking is Processed Before Color-Grapheme Synesthesia.** BRUCE BRIDGEMAN and MICHAEL P. BACON, *University of California, Santa Cruz*—We investigated individuals with grapheme-color synesthesia using metacontrast masking. A metacontrast target is rendered invisible by a mask that is delayed by about 60msec; target and mask do not overlap in space or time. There is little masking if target and mask are simultaneous. The effect is cortical because it can be obtained dichoptically. To compare synesthesia data we developed a metacontrast design in which nonsynesthete controls showed weaker chromatic masking (target and mask in different colors) than achromatic. We accomplished this with equiluminant target, mask and background for each

observer. If synesthetic color affects metacontrast, synesthetes should show achromatic masking similar to the weak chromatic masking in controls because they would add their synesthetic color to the achromatic condition. Target-mask pairs used for each synesthete were graphemes that elicited strong synesthetic colors. We found stronger achromatic u-shaped metacontrast for both synesthetes and nonsynesthete controls with optimal masking at an asynchrony of 66msec. There was no difference in performance between synesthetes and nonsynesthetes, suggesting that synesthesia occurs at a later processing stage than metacontrast masking.

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#### 10:20-10:35 (39)

**Action-Specific Effects are Immune to Spiders.** JESSICA K. WITT and MILA SUGOVIC, *Purdue University*—According to the action-specific perception account, perception is influenced by the perceiver's ability to act. For example, balls that are easier to block look slower than balls that are more difficult to block. Here, we examined if this influence on perceived speed would be reduced or eliminated when acting on spiders. Given specialized perceptual processing for spiders, their perceived speed might be more accurate and less biased by the perceiver's ability to block them. In contrast, we found that the effect of blocking ease was just as great for spiders as for balls. Furthermore, the spiders looked faster than the balls, suggesting a potentially adaptive perceptual bias in perceived speed of threatening objects.

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#### 10:40-10:55 (40)

**Your First Organization Influences Your Second: Hysteresis in Figure-Ground Assignment.** MICHU MATSUKURA and SHAUN P. VECERA, *University of Iowa*—Figure-ground assignment is a perceptual organization process that allows the visual system to distinguish object-like regions from non-object-like regions. Although both image-based and knowledge-based cues influence figure-ground assignment processes, short-term priming effects also affect figure-ground assignment. However, most short-term priming studies investigate how task-defining features of a figure (e.g., edge or shape) influence subsequent figure-ground assignment, it remains unclear if task-irrelevant features of figure (e.g., color) can prime figure-ground assignment processes. In the present study, we examined whether a task-irrelevant feature of a figural region in a preceding scene influences figure-ground assignment on a later scene. Using a figural priming paradigm, we found that task-irrelevant feature priming occurs during figure-ground assignment processes.

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11:00-11:15 (41)

**Language-Specific Tuning in Early Audiovisual Integration.** NICOLE DEPOWSKI and JULIANA FLYNN, *University of Connecticut*, MARTIJN BAART, *Tilburg University*, HEATHER BORTFELD, *University of Connecticut* (Read by Heather Bortfeld)—Perceptual narrowing characterizes age-related changes in infants' ability to perceive phonemes from their own and other languages (Werker, & Tees 1984, 2005). In this work, infants are tested with single phonemes presented auditorily (Werker & Tees, 1983; Kuhl, Williams, Lacerda, Stevens, & Lindblom, 1992). Although this allows researchers to focus on sensitivity to the speech signal while removing all other perceptual influences, it does not test whether broad multisensory abilities are selectively narrowed according to infants' environmental experience. Given that the emergence of phonemic sensitivity happens in the context of multimodal speech, the goal of the present study was to determine whether infants demonstrate perceptual narrowing for their native language relative to an unfamiliar language when presented as fluent audiovisual speech. Results suggest that perceptual narrowing characterizes infants' sensitivity to audiovisual speech as well as the auditory-only signal, thus extending the concept of perceptual narrowing to the audiovisual domain.

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11:20-11:35 (42)

**Pitch Height Independently Modulates Perceived Time Durations.** DENISE H. WU, WEI-XIANG LIN and ACER Y—C. CHANG, *National Central University, Zhongli, Taiwan*, OVID J—L. TZENG, *Academia Sinica, Taipei, Taiwan*—Recent studies have shown that numerical magnitude affects time perception. In the present study, we investigated whether frequency of a tone (i.e., pitch height) had similar effects on perceived time durations. In Experiment 1, participants judged which of two tones with different pitches and durations was longer. The results indicated that a tone with a low pitch was perceived shorter than a tone with a high pitch. Consistent findings were obtained in Experiment 2 with a temporal reproduction task even when the subjective loudness of the stimuli was controlled. Specifically, a tone with a low pitch was reproduced shorter than a tone with a high pitch. On the other hand, the reproduction accompanied by a low pitch was longer than that accompanied by a high pitch. The present study clearly demonstrated the interaction between frequency and temporal processing in audition, which might be mediated by a common magnitude system.

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11:40-11:55 (43)

**Blindness Enhances Tactile Acuity and Haptic 3-D Shape Discrimination.** J. FARLEY NORMAN and ASHLEY N. BARTHOLOMEW, *Western Kentucky University*—This study compared the sensory and perceptual abilities of the blind and sighted. The 32 participants were required to perform two tasks: tactile grating orientation discrimination (to determine tactile acuity), and haptic 3-D shape discrimination. The results indicated that the blind outperformed their sighted counterparts (individually matched for both age and sex) for both tactile tasks. The improvements in tactile acuity that accompanied blindness occurred for all blind groups (congenital, early, & late). However, the improvements in haptic 3-D shape discrimination only occurred for the early-onset and late-onset blindness groups; the performance of the congenitally blind was no better than that of the sighted controls. The results of the current study demonstrate that blindness does lead to an enhancement of tactile abilities, but they also suggest that early visual experience may play a role in facilitating haptic 3-D shape discrimination.

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### Psycholinguistics I

**Grand Ballroom D, Friday Morning, 10:20-10:55**

Chaired by Matthew J. Traxler, *University of California, Davis*

10:20-10:35 (44)

**Information Flows Forward in Time.** MATTHEW J. TRAXLER, *UC Davis*, DONALD J. FOSS, *University of Houston*, MEGAN ZIRNSTEIN, *UC Davis*—Daryl Bem (JPSP, 2011) presented evidence for "precognition." In 9 experiments, performance at one point in time correlated with experience that occurred at a later point in time. We attempted to replicate time-reversed study and time-reversed priming effects in two experiments. In the first, 119 students answered three multiple-choice questions before being exposed to stimuli that indicated the correct answer. As a group, students scored significantly below chance on the first question, above chance on the second, and at chance on the third. In the second experiment, participants' reading times were measured as they read a text about extrasensory perception. In one condition, participants read the same ESP text twice. In another condition, the ESP article was followed by an unrelated article. Bem's hypothesis predicts that participants would read the ESP article faster when it was followed by itself than when it was followed by a different text. However, no differences were detected between the two priming conditions. Instead, normal repetition priming effects were observed, as was a small practice effect. These experiments thus failed to replicate time-reversed information processing effects.

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10:40-10:55 (45)

**Processing Multiple Long-Distance Dependencies: Evidence from Sequential Learning.** MEINOU H. DE VRIES, *VU University Amsterdam*, SEBASTIAN GEUKES and PIENIE ZWITSERLOOD, *University of Münster*, KARL MAGNUS PETERSSON, *Max Planck Institute for Psycholinguistics*, MORTEN H. CHRISTIANSEN, *Cornell University* (Read by Morten H Christiansen)—The processing of long-distance dependencies is considered to be one of the hallmarks of human language. Using a cross-modal serial-reaction time (SRT) task, we investigated the processing of multiple nested (ABCCBA) and crossed (ABCABC) dependencies. Patterns of both reaction times and prediction errors highlighted problems with the processing of the middle dependency in nested (ABCC\_A) but not crossed structures, replicating the “missing VP effect” observed in English and French. Sequential learning mechanisms thus appear to be directly related to language processing, capturing the qualitative processing differences between crossed and nested dependency structures. Moreover, prior linguistic experience did not play a role: native speakers of German and Dutch, — which permit nested and crossed dependencies, respectively — showed a similar pattern of results. Together, these results indicate that constraints on the processing of multiple long-distance dependencies may not be specific to language but instead derive from limitations on structured sequence learning. Email: Morten H Christiansen, [christiansen@cornell.edu](mailto:christiansen@cornell.edu)

11:00-11:15 (46)

**Subject-Verb Integration: Effects of Animacy and Syntactic Structure.** MATTHEW W. LOWDER and PETER C. GORDON, *UNC Chapel Hill* (Read by Peter C. Gordon)—Previous work has suggested that the difficulty normally associated with processing an object-extracted relative clause (ORC), compared to a subject-extracted relative clause (SRC), is increased when the head noun phrase (NP1) is animate and the embedded noun phrase (NP2) is inanimate compared to the reverse animacy configuration. Two eye-tracking experiments were conducted to determine whether the apparent effects of NP animacy on the ORC-SRC asymmetry reflect distinct processes of interpretation that operate at NP2 and NP1. Experiment 1 revealed that integrating an inanimate versus an animate NP2 with the embedded verb was difficult, but that this difficulty was independent of the difficulty associated with processing the ORC. Experiment 2 demonstrated that the difficulty normally associated with integrating an inanimate NP with a verb is reduced when the two appear in separate clauses, as in the case of an SRC. Email: Peter C. Gordon, [pcg@email.unc.edu](mailto:pcg@email.unc.edu)

11:20-11:35 (47)

**English and Mandarin Speakers May Think About Time Differently, But for a Different Reason.** JENN-YEU CHEN, *National Cheng Kung University*, PADRAIG G. O’SEAGHDHA, *Lehigh University*, BISHAN LIANG and XISHAN HUANG, *South-China Normal University*—Do English and Mandarin speakers think about time differently? Boroditsky (2001) claimed they do, but the claim did not stand in three failed replications (Chen, 2007; January & Kako, 2007; Tse & Altarriba, 2008). Recently she and her colleagues reported data from a different task to support the claim (Boroditsky, Fuhrman, & McCormick, 2010). We repeated their study with 32 English speakers in US (college students, no experience with Mandarin or other Chinese dialects), 32 Mandarin speakers in Taiwan and 40 Mandarin speakers in China (college students, similar experience of learning English as a foreign language in high schools). The Mandarin speakers in Taiwan showed an opposite pattern of responses than the English speakers, but the Mandarin speakers in China performed similarly to the English speakers. These results are interpreted as reflecting differences in orthographic directionality adopted in different linguistic communities, uniformly horizontal in US and China, but horizontal mixed with vertical in Taiwan. English and Mandarin speakers may think about time differently, but probably not because of the different spatial metaphors used to express time in the languages.

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11:40-11:55 (48)

**Life Is A Pencil: Using Eye Tracking to Explore Metaphor Processing.** SPENCER J. CAMPBELL and GARY E. RANEY, *University of Illinois at Chicago* (Read by Gary E. Raney)—In the metaphor “life is a pencil,” life is referred to as the target and pencil as the vehicle. Current research revolves around two competing theories, categorization and the Career of Metaphor. These theories make different predictions regarding how the target and vehicle are processed in familiar and unfamiliar metaphors. The current research uses eye tracking to examine how familiar and unfamiliar metaphors are processed when presented in a context that is biased toward the meaning of the metaphor. Results showed a different pattern of eye movements (fixation times and number of fixations) for familiar versus unfamiliar metaphors. In all metaphors there was an emphasis on the vehicle and the target. Preliminary results indicate slightly greater emphasis was given to the vehicle during initial processing (first pass), but this difference was larger for unfamiliar metaphors. These results seem to support the categorization model. Further analyses examining specific patterns of eye movements are required to confirm this conclusion.

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**Metamemory I****Metropolitan A, Friday Morning, 10:00-11:55***Chaired by Daniel M Bernstein, Kwantlen Polytechnic University***10:00-10:15 (49)**

**Hindsight Bias Is Unrelated To Learning.** DANIEL M. BERNSTEIN and KAREN AUJLA, *Kwantlen Polytechnic University*, EDGAR ERDFELDER, *University of Mannheim*, WILLIAM PERIA, *University of Washington*—Upon learning the correct answer to a problem, we often think that we knew it (hindsight bias). In three experiments, we investigated how hindsight bias relates to learning. Nine- to 12-year old children and adults answered trivia questions, and then tried to recall their original answers before (control condition) and after (hindsight condition) learning the correct answers to the questions. To explore learning, we later asked participants to recall the correct answers. Participants showed robust hindsight bias by recalling their original answers as being closer to the correct answers in the hindsight condition than in the control condition. Participants also showed learning by recalling the correct answers to several questions. However, hindsight bias was unrelated to learning. Thus, we might erroneously think that we knew it, but this doesn't mean that we learn from our mistakes.

Email: Daniel M Bernstein, [daniel.bernstein@kwantlen.ca](mailto:daniel.bernstein@kwantlen.ca)**10:20-10:35 (50)**

**It's Obvious To Me!: The Effect of Related Primes On Auditory Hindsight Bias.** PHILIP A. HIGHAM and GREGORY J. NEIL, *University of Southampton*, DANIEL M. BERNSTEIN, *Kwantlen Polytechnic University*—Auditory hindsight bias (AHB) occurs when people overestimate the decipherability of perceptually degraded, aurally presented stimulus when they have prior knowledge of the stimulus' identity. AHB is robust and can account for such phenomena as lyrics seeming obviously clear to fans familiar with particular music, but indecipherable to naïve listeners. In the current research, we examined the role of associatively related primes on AHB. By one hypothesis, if a degraded target (e.g., spoon) is preceded by a related prime (e.g., fork), the prime should both facilitate target identification and also serve as an obvious source of identification success. Thus, related primes may cause participants to partially refrain from discounting hindsight knowledge, thus boosting AHB. However, we show that related primes decrease AHB, suggesting an alternative hypothesis such as discrepancy attribution (e.g., Whittlesea, 2002). We also present metacognitive calibration and resolution results, not typically examined in hindsight research.

Email: Philip A. Higham, [higham@soton.ac.uk](mailto:higham@soton.ac.uk)**10:40-10:55 (51)**

**Cognitive Load Eliminates Debiasing of Metacognitive Judgments of Association.** ERIN BUCHANAN, *Missouri State University*, WILLIAM S. MAKI, *University of Arizona* (Read by William S. Maki)—The associative strength binding two words is measured in the traditional free association (FA) task. In the associative judgment task, ratings of association show an inflationary bias. When plotted against FA probabilities, ratings fall along a linear function with a high intercept and a shallow slope (the JAM function). Last year, we reported that debiasing instructions focused on backwards associations, coupled with error correction training, reduced the intercept and sharpened the slope of the JAM function. However, debiasing did not reduce the amplifying effect of backward associations on associative judgments. We speculated that the debiasing effects were due to effortful processing that left the more automatic, backward association effects unchanged. In a new experiment, we evaluated that explanation. We manipulated cognitive load and debiasing instructions. Cognitive load by itself had no effect on associative judgments. Debiasing by itself again reduced the intercept and increased the slope of the JAM function. Cognitive load in conjunction with debiasing eliminated the debiasing effects. Debiasing appears to engage effortful, cognitive processes other than those required for associative judgments.

Email: William S. Maki, [wsmaki@gmail.com](mailto:wsmaki@gmail.com)**11:00-11:15 (52)**

**Does Monitoring Have A Dark Side? Reactivity in Judgments of Learning.** AINSLEY L. MITCHUM and COLLEEN M. KELLEY, *Florida State University* (Read by Colleen M. Kelley)—Does asking participants to monitor their performance alter the way metacognitive processes operate? Judgments of learning and other similar metacognitive judgments are recognized as a type of verbal report, and although reactivity is often a central concern in other verbal report methods (see Fox, Ericsson, & Best, 2011), surprisingly little work has specifically evaluated reactivity in JOLs. We present a series of experiments demonstrating that immediate JOLs are reactive under self-paced study conditions. Specifically, immediate JOLs change how participants allocate their self-paced study time, which in turn affects memory performance. We argue that this occurs because the expectation that a JOL will be requested for a given item changes participants' criteria for terminating study. Implications for theories of self-regulated study are discussed.

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11:20-11:35 (53)

**The Effect of Question Order on Evaluations of Test Performance at Different Grain Sizes.** YANA WEINSTEIN and HENRY L. ROEDIGER, *Washington University in St. Louis*—Weinstein and Roediger (2010) found that manipulating the order of questions on a general knowledge quiz resulted in differing evaluations of performance at the end of the quiz, with better performance predicted when questions were given in an easy to hard order. In the current experiment, participants were stopped 10 times throughout the quiz and asked to evaluate their performance on the last 10 questions they answered, as well as rating their impressions of the quiz so far and predicting their final performance. Arranging the questions from the easiest to the hardest produced more optimistic performance evaluations on each block than an analogous hard-easy question order. Furthermore, ratings of item difficulty on each block of 10 questions were asymmetrical in the two conditions, with a higher sensitivity to increasing as compared with decreasing question difficulty. Participants tended to anchor their judgments at the beginning of the test and did not update sufficiently to overcome their initial anchor, especially when early questions were easy. On the other hand, item-by-item ratings and predictions of final performance remained unaffected by question order.  
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11:40-11:55 (54)

**Noncriterial Recollection and Resolution of Episodic Feeling-of-Knowing Judgments.** CHRISTOPHER HERTZOG, ERIKA J. FULTON and STARLETTE SINCLAIR, *Georgia Institute of Technology*, JOHN DUNLOSKY, *Kent State University*—Hertzog, Dunlosky, & Sinclair (2010) reported that more repetitions of paired associates (PA) during study increased the subsequent resolution of episodic feeling-of-knowing judgments (FOK) for unrecalled items. We tested the hypothesis that noncriterial recollection of mediator features in the absence of target recall accounted for this effect. Individuals were instructed to use interactive imagery to learn the PA items and described their mediator after studying each item. Number of presentations and concreteness were within-subjects factors. After a 7-day delay, PA recall was tested. For each item, participants attempted target recall, mediator recall, and made an FOK. 4-alternative forced choice recognition tests were given in a later block. Number of presentations and concreteness affected FOKs and FOK resolution. Mediator recall coding was used to test whether accurate access to mediator features accounts for above-chance FOK resolution when target recall failed.  
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### Working Memory I

**Grand Ballroom C, Friday Morning, 10:00-11:55**

*Chaired by Robert H. Logie, University of Edinburgh*

10:00-10:15 (55)

**Multitasking: Multiple, Domain-Specific Cognitive Functions in A Virtual Environment.** ROBERT H. LOGIE and STEVEN L. TRAWLEY, *University of Edinburgh, UK*, ANNA S. LAW, *Liverpool John Moores University, UK*—Participants completed a set of diverse subtasks within a simulated shopping mall and office environment, the Edinburgh Virtual Errands Test (EVET). The aim was to investigate how different cognitive functions such as planning, retrospective and prospective memory, and visuo-spatial and verbal working memory contribute to everyday multitasking. Predictions were derived from a statistical model of multitasking impairments associated with frontal lobe lesions (Burgess et al., 2000). Multiple regression indicated significant independent contributions from measures of retrospective memory, visuo-spatial working memory and on-line planning. Structural Equation Modelling showed that the best fit from three constructs, with Memory and Planning having a weak link, but with both having a strong directional pathway to an Intent construct that reflected implementation of intentions. Participants who followed their pre-prepared plan achieved higher scores than those who altered their plan during multitask performance, regardless of whether the plan was efficient or poor. Results develop and extend the Burgess et al. (2000) model to healthy adults, and yield new insight into the poorly understood area of everyday multitasking.  
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10:20-10:35 (56)

**The Benefits of Interruptions During Complex Task Performance.** NANCY FRANKLIN, *Stony Brook University*, BENJAMIN SWETS, *Grand Valley State University*, LAZLO RING, *Northeastern University*, JULIA WRIGHT, *Grand Valley State University*, MICHAEL GREENSTEIN, ASA VICCELLIO, and BRADY PLASTARAS, *Stony Brook University*—Interruptions impair performance, but they happen constantly in chaotic environments like Emergency Rooms. Unlike the interruptions examined in the classic literature, in which interruptions typically distract participants from their primary task, interruptions in more complex, real-world environments are often relevant to suspended actions. Such relevant interruptions may serve to reduce demands on working memory and prospective memory by eliminating the need to monitor multiple aspects of complex situations. We developed computer-based simulation games that required parallel problem solving of multiple crimes (undergraduates) or multiple medical cases (physicians). We then manipulated the presence of interruptions that re-called the player to suspended tasks. Such interruptions led to better overall performance, as measured by total pieces of data collected and other measures of global efficiency. These results add to the classic view by examining an important type of interruptions the field has neglected: relevant ones.  
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10:40-10:55 (57)

**Motor Affordance and Visual Working Memory.** DIANE PECHER, *Erasmus University Rotterdam*—Do motor affordances play a role in visual working memory for objects? Prior neuro-imaging studies showed greater premotor cortex activation when participants remembered manipulable objects (e.g., hammer) than when they remembered non-manipulable objects (e.g., polar bear), suggesting that motor affordances form an additional component of working memory. In the present study participants held object pictures in working memory while performing concurrent tasks such as articulation of nonsense syllables and hand movements. Although concurrent tasks did interfere with working memory performance, in none of the experiments did I find any evidence that concurrent motor tasks affected memory differently for manipulable and non-manipulable objects. I conclude that motor affordances are not used for visual working memory.

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11:00-11:15 (58)

**Generalization of Working Memory Training To Complex Cognition?** THOMAS S. REDICK, *Georgia Insti. of Technology*, DAVID Z. HAMBRICK, *Michigan State*, ZACHERY SHIPSTEAD, TYLER L. HARRISON, KENNETH L. HICKS and RANDALL W. ENGLE, *Georgia Inst. of Technology* (Read by Randall W. Engle)—Recently, there have been numerous studies in the literature providing evidence for the benefits of working memory training. In a review of the training literature, Shipstead, Redick, and Engle (2010) concluded that there is reason to treat many results with a critical eye. Many of the existing studies have issues related to design (no-contact control groups, single measures of cognitive constructs) and to theory (identifying the mechanisms responsible for observed transfer). The current research compared young adults who received 20 sessions of practice on an adaptive dual n-back program or an adaptive visual search program with a no-contact control group that received no practice. In addition, all participants completed pre-test, mid-test, and post-test transfer sessions, in which multiple measures of multitasking, working memory capacity, fluid intelligence, crystallized intelligence, and perceptual speed were administered. The results indicated that despite improvements on both the dual n-back and visual search tasks, there was no indication of transfer to any of the cognitive abilities tests administered at mid-test or post-test. The results are discussed relative to previous research and for future studies of working memory training.

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11:20-11:35 (59)

**Component Analysis of Adaptive Working Memory Training.** BRADLEY S. GIBSON, DAWN M. GONDOLI, ANN C. JOHNSON, CHRISTINE M. STEEGER and REBECCA A. MORRISSEY, *University of Notre Dame*—Adaptive training of working memory (WM) using the Cogmed-RM intervention has recently been shown to enhance fluid IQ and to reduce the symptoms associated with ADHD. The present study was conducted to determine if specific components of WM could be targeted by training. According to the dual-component model, there are two dissociable functions of WM: (1) the active maintenance of a limited amount of information in primary memory (PM); and, (2) the retrieval of goal-relevant information from secondary memory (SM), after that information has been lost from PM (due to failures of active maintenance and/or storage limitations). Recent component analyses suggest that retrieval from SM may be especially critical for both fluid IQ and ADHD. However, a recent component analysis of the effects of WM training suggests that Cogmed-RM mainly enhances PM, not SM. The present study investigated whether the structure of the training exercises could be modified (from simple span exercises to complex span exercises) to enhance SM as well as PM. The results suggested that the use of complex span exercises is not sufficient to enhance SM. Additional modifications involving the adaptive algorithm will also be discussed.

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11:40-11:55 (60)

**Asymmetric Cross-Domain Interference Between Two Working Memory Tasks: Implications for Models of Working Memory.** CANDICE C. MOREY, RICHARD D. MOREY, MADELEINE VAN DER REIJDEN and MARGOT HOLWEG, *University of Groningen*—Modular models of working memory (e.g., Baddeley, 1986; Repovš & Baddeley, 2006) are supported by the observation of higher dual-task costs when stimuli come from a common domain than when stimuli differ by domain. We observe an asymmetric pattern of interference between verbal and visual-spatial tasks, such that increasing verbal memory load provoked a graded decrease in visual memory performance, but increasing visual memory load did not much affect verbal memory performance. Disproportionately rewarding participants for correct visual task responses did not reverse the asymmetric pattern of interference. We discuss our results in light of influential models of working memory, and consider whether these models could account for the asymmetric pattern we observed. Embedded working memory models (e.g., Cowan, 2005; Oberauer, 2002) accommodate but do not predict this finding, while modular models cannot account for this finding without modification.

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**Reasoning and Judgment****Metropolitan B, Friday Morning, 10:20-11:55***Chaired by Valerie F. Reyna, Cornell University***10:20-10:35 (61)**

**The Gist of Delay Discounting: Neurobiology and Representation.** VALERIE F. REYNA, EVAN WILHELMS, PRISCILA BRUST, WILSON SUI and SETH PARDO, *Cornell University*—Discounting of later larger rewards, relative to sooner smaller ones, predicts outcomes such as obesity and alcohol use. Psychophysical theories posit discount rates that differ across individuals. However, according to fuzzy trace theory, discounting the future depends on neurobiological characteristics and how decision options are represented: as quantitative tradeoffs (compensatory thinking) between delay and reward or as qualitative or categorical gist (noncompensatory thinking). Categorical gist should be associated with healthier behavior. 867 subjects responded to: (a) choices between sooner smaller or later larger rewards involving food, alcohol, or money, (b) 27 item Kirby discounting scale, (c) sensation seeking scale, and (d) single-item gist scales for food, alcohol, or money with options such as “now is always better than later.” Single-item gist scales were distinct from neurobiological measures and correlated with more elaborate measures of discounting. Gist scales also significantly predicted problem behaviors (Adolescent Risk Questionnaire; Alcohol Use Disorders Identification Test; Spendthrift Scale). “Advanced” decision makers did not trade off time and reward magnitude, consistent with fuzzy trace theory.

Email: Valerie F. Reyna, [vr53@cornell.edu](mailto:vr53@cornell.edu)**10:40-10:55 (62)**

**Can't Hardly Wait: Ego Depletion Selectively Modulates Delay Discounting.** CHRISTIAN C. LUHMANN, *Stony Brook University*—Delay discounting refers to decision-makers' tendency to value immediately-available goods more than identical goods available only after some delay. Contrary to normative prescriptions, decision-makers tend to exhibit patience when selecting between pairs of rewards available far in the future but lose patience as time passes and ultimately reverse their preferences. These preference reversals have been explained by assuming that discount functions are hyperbolic (rather than exponential as normatively prescribed). Here, we employ a pretest-posttest design to examine the influence of an unrelated executive control task on discounting behavior. Our results demonstrate that depleting executive control does not, in general, produce more impatient choices. Instead, depletion induces “more hyperbolic” choice behavior, thus increasing the likelihood of irrational preference reversals. These findings suggest that executive control plays a critical role in shaping temporal preferences and, more generally, demonstrates that economic preferences may be labile and not the rigid, trait-like properties typically assumed. Instead, these preferences may be better thought of as a manifestation of malleable cognitive processes.

Email: Christian C. Luhmann, [christian.luhmann@stonybrook.edu](mailto:christian.luhmann@stonybrook.edu)**11:00-11:15 (63)**

**Judging From Experience: Experienced Sequences are Predicted Better Than Described Sequences.** PETKO KUSEV, *Kingston University London/City University London*, PAUL VAN SCHAİK, *Teesside University*, ASGEIR JULIUSSON, *City University London*, YVETTE KILEY, *Kingston University London*—When attempting to predict future events, people commonly rely on historical data. Events in a time series can be experienced sequentially (dynamic mode), as in learning about decisions from experience (e.g., Kusev et al., in press, JEP:HPP), or, as with learning about decisions from descriptions, they can also be retrospectively viewed holistically (static mode) – not experienced individually in real time. In one experiment, we studied the influence of presentation mode (dynamic and static) on three sorts of judgments: (i) predictions of the next event (forecast), (ii) estimation of the average value of all the events in the presented series (average) and (iii) judged satisfaction of workers given that the series represented their monthly income (satisfaction). Relative to the static mode participants' responses in dynamic mode were anchored on more recent events for all three types of judgments but with different consequences – hence dynamic presentation improved prediction accuracy, but not estimation.

Email: Petko Kusev, [p.kusev@kingston.ac.uk](mailto:p.kusev@kingston.ac.uk)**11:20-11:35 (64)**

**Reasoning with Conjunctive Causes.** BOB REHDER, *New York University*—Conjunctive causes are causes that all need to be present for an effect to occur. They contrast with independent causes that by themselves can each bring about an effect. We extend existing “causal power” representations of independent causes to include a representation of conjunctive causes. We then demonstrate how independent vs. conjunctive representations imply sharply different patterns of reasoning (e.g., explaining away effects for independent causes as compared to exoneration effects for conjunctive causes). An experiment testing how people reason with independent and conjunctive causes found that their inferences generally matched the model's prediction, albeit with some important exceptions.

Email: Bob Rehder, [bob.rehder@nyu.edu](mailto:bob.rehder@nyu.edu)**11:40-11:55 (65)**

**Reasoning About Abstract and Social Rules Differs Qualitatively, Not Quantitatively.** JOHN P. TAYLOR, *Southern Oregon University*—Researchers have previously suggested that we reason better about social contracts than about abstract rules and that this is not due to previous experience but an inherent, evolved cognitive module that may have arisen to protect us from being cheated in social interactions. Our original intent was to rule out the possibility that observed effects might be due to instructional differences between abstract and social rules.

We presented participants with rules that were abstract, about social contracts, and about social contracts involving harm to people. Participants were then instructed to test the rule or check for a violation of the rule by turning over the correct two out of four “cards” presented digitally on a screen that would test the rule or check for a violation. We discovered that when checking for violations, compared to testing the rule, performance improved. However, this wasn't sufficient to explain the difference between reasoning about abstract and social contract rules. A subsequent two-alternative, one-choice version of the same task revealed that shifts in reasoning followed a global pattern, rather than an improvement in reasoning that is localized to social contracts.

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### Animal Cognition

**Grand Ballroom D, Friday Afternoon, 1:30-3:05**

*Chaired by Michael F. Brown, Villanova University*

**1:30-1:45 (66)**

**Social Modeling of Spatial Choice in Rats.** MICHAEL F. BROWN, TEAGAN A. BISBING, JUSTIN M. SAYDE and JARED M. BATTERMAN, *Villanova University*—Social influences on spatial choice were examined by training “Model” rats to search for food in one side of an arena and testing them with “Subject” rats that found food on different sides of the arena on different trials. During half of the trials the rats were tested separately. During the other half a Subject was test together with a Model, with the food on the side of the arena appropriate for that Model rat. Subject rats learned to use both the location of discovered food and the location of the Model rat as discriminative cues for which side of the arena was baited on any particular trial. The former cues were sufficient to guide subsequent spatial choices by the Subject rats. The effect of social cues on spatial choices by the Subject rats depended on the informational properties of spatial cues from the perspectives of both the Subject and Model rats.

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**1:50-2:05 (67)**

**A Rodent Model of Episodic Memory.** JONATHON D. CRYSTAL, WENYI ZHOU and WESLEY T. ALFORD, *Indiana University*—We recently showed that rats remember specific past episodes (Zhou & Crystal, 2009, 2011). To validate this candidate model of episodic memory, we proposed that rats should pass two other tests. In the first test, we asked if rats represent the origin–source–of information. We developed an animal model of external source monitoring by asking if rats can discriminate self-generated (walking along a runway, encountering food) and experimenter-generated (placement at a food site without walking) events. In the second test, we asked if rats can answer an unexpected question after incidental encoding. Rats were initially trained in Task 1 (win-shift search for food) and Task 2 (discriminate food vs. no-food).

Subsequently, they were unexpectedly asked to report if they had eaten or not in a Task-2 test. Rats exhibited source monitoring and answered unexpected questions. These experiments provide converging lines of evidence for a rodent model of episodic memory.

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**2:10-2:25 (68)**

### Effects of Posttraining Manipulations of the Overshadowing Landmark On Spatial Overshadowing.

JARED WONG and AARON P. BLAISDELL, *UCLA* (Read by Aaron P Blaisdell)—Spatial overshadowing is the impaired spatial control by a distal landmark X when trained in the presence of a more proximal landmark A. We test whether spatial overshadowing reflects an acquisition deficit (e.g., Rescorla & Wagner, 1972) or a performance deficit (e.g., Stout & Miller, 2008). In Phase 1, pigeons learned to find a food goal on a computer screen in the presence of compounds AX and BY separately, with A and B closer to the goal than X and Y. In Phase 2, A was extinguished by presenting it alone on the screen without reinforcement. Following extinction, tests of each landmark alone revealed strong spatial control by B but not by Y, replicating spatial overshadowing, and weak spatial control by A, indicating successful extinction. Spatial control by X, however, remained poor, suggesting that the overshadowing effect in our spatial paradigm reflects an acquisition deficit rather than an expression deficit.

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**2:30-2:45 (69)**

### Environmental Enrichment Effects On Reward Sensitivity.

KIMBERLY KIRKPATRICK, JACOB CLARKE and MARY E. CAIN, *Kansas State University*—Rearing in an enriched environment has been shown to decrease self-administration of substances such as amphetamine and cocaine. The present experiment assessed whether environmental enrichment would decrease sensitivity to food rewards. Three groups of rats were reared for 30 days, beginning at 21 days of age, in enriched, standard, or impoverished conditions (n = 8). Following enrichment, the rats were tested with a concurrent variable-interval 30-s schedule with different magnitudes of reward available on the two levers (1:1, 4:1, 2:1, 3:1, 3:2 and 4:2 or 1:1, 4:1, 4:2, 3:2, 3:1, and 2:1) to assess magnitude matching. Environmental enrichment produced a general decrease in sensitivity to reward, with the enriched rats under-matching their response rates to a greater degree than the impoverished rats. The results suggest that environmental enrichment may operate to reduce the sensitivity of the reward system to stimulation by a variety of reinforcers.

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2:50-3:05 (70)

**Signal Sequence and Inter-Signal-Interval Effects on Rats' 5-choice Serial Reaction Time.** VARAKINI PARAMESWARAN, SARA GALLANT, MICHAEL TAVOLIERI and JEROME COHEN, *University of Windsor* (Read by Jerome Cohen)—Rats and other animals (pigeons, monkeys and humans) typically display shorter reaction times to successively presented visual signals when they occur in a fixed than in a random pattern. This fixed SRT effect may reflect a type of rule-learning. We carried out a series of experiments to determine whether such a rule represents a set of successive spatial associations or a more automated motor response pattern. In some experiments, rats received blocks of fixed and random serial patterns of five successively presented lit nose poke keys. In other experiments rats always received a fixed pattern but were exposed to different inter-signal-intervals over sessions. Response time and errors (misses and incorrect nose pokes to unlit keys) were measured under these conditions. We present data that suggest the fixed SRT effect reflects more of an automated motor pattern than a deliberative set of spatial associations.

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### Action and Perception I

**Grand Ballroom C, Friday Afternoon, 1:30-3:05**

*Chaired by J. Devin McAuley, Michigan State University*

1:30-1:45 (71)

**Discrimination of Slowed Rhythms Mimics Beat Perception Impairments in Parkinson's Disease.** J. DEVIN MCAULEY and KARLI NAVE, JONATHAN WALTERS, AMELIA WIGGINS, *Michigan State University*—Simple auditory rhythms that induce the perception of a salient beat are better discriminated than more complex rhythms with a less salient beat. Supporting a role for cortical-striatal-thalamic circuitry in beat perception, individuals with Parkinson Disease (PD) do not show this beat-based advantage in rhythm discrimination. The present study examined rhythm discrimination for simple and complex rhythms presented at either a control tempo expected to produce a beat-based advantage or at a much slower tempo. Participants showed a reliable difference in the discrimination of simple and complex rhythms at the control tempo (i.e., they showed a beat-based advantage), but not at the slower tempo. Notably, performance on the slower rhythms was strikingly similar to the pattern previously observed for individuals with PD. Findings will be discussed in terms of a distinction between beat-based and interval-based modes of timing.

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1:50-2:05 (72)

**Action Alters Object Identification: Wielding A Gun Creates A Bias To See Guns.** JESSICA K. WITT, *Purdue University*, JAMES R. BROCKMOLE, *University of Notre Dame*—Individual variability in performance skill and intended behavior scales optical information when making

psychophysical judgments. To determine if this scaling extends to the identification of objects, we investigated whether people holding guns adopt different criteria to identify objects. While holding a gun or a neutral object, participants determined whether actors also held guns or neutral objects. Participants raised the object in their hand if they detected a gun and lowered it if they did not. Holding a gun resulted in stronger biases to report "gun present". This shift in criterion was absent when a gun was within participants' reach, but never used. The opportunity to use a gun therefore increases the likelihood an observer will classify objects in a scene as threats and exhibit threat-induced behavior (raising firearms to shoot). These findings have theoretical implications for event perception, object identification, and decision making, and practical implications for public safety.

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2:10-2:25 (73)

**Improved Visual Cognition Through Stroboscopic Training.** STEPHEN R. MITROFF, L. GREGORY APPELBAUM, JULIA E. SCHROEDER and MATTHEW S. CAIN, *Duke University*—Fast-paced activities, such as those involved in competitive sports, place great demands on vision. As such, much can be gained by enhancing visual cognition abilities. We provide evidence for improved performance via stroboscopic visual training. Individuals were divided into an experimental group that trained with stroboscopic eyewear and a control group that trained with identical eyewear that contained transparent lenses. The stroboscopic eyewear (Nike Strobes) was equipped with lenses that alternated between transparent and opaque states. Participants included Duke University varsity and club sport athletes and non-athletes. Training varied across these populations to suit the individuals, and ranged from 2 to 10 training sessions. Computer-based assessments were administered pre- and post-training. One assessment revealed lowered motion coherence thresholds for the experimental group, suggesting increased motion sensitivity. Another revealed an improved ability in the experimental group to accurately identify visual information that was presented for approximately 100ms. Along with other measures, these results suggest that stroboscopic training can improve visual cognition.

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2:30-2:45 (74)

**Planning for Object Displacements Requiring Walking and Reaching.** LANYUN GONG and DAVID A. ROSENBAUM, *Pennsylvania State University* (Read by David A. Rosenbaum)—How do we decide which paths to take to pick up and carry objects? What factors do we take into account, and what internal dynamics lead us to choose the paths we do? We describe experiments designed to reveal the relative importance of walking-related factors and reaching-related factors. Among the factors we studied were



how far to walk, how far to reach, and how far to carry. We used real-action tasks as well as virtual-action tasks in which decision times could be easily measured. The data indicate that reaching over some distance is judged more costly than walking over that same distance, that near objects are more likely to be picked up than far objects even if carrying distance is greater, and that decision times depend on the judged costs of the alternative actions.

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2:50-3:05 (75)

**Stimulus-Response Uncertainty Effects: Separating the Influence of Number of Effectors from that of the Number of Alternatives.** CHARLES E. WRIGHT and LEAH C. ACOSTA, *University of California, Irvine*—Response times (RTs) generally increase linearly with the logarithm of the number of stimulus-response alternatives (NA) – Hick’s Law. For keypress responses, RT typically increases by 80-150ms per NA doubling. However, for pointing responses the increase is much less, 0-10ms per NA doubling. Both these values increase dramatically when less direct stimulus-response mappings are used. One difference in these tasks is that with keypress responses the number of possible effectors (NE) is typically confounded with NA, while tasks with pointing responses always use the same effector. Here we report results from an experiment using pointing responses in which both NA and NE were manipulated. Doubling NE, with NA held constant, led to an RT increase of up to 15 ms per doubling. When NE was held constant and NA was varied between 2 and 16, RT increased by 2 ms to 14 ms per doubling, depending on NE. These results underscore the importance of effector selection, along with NA and S-R compatibility as sources of uncertainty effects. Still unexplained is why the sum of the NA and NE effects observed here with pointing responses still falls well short of that observed in similar tasks with keypress responses.

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### Judgment and Decision Making I

Willow AB, Friday Afternoon, 1:30-3:05

Chaired by X.T. Wang, *University of South Dakota*

1:30-1:45 (76)

**Predicting Choice Preference for Salary Options using Natural Reference Points.** X.T. WANG, *University of South Dakota*, PENG WANG, *East China Normal University*—Based on a Tri-Reference Point model of risky choice, we examined how natural and implicit reference points of Goal (G), Minimum Requirement (MR) and Status Quo (SQ) affect risk preference for different salary options. We first estimated the desired salary level (G), minimally required salary (MR), and the most likely salary level (SQ) for new college graduates working in Shanghai, China. We then designed fixed and variable salary options ranged within or across these implicit reference points. In three experiments, the participants chose either a variable salary option or its certainty equivalent based on the relationship between the settings of the reference points and the

distributions of the salary options. The participants preferred fixed option when the expected value of the salary options was above the MR and reversed the choice preference when the expected value was below the MR. Variable options were preferred when the outcome distributions spread over SQ and G but not when it spread over both MR and G, showing a priority of MR over G and failure aversion. These findings cannot be fully accounted for by a single-reference point model such as prospect theory. The practical implications for HR management are discussed.

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1:50-2:05 (77)

**Decision Rules and the Transformation of Perceptual Information Into Decision-Related Action.** COREY N. WHITE and RUSSELL A. POLDRACK, *University of Texas at Austin*—Perceptual decision making is thought to involve the accumulation of evidence toward boundaries representing the possible choices. We employed cognitive modeling and functional magnetic resonance imaging to explore this process with emphasis on the decision rule that is used to transform perceptual information into decision evidence. Participants performed perceptual discrimination tasks in the scanner in which two types of stimuli, lines or patches of dots, were identified as large or small. The size of the decision rule (midpoint) was manipulated between blocks. The data were modeled with a drift-diffusion model and the parameters were used to create modulated regressors corresponding to decision evidence, difficulty, and the size of the decision rule. Distinct regions of cortex were identified that corresponded to the stimulus size, decision rule size, decision evidence, and motor response. The results provide insight into the neural systems involved in transforming perceptual information into decision-related action.

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2:10-2:25 (78)

**Framing Effects in Ambiguous Risk Decision Making.** PAUL WHITNEY, JOHN M. HINSON and PETER J. ROSEN, *Washington State University*—The finding that framing decisions in terms of gains promotes risk aversion and framing in terms of losses promotes risk-taking comes from studies in which risks are stated as known probabilities. Many popular tasks, such as the Iowa Gambling Task (IGT), involve choices whose risk is initially ambiguous, with the risks associated with choices becoming better known as gains and losses are accumulated. There is little research on framing in tasks such as the IGT where risks are ambiguous, and where the evaluation of risk changes over time. We modified the IGT to provide a sure alternative, framed as a gain or loss, allowing us to examine the impact of framing when risks were ambiguous, and later when risks were better known based on actual choices. Even though ambiguous risks are considered especially aversive, participants were twice as likely to take a risk when the sure option was a loss.

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2:30-2:45 (79)

**Using Bayesian Statistics for Evaluating the Adaptive Toolbox Approach.** BENJAMIN SCHEIBEHENNE and JÖRG RIESKAMP, *University of Basel*, ERIC JAN WAGENMAKERS, *University of Amsterdam* (Read by Jörg Rieskamp)—Many theories in psychology assume that people possess a repertoire of strategies from which they choose when making decisions or solving problems. While this concept of a cognitive "toolbox" provides a feasible way to account for intra- and interindividual differences, it suffers from the epistemological problem on how rigorously to test and compare toolbox models as a whole. Furthermore, it is unclear how many strategies should be included into a toolbox in the first place. Towards this goal, Bayesian methods can be applied to develop a criterion to constrain the number of possible strategies. The applicability of this approach is demonstrated by means of parameter recovery simulations and analysis of empirical data in a decision making context. The approach is further extended by showing how cognitive toolboxes can be tested against alternative theories, both on the individual and on the group-level. The suggested Bayesian evaluation method should stimulate necessary comparisons between a toolbox approach and alternative perspectives to cognition. Email: Jörg Rieskamp, [joerg.rieskamp@unibas.ch](mailto:joerg.rieskamp@unibas.ch)

2:50-3:05 (80)

**Alternatives to Discounting in Intertemporal Choice.** JEFFREY R. STEVENS, *University of Nebraska-Lincoln*—Standard models of intertemporal choice assume that individuals discount, or subjectively devalue, delayed rewards by integrating reward amounts and time delays to generate a discounted value for future rewards. An alternative group of models suggests that individuals compare attributes (reward amounts and time delays) instead of options. Here, I tested hyperbolic and exponential discounting models against several attribute-based models adapted for intertemporal choice (proportional difference, weighted ratio, priority heuristic, and similarity models). I collected intertemporal choices and similarity judgments for the reward amounts and time delays in two experiments. In general, the hyperbolic discounting model slightly outperformed other models in predicting choice, but the proportional difference and similarity models predicted almost as well. When restricting the analysis to situations in which the similarity model made deterministic predictions, it predicted the data much better than the other models. Thus, attribute-based models such as proportional difference, weighted ratio, and similarity models provide alternatives to discounting and offer insight into the process of making intertemporal choices. Email: Jeffrey R. Stevens, [jeffrey.r.stevens@gmail.com](mailto:jeffrey.r.stevens@gmail.com)

Spatial Cognition

Metropolitan B, Friday Afternoon, 1:30-3:05

Chaired by Maria Kozhevnikov, *Harvard Medical School*

1:30-1:45 (81)

**Three Distinct Types of Spatial Navigation Strategies and their Assessment.** MARIA KOZHEVNIKOV, *Harvard Medical School*, JIMMY ZHONG, *National University of Singapore*—A new instrument, the Navigational Strategy Questionnaire (NSQ), was designed to assess individual differences on three scales measuring different navigational strategies: spatial updating, survey, and landmark/procedural strategies. We administered the NCQ and a number of spatial and navigational tasks to 150 participants, who were also asked to draw sketch maps of large-scale familiar environments. While those individuals who scored the highest on the spatial updating scale of the NSQ relied on egocentric frames of references during encoding of spatial information and drew accurate first-person perspective 3D sketch-maps, the individuals who scored the highest on the survey scale of the NSQ relied on allocentric spatial frames and drew accurate 2D survey-type representations of environments from eye-bird (3rd person) perspective. The results imply the existence of a distinct spatial updating navigational strategy and argue for the importance of its assessment, in contrast to previous navigational questionnaires measuring survey and landmark/procedural strategies only.

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1:50-2:05 (82)

**Social Aspects of Wayfinding.** BEVERLY ROSKOS and J. HENRY MCKEEN, *University of Alabama*—Successful wayfinding involves not only cognitive abilities, but also social abilities. After all, when we find ourselves in an unfamiliar environment and our GPS devices or directions are inaccurate, we often seek help from others. In a series of three studies, we investigated the social aspects of wayfinding. In the first study, participants were asked to recall a situation in which they were lost or disoriented. They wrote an essay about that experience, which was coded for environmental setting, mention of confusing environmental characteristics, and frustration with their own abilities. In addition, they indicated how they became "unlost." Most often, participants called others for help. In the other studies, participants' willingness to ask and give directions was investigated. General anxiety and self-reported sense of direction predicted both asking for and giving directions. There was an interaction with gender depending on whether the other person was known or a stranger.

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2:10-2:25 (83)

**Think3-D: An Elementary-Age Curriculum to Train Spatial Thinking.** HOLLY A. TAYLOR and ALLYSON HUTTON, *Tufts University*—Elementary school seems a critical time to develop spatial thinking critical to STEM success. The hippocampus, which sub-serves spatial skills, shows developmental changes during elementary school (Gogtay, et al., 2006). Further, spatial thinking can be trained (Wright, et al., 2008). Yet, elementary school curriculum leaves out spatial thinking (NRC, 2006). We developed and tested a spatial thinking curriculum based on origami and pop-up paper engineering (Think3-D). Built on cognitive principles, pairs of successive lessons give children tools and understanding and then ask them to use this understanding for exploration and experimentation. Between-lesson challenges fostered practice and innovation. Evaluations, conducted at the beginning, middle, and end of the six-week curriculum, focused on general spatial thinking skills. Results showed gains in spatial thinking for Think3D participants compared to controls. Students' overwhelming critique asked for "more": more sessions and more time in sessions. Results suggest a promising and inherently compelling way to get elementary-aged children thinking spatially.

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2:30-2:45 (84)

**Effects of Shifting Point of View on Memory for Location.** DOUGLAS H. WEDELL and ADAM T. HUTCHESON, *University of South Carolina*—Cues have been demonstrated to have minimal effects on memory for location when orientation to the task field is constant, but to have strong effects on error and bias measures when the task field is rotated on some trials. The current research examines the effects of cues on memory when changing between allocentric and egocentric viewpoints on different trials. On each trial, participants viewed a location in a circular arena from either an allocentric perspective (map) or an egocentric perspective (ground-level view). After a short delay, they reproduced the location using either the same or different perspective. Cues were manipulated between subjects, appearing at either north-south locations or east-west locations outside the arena. Large effects of cues on errors were observed in all four encoding by retrieval conditions. These results support the idea that cues are used to encode location when orientation to the spatial layout is expected to change.

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2:50-3:05 (85)

**What Can the Configuration-error Paradigm Tell Us?** RANXIAO FRANCES WANG, *University of Illinois at Urbana-Champaign*—The configuration-error paradigm was originally developed by Wang & Spelke (2000) to examine whether the relationship in people's pointing responses to multiple targets is impaired by disorientation. They found that configuration errors, which was defined as

the standard deviation of the signed angular errors to individual targets, increased when people were disoriented, and proposed an egocentric updating model to account for these results. This paradigm was adopted by recent research as a way to distinguish between egocentric and allocentric representations, which is a mis-interpretation of this paradigm. The underlying assumptions and theoretical implications of this paradigm will be discussed.

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### Letter and Word Processing I

**Metropolitan A, Friday Afternoon, 1:30-3:25**

*Chaired by Michael McCloskey, Johns Hopkins University*

1:30-1:45 (86)

**Form and Functions of Orthotactic Knowledge.** MICHAEL MCCLOSKEY and COLIN WILSON, *Johns Hopkins University*, SIMON FISCHER-BAUM, *University of Illinois*, DON MATHIS, AMANDA GLASSER and SATYAM GHODASARA *Johns Hopkins University*—Orthotactic constraints in a language govern the permissible combinations of letters in written words, and thereby define the set of possible written words in the language. We present initial results from a project aimed at understanding the form of orthotactic knowledge in English, and the functions of this knowledge in lexical processing. First, we first argue that despite the close relationship between orthotactics and phonotactics, orthotactic constraints are not entirely reducible to phonotactic constraints. In support of this claim we present evidence that phonologically equivalent letter strings (e.g., *crel* and *crell*) vary systematically in orthotactic acceptability. Second, we argue that the representational resources of simple n-gram models are inadequate for formulating orthotactic constraints, suggesting the need to posit richer representations (e.g., representations specifying syllabic role as well as letter identity). Finally, we present evidence from normal individuals and brain-damaged patients concerning the roles of orthotactic knowledge in reading and spelling.

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1:50-2:05 (87)

**ERP Effects of Morpheme Detection and Morphological Decomposition.** JOANNA MORRIS, *Hampshire College*, JONATHAN GRAINGER, *CNRS, Universite de Provence*, PHILLIP HOLCOMB, *Tufts University*—Recent masked priming studies suggest that morphological decomposition is performed prelexically on the basis of the orthographic properties of the word form. However, there are few studies that directly measure responses to complex words, with the aim of identifying decomposition related activity. In this study, using a single word lexical decision task, we measured ERPs to nonwords and manipulated the morphemic status of their initial and final segments. Nonwords consisted of (a) a real word stem and legal affix, e.g. *top-ment*, (b) a real word stem and non-affix, e.g. *top-ire*, (c) a nonword stem and legal affix, e.g. *tod-ment*, and (d) a nonword stem and non-

affix, e.g. tod-ire. Our data show an early morpheme detection effect in frontal sites such that nonwords with embedded morphemes produce less negative-going waves (todment < todire; topire < todire), as well as an effect of full decomposition in the N400 time-window.

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#### 2:10-2:25 (88)

**Revealing the Temporal Dynamics of Lexical Processing Through ‘Changes of Mind’.** MATTHEW S. FINKBEINER, *Macquarie University*—Typical studies of lexical processing use mean reaction times (RT) as the dependent measure. While mean RTs are certainly useful, they are relatively insensitive to the dynamics of the effects under investigation. To address this, some researchers have begun using reaching trajectories as their dependent measure. The promise of this continuous measure is that it can reveal effects in real time; but this is only true if stimulus processing is still ongoing during the reaching movement. In this talk I will introduce a new “change of mind” (CofM) measure that identifies trials for which stimulus processing is still unfolding during the reaching response. I will demonstrate how the point at which the CofM occurs varies in time, direction, velocity and location for high- and low-frequency words. I will also argue that the onsets of the non-CofM trials can be used to reveal very early (~150ms) effects of lexical frequency.

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#### 2:30-2:45 (89)

**The British Lexicon Project.** EMMANUEL KEULEERS, *Ghent University, Belgium*, PAULA LACEY and KATHLEEN RASTLE, *Royal Holloway, University of London*, MARC BRYLSBAERT, *Ghent University, Belgium*—We present the data of the British Lexicon Project, a collection of lexical decision data for 28,730 monosyllabic and disyllabic English words. The BLP contains the trial-level data of 78 British participants, each of who responded to 14,365 words and the same number of non-words. This database fills an important gap between the Dutch Lexicon Project (Keuleers et al., 2010) and the English Lexicon Project (Balota et al., 2007) because it applies the repeated measures design of DLP to the English language. The high correlation between the BLP and ELP data indicates that a high percentage of variance in lexical decision datasets is systematic variance rather than noise, and that the results of megastudies are rather robust with respect to the selection and presentation of the stimuli. Because of its design, BLP makes the same powerful analyses possible as DLP, offering researchers with a new interesting dataset of word processing times for mixed effects analyses and mathematical modeling. We show that simulations using the BLP data can reliably replicate the results of effects previously reported in the visual word recognition.

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#### 2:50-3:05 (90)

**Investigating Incongruous Emotional Facilitation in Psychopathy using a Lexical Decision Task.** RACHEL GRIEVE and GERRY TEHAN, *University of Southern Queensland*—Previous research has established that psychopathic individuals display deficits in emotional processing, and yet are able to use emotion to their advantage. The aim of this study was to explore this anomaly by assessing the influence of psychopathy and interpersonal reactivity (empathy) on the accessibility of emotion related words in a lexical decision task. Participants completed measures of primary and secondary psychopathy, empathy, and a lexical decision task containing positive and negative emotion related words. Analysis was conducted using moderated multiple regression, considering the role of interpersonal reactivity as a moderating variable. Results provided mixed support for the hypotheses, with the findings highlighting the complex nature of emotional facilitation as a function of psychopathy. Possible underlying mechanisms are discussed.

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#### 3:10-3:25 (91)

**Lexical Decision of Abstract Emotional Hebrew Words in Young Adults.** RINAT ARMONY-SIVAN, ADI GALANTI, JANICE ELIJAH, ALIZA ELAZAR, HADAS EREL and HARVEY BABKOFF, *Ashkelon Academic College*—Previous studies have reported that emotional words impact response times in cognitive tasks. Although it is well established that response times to concrete words are faster than abstract words, mixed list of concrete and abstract emotional words were often used. The present study was undertaken to determine whether the emotional valence level of abstract words affected response times of young adults in a lexical decision task. Valence and arousal of 108 abstract Hebrew words were evaluated by using SAM rating scale (Lang, 1980), and subdivided into positive, neutral and negative groupings (positive,  $M=7.8\pm.60$ ; neutral,  $M=5.4\pm.59$ ; negative,  $M=2.4\pm.63$ ;  $p<.01$ ). Non-words were constructed from these words. Lexical decision task was performed by different participants. Response times to words were faster than to non-words (word,  $M=729\pm100$ ; non-words,  $M=818\pm102$  ms;  $p<.01$ ). Response times to positive words were shorter than neutral and negative words (positive,  $M=698\pm93$ ; negative,  $M=726\pm98$ ; neutral,  $M=745\pm100$  ms;  $p\leq.01$ ). Response times to negative words were not different from neutral words. These data indicate that young adult access positive abstract words more quickly than neutral or negative words.

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**Explicit Memory I****Grand Ballroom AB, Friday Afternoon, 1:30-3:25***Chaired by Henry L. Roediger, III, Washington University***1:30-1:45 (92)**

**Does Variable Encoding Affect Learning and Retention Relative To Constant Encoding.** HENRY L. ROEDIGER, III, JACOB B. SANCHES and POOJA K. AGARWAL, *Washington University in St. Louis*—The concept of encoding variability is widely applied to explain memory phenomena such as the spacing effect, but direct evidence for it is decidedly mixed. We conducted two experiments to manipulate variability of encoding either in terms of types of covert processing applied to words or by manipulating external presentation conditions. In Experiment 1, subjects were given different orienting tasks on the same words for 5 consecutive study/test trials (e.g., pleasantness ratings and 4 other tasks) to instantiate varied encoding, or they used the same orienting task on every trial (constant encoding). In Experiment 2, over 4 study/test trials, subjects in the varied encoding condition received the same concept as a written word read silently, a written word read aloud by the subject, a word heard in another voice, and a picture. This varied encoding condition was compared to constant encoding (e.g., words read silently over 4 trials). In both experiments, regardless of whether variation occurred in orienting tasks or in external presentation conditions, varied encoding produced no benefit in learning or in retention (measured 2 days later). Encoding variability is an attractive theoretical concept but seems empty.

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**Retrieval Practice Consolidates Practiced and Related Unpracticed Memories.** MAGDALENA ABEL and KARL-HEINZ T. BÄUML, *Department of Experimental Psychology, Regensburg University, Germany* (Read by Karl-Heinz T. Bäuml)—Retrieval practice on a subset of previously studied material typically improves later recall of the practiced material but impairs recall of related unpracticed material. Employing such retrieval-practice procedure, we examined practiced and unpracticed items' normal forgetting and interference susceptibility. Subjects studied a categorized item list and then repeatedly retrieved some items from some of the categories. In Experiment 1, subjects were tested after a short or a long retention interval; in Experiment 2, they were tested in the presence or the absence of a second study list, interpolated between retrieval practice and test. Recall of control items from unpracticed categories was reduced after the long retention interval and was reduced after study of the interpolated list, thus showing normal forgetting and interference susceptibility. In contrast, both effects were absent in practiced and unpracticed items. These results indicate that retrieval practice consolidates memories, both the practiced and related unpracticed memories.

Email: Karl-Heinz T. Bäuml, [karl-heinz.baeuml@psychologie.uni-regensburg.de](mailto:karl-heinz.baeuml@psychologie.uni-regensburg.de)**2:10-2:25 (94)**

**Second Generation: The Importance of Distinctive Retrieval Practice.** COLIN M. MACLEOD, *University of Waterloo*, MOLLY M. POTTRUFF, *McMaster University*, NOAH D. FORRIN, *University of Waterloo*—Two experiments investigated the influence of repetition in the context of the generation effect. In both experiments, subjects studied words once or twice. Once-studied words were read or they were generated from a definition. Twice-studied words were either read both times, generated both times, or read once and generated once. Free recall was best after generating twice, then after generating plus reading, and finally after generating once; any generation was better than reading. Recognition showed a similar pattern except that reading plus generating was just as effective as generating twice and the benefit of generating twice was not as striking as in recall. The overall pattern of results suggests that a first generation practices retrieval and produces a distinctive encoding whose benefit is enhanced substantially by subsequent retrieval practice during a second generation.

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**Interrupting Stories with Free-Recall Tests Reduces Retention of Subsequent Events.** MICHAEL D. PATTERSON and WANTING LOW, *Nanyang Technological University*—Free-recall tests boost longer retention of brief prose-passages (Roediger & Karpicke, 2006). However, in previous studies, free-recall was performed following the passages. In the current experiment we examined whether free-recall also improves memory when interrupting a prose-passage. Each participant read six short stories, divided equally into three conditions: free-recall immediately following each story, in the middle of each story, and no free-recall (only passive-reading). After reading all stories, participants performed a short intervening task, and then a multiple-choice test of memory retention for the stories. Retention for the second half of the story was reduced in the story-interrupting free-recall condition compared to passive-reading, or free-recall immediately after the story. Retention for the first half of the story was unaffected by free-recall. These results indicate that free-recall interrupting a story may interfere with the ability to encode or consolidate subsequent information; studies using longer delay periods are underway to examine this hypothesis.

Email: Michael D. Patterson, [mdpatterson@ntu.edu.sg](mailto:mdpatterson@ntu.edu.sg)**2:50-3:05 (96)**

**Effects of Delay on Prospective Memory.** BOB UTTL, JOANNA MCDOUALL and CARRIE A. LEONARD, *Mount Royal University*—Unique function of prospective memory proper (ProM proper or episodic ProM) is to bring back to awareness previously formed plan at the right time and place. Vigilance differs from ProM proper in that the plan remains in consciousness. Using new continuous

measures of ProM, we examined the effect of a delay between ProM instructions and an ongoing task start and a delay between the ongoing task start to the appearance of the first ProM cue on ProM task performance. The results showed that both delays influenced ProM task performance, supporting the distinction between ProM proper and vigilance/monitoring.

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### 3:10-3:25 (97)

**A Negative Effect of Repetition On Free Recall.** DANIEL PETERSON, *Knox College*, NEIL W. MULLIGAN, *University of North Carolina* (Read by Neil W. Mulligan)—There is perhaps no more basic phenomenon in human memory than the repetition effect: greater long-term memory for repeated stimuli. We present an interesting violation of this pattern in which a twice-presented stimulus produces worse free recall than a once-presented stimulus. The stimuli were a set of rhyming word pairs (e.g., Moon – Spoon) in which the second word from each pair came from one of a small set of categories (e.g., Utensils). One group was initially presented with the word pairs in a random order, and then a second time in which the word pairs were blocked by the category of the second word. Another group was presented only with the second ordering of the word pairs. Participants then recalled the second word from each pair, and the group given a single exposure to the word pairs recalled more items. The initial presentation of the word pairs appears to have retarded the encoding of the useful organization scheme present in the second presentation of the list. The result is analyzed in terms of item-specific and relational information in memory.

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### Visual Attention

#### Grand Ballroom C, Friday Afternoon, 3:30-5:25

*Chaired by Todd S. Horowitz, Brigham and Women's Hospital*

### 3:30-3:45 (98)

**Tracking As A Continuous Visual Working Memory Task.** TODD S. HOROWITZ, *Brigham and Women's Hospital*—Classical accounts assume that multiple object tracking is a purely spatial task, involving spatial indexes, spatial attention, or spatial grouping processes which encode little or no information about target features. Yet the ability to track the positions of multiple targets but not their identity would be a pyrrhic accomplishment by the visual system. Indeed, multiple identity tracking experiments demonstrate that the visual system does know which objects are where. I will describe studies demonstrating that identity (featural) and spatial information are encoded in a common representation during tracking. Prioritizing location information reduces fidelity of identity information and vice versa. Improving encoding of identity information frees up space for positional information. Electrophysiological, and neuroimaging studies demonstrate a substantial overlap between the brain networks implicated in visual working

memory tasks and those implicated in tracking (particularly in intraparietal sulcus); though tracking evokes additional activity presumably reflecting updating processes. Tracking can be seen as a continuous visual working memory task; alternatively, we can see visual working memory as a degenerate tracking task.

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### 3:50-4:05 (99)

**The Feature-Binding Question Is An Ill-Posed Question.** VINCENT DI LOLLO, *Simon Fraser University*—The binding problem arises when one feature of an object, such as its shape, is to be associated with another feature, such as its colour, to yield a veridical representation of that object. Here I propose that the binding problem arises only when the sequence of information processing events is regarded as strictly feed-forward. The binding problem simply does not arise within a framework in which perceptions arise from iterative exchanges between brain regions linked by two-way pathways. The initial feed-forward sweep activates a large number of perceptual hypotheses at higher levels. The perceptual hypotheses then descend through reentrant pathways to the lower levels where they attempt to match themselves to the pattern of ongoing activity through a process of correlation. Matches that yield low correlations are discarded, while the hypothesis that yields the highest correlation is confirmed and eventually leads to conscious awareness. In such a reentrant system, there is no separate binding process that actively assigns features to objects: binding is inherent in the workings of the system. Within such a reentrant processing system, the binding question becomes an ill-posed question.

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### 4:10-4:25 (100)

**Its All in Your Head: Distractor Interference Produced By Top Down Expectations.** YEHOOSHUA TSAL and ROTEM AVITAL, *Tel Aviv University*—In the frequently used flanker task the unintentional processing of to-be-ignored distractors is assumed to be largely dictated by bottom up processes, where features of incongruent distractors penetrate and automatically activate the representation of the opposite response category. In a series of experiments we show that such interference can be completely governed by top down expectations. For example, in responding to one of two possible targets (S vs. O) the same ambiguous distractor, i.e., S-5 hybrid produced substantial interference in responding to an O target when subjects expected letters as distractors but no interference at all when expecting digits as distractors. The nature of interaction between top down and bottom up processes in producing unattended perceptual representations will be discussed.

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**4:30-4:45 (101)**

**Active Suppression of Salient Distractors.** RISA SAWAKI and STEVEN J. LUCK, *University of California, Davis* (Read by Steven J. Luck)—Some investigators argue that salient stimuli capture attention automatically, whereas others propose that capture is contingent on top-down control settings. We propose an intermediate alternative: Salient objects automatically generate an “attend-to-me” signal, but top-down control mechanisms can be used to suppress this signal and avoid capture of attention. By this account, the absence of capture is a consequence of successful top-down suppression. To test this account, we have used the N2pc and Pd ERP components as indices of capture and suppression, respectively. Under many conditions, we find that salient distractor stimuli do not capture attention (as indexed by N2pc), but are instead actively suppressed (as indexed by Pd). Moreover, trial-to-trial variations in top-down control (indexed by prefrontal theta activity) can lead to capture on some trials (indexed by N2pc and slow RTs) and suppression on other trials (indexed by Pd and fast RTs). Thus, salience is automatic, but the allocation of attention is under top-down control. Email: Steven J. Luck, [sjluck@ucdavis.edu](mailto:sjluck@ucdavis.edu)

**4:50-5:05 (102)**

**Reward's Impact on Saccadic Eye Movements.** WIESKE VAN ZOEST and CLAYTON HICKEY, *VU University Amsterdam*—Two experiments investigated the impact of reward on saccadic trajectory. In one, participants made a pro-saccade to a target in the presence of an irrelevant color distractor. In the other, participants completed a task based on the oculomotor capture paradigm. In both cases results show that saccadic trajectories are impacted by the prior reward history of target and distractor stimuli. When the eyes are rapidly deployed, they curve towards a reward-associated distractor and oculomotor capture is more likely to occur. When deployment is slower, they curve away from a reward-associated distractor and the likelihood of capture decreases. This does not appear strategic in nature, as our experimental paradigm provides no opportunity for participants to establish a preference for any specific stimulus type. These results suggest that reward has a low-level facilitatory impact on distractor salience that causes a subsequent increase in the need for inhibition. Email: Wieske van Zoest, [w.van.zoest@psy.vu.nl](mailto:w.van.zoest@psy.vu.nl)

**5:10-5:25 (103)**

**Phasic Alerting of Developmental Dyslexics Improves Their Slow Attentional Shifting.** JEAN VROOMEN and LISELOTTE SCHELLEKENS, *Tilburg University*—We examined whether developmental dyslexic adults suffer from sluggish attention shifting by measuring the speed of their orienting of attention in a clock reading task (Vroomen & Keetels, JEP:HPP, in press) and a visual search task with dynamic cluttered displays (van der Burg, JEP:HPP, 2008). The visual latencies of dyslexics in the clock reading task were slower than those of normal readers. In both groups

alike, visual latency improved when the target was close rather than far from fixation, when the target was cued exogenously rather than endogenously, and when the cue was accompanied by a click sound rather than presented in silence. In the visual search task, dyslexics were also slower than normal readers and the slope of their search time per item was steeper. A click sound improved the search time for both groups. These results indicate that dyslexics have problems in disengaging attention from the current fixation, and that the phasic alerting by a sound can overcome this deficit.

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**Perceptual Organization****Grand Ballroom D, Friday Afternoon, 3:30-5:05**

Chaired by Anne P. Hillstrom, *University of Portsmouth*

**3:30-3:45 (104)**

**Effect of Transparency on Recognition of Overlapping Objects.** ANNE P. HILLSTROM, HELEN R. SCHOLEY, HANNAH WAKEFIELD and MICHAEL TULL, *University of Portsmouth*—The perception literature is relatively silent about whether overlapping objects are easier to identify when the objects are transparent or opaque, but this issue is important in understanding whether transparency in displays such as X-ray images of luggage contributes to the difficulty in searching those images for targets. In transparent displays, there is a benefit of having extra information about the back object but a potential cost in having to interpret unfamiliar junctions at the region of overlap. Experiment found threshold durations at which adult participants could identify pairs of overlapping objects that were opaque or transparent. For the back object in the opaque displays, but not the front object, recognition was possible at shorter durations in transparent displays. Experiment 2 changed the nature of transparency to remove subtle cues about which objects was in front (which is closer to transparency in X-ray images), and found that threshold durations were slightly longer for transparent than for opaque objects. When gaze was tracked, no difference in image inspection was found for the different display conditions. Thus, the effect of transparency critically depends on whether it removes cues to parse objects.

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**3:50-4:05 (105)**

**Severe Loss of Instantaneous Information in a Dynamic Visual Surveillance Task.** CATHLEEN M. MOORE, *University of Iowa*, EMILY SKOW, *Simpson College*, LYNDSEY K. LANAGAN-LEITZEL, *Eastern Connecticut State University*, MOUNA ATTARHA, *University of Iowa*—We explored differences between visual search, where observers search static visual displays for a target stimulus, with visual surveillance, where observers monitor dynamic scenes over a period of time for target events. To do so, we adapted a visual search task in which observers searched for an oblique bar among vertical and horizontal distractor bars.

Under normal static conditions, this is an easy task. However, we added context frames prior to and after the target display, which changed the task into surveillance for a single state of the bars within an ongoing dynamic display. Specifically, line segments rotated into the critical-display positions and then rotated out of those positions. Observers tried to see the critical display and find the oblique bar among vertical and horizontal bars. The addition of this event context was devastating; performance was nearly at chance, despite the fact that it was a trivially easy task out of context. Follow-up experiments are exploring the relative contributions of local contour interference versus higher-level interference.

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#### 4:10-4:25 (106)

**Dissecting Perceptual Processes with a New Tri-Stable Reversible Figure.** GERALD M. LONG and JARED M. BATTERMAN, *Villanova University*—An unusual tri-stable reversible figure is described which, because of its striking instability and its simple structure, is especially revealing of the role of both bottom-up and top-down processes in determining observers' reports of the figure's organization. A series of experiments demonstrates the powerful effects of fixation location, afterimage presentation, prior adaptation, and instructions on observers' reports of the three possible organizations of the figure. Two dependent measures with the figure are used: (a) the first alternative reported upon figure presentation and (b) the number of times each of the three alternative organizations is reported in a 30-sec test period. In every case, the ability of a manipulation to selectively impact a particular organization of the figure is evident even with relatively unpracticed observers. The sensitivity of this tri-stable figure to manipulations of viewing conditions, stimulus variables, and instructions -- whose impact has been less clear and, at times, controversial in the reversible figure literature -- is emphasized.

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#### 4:30-4:45 (107)

**Perceptual Wholes Can Silence the Awareness of Their Changing Parts.** ERVIN POLJAC, LEE DE-WIT and JOHAN WAGEMANS, *University of Leuven* (Read by Johan Wagemans)—Humans can rapidly extract the gist of a given image despite surprising limitations in detecting changes to its individual parts. Suchow and Alvarez (2011, *Current Biology*) recently showed that the motion of a collection of dots could reduce ("silence") the conscious accessibility to color changes of those dots. We replicate this effect by demonstrating that color changes to moving dots making up a biological motion walker are less visible than the color changes of a static figure. Moreover, in an inverted biological motion figure (which is less interpretable as a perceptual whole or Gestalt) the same color changes are more visible than in an upright figure. This result suggests that the rapid extraction of a perceptual Gestalt, and the inaccessibility of the parts that make up that Gestalt, may

reflect two sides of the same coin whereby human vision provides only the most useful level of abstraction to conscious awareness.

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#### 4:50-5:05 (108)

**Indicating Direction Efficiently: A Few Pointers.** ANNA I. CRAGIN and ERIN SPARCK, *Rice University*, JAMES R. POMERANTZ, *Rice University* (Read by James R. Pomerantz)—When we want to point in a particular direction on a map or on a road, we commonly use arrows, Vs, or triangles. What makes these three stimuli so popular, and why don't we use seemingly comparable Ts or Ys to point? We examine whether stimuli point "naturally" by virtue of critical features like asymmetry, or whether we learn to associate stimuli with specific directions. We test pointing by having subjects (1) subjectively rate pointing; (2) navigate a maze as rapidly as possible with different pointers serving as road signs; (3) detect a target primed by different pointers. People agree that arrows point best, but their maze navigation tells a different story: Ss are almost as efficient navigating a maze using Ts as using arrows, a finding we explain by suggesting we may learn novel associations between stimuli and directions. We discuss implications for signage and GPS systems.

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#### Judgment and Decision Making II

**Willow AB, Friday Afternoon, 3:30-5:25**

*Chaired by Christopher R. Wolfe, Miami University*

#### 3:30-3:45 (109)

**Toward a Fuzzy Processing Preference Index.** CHRISTOPHER R. WOLFE and CHRISTOPHER R. FISHER, *Miami University*—Sometimes people have to integrate quantitative base rate information with qualitative textual information. Fuzzy-Trace Theory (FTT) predicts a general preference for processing at the fuzzy end of the fuzzy-verbatim continuum. However little is known about individual differences in this fuzzy processing preference. Four studies were conducted to develop a reliable and valid instrument consisting of 19 probability estimation items, and 5 "L-Scale" items to distinguish lazy patterns of responding from meaningful results. Formulae are used to compute a Verbatim and Gist score for each participant. Reliability, as assessed by Cronbach's Alpha, was consistently at or above 0.90. Validity is suggested by five findings: high and significant correlations between Verbatim scores and "Rule Based" scores using the Process Dissociation Procedure; significant correlations between Gist scores and the number of conjunctive and disjunctive fallacies on joint probability estimation problems; significant correlations with syllogistic reasoning problems between Verbatim and logic index scores, and between Gist and belief bias index scores; and high correlations between verbatim scores and odds ratios consistent with Bayesian inference

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3:50-4:05 (110)

**Hot Hand in Computer Games: Combining Measures of Performance and Task-Difficulty.** AMI EIDELS and PAUL WILLIAMS, *University of Newcastle, Australia*—The ‘Hot Hand’ phenomenon in basketball (Gilovitch, Vallone, & Tversky, 1985), or other sports, refers to the probability of making the next shot after a sequence of successful shot(s), compared to the probability of making the next shot after unsuccessful shot(s). While belief in the Hot Hand is common, empirical data from skilled-performance studies have largely failed to support this belief. According to one hypothesis, high confidence may lead players to attempt more difficult shots after successful shots. Potential Hot Hand effects may then be masked by increased difficulty. Because shot-difficulty can hardly be assessed in the field, we have designed cognitive tasks, in the form of computer games, to test if the Hot Hand exists in controlled environments. We extend on previous Hot Hand investigations by viewing performance in terms of both accuracy and task difficulty, with a particular focus on whether players take higher risks after successful trials. Email: Ami Eidels, [Ami.Eidels@newcastle.edu.au](mailto:Ami.Eidels@newcastle.edu.au)

4:10-4:25 (111)

**Communicating Forecast Uncertainty: Visualization Doesn't Always Help.** SUSAN JOSLYN and SONIA SAVELLI, *University of Washington*—Forecast uncertainty is complex, abstract and can be difficult for non-experts to understand. Many claim that understanding is facilitated by visualizations, however little empirical work supports these claims. The experiment reported here compares visualizations of the 80% predictive interval for temperature to verbal-numeric (text only) descriptions as well as to the conventional single-value deterministic forecast. Participants made temperature estimates and precautionary decisions for a sequence of forecasts. Those with predicative interval forecasts expected a narrower range of outcomes and made fewer risk seeking choices than did those with the deterministic forecast, regardless of whether visualizations were included. However, more than 20% of those using predictive interval visualizations misinterpreted them as a description of diurnal fluctuation (a deterministic forecast), which in turn influenced their decisions. Those using verbal-numeric descriptions made significantly fewer such errors. Contrary to popular belief, visualizations may NOT be advisable for expressing the abstract concept of uncertainty. Email: Susan Joslyn, [susani@uw.edu](mailto:susani@uw.edu)

4:30-4:45 (112)

**Repetition Priming: Is It More About Decision Making Than Memory.** JAMES SHANTEAU, *Kansas State University*—This research examines the relative impact of memory and decision-making processes for repetition priming in a question-answering task. The long-term goal is to relate these results to the development of expertise. I will discuss (1) some of the history and research on repetition priming, (2) the role that repetition priming may, or may

not, play in the performance of experts, and (3) a reanalysis of some empirical research using reaction times to analyze decision processes in question answering that revealed unexpected repetition priming.

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4:50-5:05 (113)

**The Robust Beauty of Ordinary information.** KONSTANTINOS KATSIKOPOULOS and LAEL J. SCHOOLER, *Max Planck Institute for Human Development*, RALPH HERTWIG, *University of Basel*—Heuristics embodying limited search and modest processing of information can yield robust performance relative to computationally more complex models. One criticism raised against the heuristics’ success is that complexity is hidden in the calculation of the cue order used to make predictions. In response, we discuss ways to order cues that do not entail individual learning. Then we propose and test the thesis that when orders are learned individually, people’s necessarily limited knowledge will curtail computational complexity while also achieving robustness. Using computer simulations we compare the performance of the take-the-best heuristic to benchmarks such as Naive Bayes in 19 environments. Even with minute sizes of training sets, take-the-best using continuous cues excels. For 10 environments, we probe people’s intuitions about the direction of the correlation between cues and criterion. Based on these intuitions, in most of the environments take-the-best achieves a level of performance expected for take-the-best with perfect knowledge of half of the environment. Thus, ordinary information about cues—either gleaned from small training sets or intuited—can support robust performance without requiring Herculean computations.

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5:10-5:25 (114)

**Comparability Effects in Probability Judgments: Evidence for a Sequential Sampling Process.** TIMOTHY J. PLESKAC, *Michigan State University*—Theories of subjective probabilities typically assume that accumulated evidence or support mediates the relationship between the event and the judgment. These theories assume the support for a particular hypothesis is independent of the alternative hypothesis. In a study where participants judged the likelihood of a bicyclist winning a race, I show that when people made judgments the evidence they garnered for a bicyclist winning depended on the comparability of the bicyclists. This comparability effect led to systematic violations in this independence assumption. These results are consistent with a computational model of probability judgments called Judgment Field Theory. JFT assumes evidence is accumulated over time via attention switching between the attributes of each hypothesis. Markers representing the overt judgments are placed across the evidence space. When evidence passes a marker there is a probability the judge stops and gives the respective estimate.

I show JFT accounts for both the violations in independence and the time course of judgments. JFT in combination with Decision Field Theory offers a single process account for judgment and decision making rather than a process for judgment and a process for decision.

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#### Working Memory II

**Metropolitan A, Friday Afternoon, 3:50-5:25**

*Chaired by Valerie Camos, Universite de Fribourg*

#### 3:50-4:05 (115)

**Does Level of Processing Impact Working Memory?** VALERIE CAMOS, *Universite de Fribourg*, LUCIE CORBIN, *Universite de Bourgogne*—It was long established that increasing the level of processing of memoranda favors their long-term retention. Recently, Rose et al. (2010) showed that such an effect differentiates long-term from working memory. In a complex span task, the increase of level of processing benefited delayed recognition test, but not immediate recall test. However, to vary the level of processing of memoranda, Rose et al. manipulated the nature of the task performed concurrently to maintenance, resulting in variation of attentional demand of this task. Because deeper level of processing was correlated with a reduced availability of attention for maintenance, the absence of level-of-processing effect could be due to this confound. The present study aimed at manipulating the level of processing of the memoranda independently from attentional demand of the concurrent task. As we predicted, when attention is available for maintenance, deeper level of processing of memoranda favored delayed but also immediate recall in a complex span task. However, when the availability of attention was reduced, the level-of-processing effect disappeared, replicating Rose et al. Thus, in working memory as in long-term memory, the level of processing affects performance.

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#### 4:10-4:25 (116)

**Serial STM for Pseudoword Lists in English and Italian: Stress Position and Phonological Similarity matter.** ELISABET SERVICE, *McMaster University*, MARCELLA FERRARI and PAOLA PALLADINO, *University of Pavia*—The characteristics of phonological memory are best studied with pseudoword lists, avoiding massive effects of lexical origin. Previous results from Finnish suggested a special cue value for first syllables. Finnish always puts main lexical stress on the first syllable. In English, stress in three-syllable words is mostly on the first syllable whereas Italian default stress is on the second syllable. Experiment 1 showed that recall of lists of three-syllable English pseudowords was harmed if they shared the first syllable and had first-syllable stress but helped if stress was on the second syllable. Experiments 2 and 3 showed that in Italian, recall was harmed if items shared the second syllable and irrespective of similarity if stress was on the first syllable.

The results also suggest that recall of individual syllables in pseudoword lists is influenced by both language-specific effects of main stress and the discriminatory cue value of the previous syllable

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#### 4:30-4:45 (117)

**Effects of Irrelevant Speech on Immediate Forward and Backward Serial Recall.** GEORGINA A. TOLAN and GABRIELLE LUSIS, *Australian Catholic University*, GERALD TEHAN, *University of Southern Queensland*—This study intended to extend the Bireta et al. (2010) findings who failed to demonstrate the irrelevant speech effect for backward serial recall of strings of letters. Thirty adults participated in this study and word lists were used as recall stimuli. Like Bireta et al. the irrelevant speech effect emerged for lists of words under immediate forward serial recall, that is, performance under silent conditions was better than during irrelevant speech. Results did not replicate the Bireta et al. findings; instead irrelevant speech effects were observed for lists of words on an immediate backward serial recall task, that is, more words were recalled under silent conditions than during irrelevant speech. Overall, there was no difference in performance between immediate forward and backward serial recall. This is contrary to several previous findings (e.g., Farrand & Jones, 1996) but consistent with the Bireta et al. results.

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#### 4:50-5:05 (118)

**Chunking in Working Memory Does Not Depend on Rehearsal.** ANGELA M. AUBUCHON and NELSON COWAN, *University of Missouri* (Read by Nelson Cowan)—In working memory tasks, the advantages of chunking (grouping items together) and rehearsal (covert pronunciation of items) are well known. There has been little investigation, however, of the relation between these mnemonic processes. Forming new chunks or reactivating familiar chunks in memory may or may not require rehearsal. We report response time data from the verbal recall of picture series (Experiment 1) and reconstruction of order of these pictures in each series (Experiment 2), to identify chunks of familiar information. Specifically, relatively long inter-item response lags were taken to indicate the locations of boundaries between chunks. To isolate the use of chunking, some participants were required to engage in articulatory suppression, which prevents rehearsal, during encoding of the series. Both for series of unrelated pictures and for series of previously-learned picture triads, the evidence for chunking was at least as prevalent with rehearsal prevented as it was with rehearsal allowed.

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5:10-5:25 (119)

**Local and Asymmetric Effects of Free Time Benefits in Complex Span.** SIMON FARRELL, *University of Bristol*, KLAUS OBERAUER, *University of Zurich*, MARTIN GREAVES and KAZIMIR PASIECZNIK, *University of Bristol*, STEPHAN LEWANDOWSKY, *University of Western Australia* CHRIS JARROLD, *University of Bristol*—Evidence from the complex span task indicates that any free time after processing operations can be used to offset the detrimental effects of the distracting activity. We tested two competing hypotheses about the beneficial effects of free time: that free time allows for the refreshing of memory traces that decayed during the distracting activity; and that free time is used to remove distractors that have been encoded by virtue of having been processed. In several experiments the density of processing was varied within lists, such that one burst of processing following an item on the list was particularly dense or particularly undemanding. The density of the distractor burst had a greater effect on the immediately preceding item (a locality effect) and affected recall of items that had not yet been presented. Both findings are consistent with the distractor removal hypothesis, and the latter is troublesome for the view that decay is offset by refreshing.

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#### Cognitive Aging

**Metropolitan B, Friday Afternoon, 3:30-5:25**

*Chaired by Moshe Naveh-Benjamin, University of Missouri*

3:30-3:45 (120)

**Assessing the Associative Memory Deficit of Older Adults in Long-Term and Short-Term/Working Memory.** MOSHE NAVEH-BENJAMIN and TINA CHEN, *University of Missouri*—Older adults exhibit a deficit in associative long-term memory relative to younger adults. However, the literature is less conclusive regarding whether this deficit exists in short-term memory or working memory. To elucidate the issue, three experiments assessed younger and older adults' item and associative memory in both short- and long-term memory. In Experiment 1, participants were tested on item and associative recognition memory with both long-term and short-term retention intervals using a continuous recognition paradigm. There was an associative deficit for older adults in the short-term as well as the long-term intervals. In Experiment 2, only short-term intervals were used, and blocking the test did not attenuate the age-related associative deficit seen in the mixed test blocks. Finally, in Experiment 3, an age-related associative deficit was found when study material was presented both sequentially and simultaneously. Overall, the associative deficit of older adults is evident in long-term as well as in short-term/working memory.

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3:50-4:05 (121)

**Cognitive Decline in Aging: Can ICT and Social Networking Compensate?** SOLEDAD BALLESTEROS, MAYAS JULIA, JOSÉ M. REALES, MANUEL SEBASTIÁN and PILAR TORIL, *Universidad Nacional de Educación a Distancia*—Aging is a complex phenomenon that affects all individuals. We report results from a study in which young and older participants (healthy adults and mild cognitive impaired elders-MCI) were assessed in a series of cognitive tasks. Young adults performed better than older adults in executive-control and speeded processing tasks but not in a repetition priming task for attended and unattended stimuli at encoding. The MCI group performed worse in all tasks and did not show repetition priming effects. There is evidence that an engaged and active lifestyle enhance cognitive functioning (Hertzog et al., 2009; Park et al., 2007). Here, we investigate the effectiveness of social integration, connectivity, and mental stimulation through a user-sensitive home-based information computing technology (ICT) environment and a web-based social networking system (AGNES) to compensate cognitive losses in later adulthood. Reducing social isolation and providing stimulating and active environments are expected to preserve and/or improve cognitive and brain functioning, especially of those processes that suffer more with aging. Cognitive-enrichment effects will be discussed.

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4:10-4:25 (122)

**Aging and the Speed-Accuracy Tradeoff: A Model-Based Analysis of Neuroanatomical Data.** BIRTE U. FORSTMANN, *University of Amsterdam*, MARC TITTEMEYER, *Max Planck Institute for Neurological Research, Cologne, Germany*, E-J. WAGENMAKERS, *University of Amsterdam*, JAN DERRFUSS and DAVID IMPERATI, *Max Planck Institute for Neurological Research, Cologne, Germany*, SCOTT D. BROWN, *University of Newcastle, Australia* (Read by Scott D. Brown)—Even in simple tasks, older adults take more time to respond than young adults. One reason for this is that older adults are reluctant to commit errors, a cautious attitude that prompts them to accumulate more information before making a decision. This hypothesis suggests that age-related slowing may be partly due to a voluntary, strategic choice by the elderly participants to be more careful. We investigated the neuroanatomical and neurocognitive bases of age-related slowing in a perceptual decision-making task. Mathematical modeling of the behavioral data confirmed that cueing for speed selectively lowered response thresholds, but that it did so to a lesser extent in the elderly than in the young. Comparing individual model parameters estimated from the behavioral data with diffusion weighted structural images showed that the detrimental effect of age on threshold flexibility was partially mediated by white matter integrity in cortico-striatal tracts that connect the pre-

SMA to the striatum, consistent with current theories about neuroanatomical decision networks. This suggests that the older peoples' more cautious attitude to simple decisions may not be entirely voluntary, but instead might reflect a neuroanatomical limitation.

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#### 4:30-4:45 (123)

**Emotionally Arousing Sounds Increase Short-Term Recall of High Contrast Visual Stimuli in Younger and Older Adults.** MATTHEW R. SUTHERLAND and MARA MATHER, *University of Southern California* (Read by Mara Mather)—Arousal-biased competition theory (Mather & Sutherland, 2011) posits that arousal increases the mental dominance of perceptually salient stimuli, while decreasing mental representations of competing stimuli. In several experiments we tested this hypothesis by having participants listen to arousing or neutral sounds followed by a brief visual presentation of letters. Some letters were more salient (printed in dark grey) than others (printed in light grey). On arousing trials, younger adults recalled more high contrast letters but fewer low contrast letters than on non-arousing trials, indicating that arousal both enhanced processing of high priority stimuli and inhibited processing of low priority stimuli. Similarly, older adults showed an arousal-induced enhancement effect. However, older adults showed no significant arousal-induced inhibition effect. Together, these findings support the notion that arousal enhances processing of perceptually salient stimuli and suggest that there are age differences in how much arousal leads to inhibition of less salient stimuli.

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#### 4:50-5:05 (124)

**Deficit in Phonological Awareness Among Healthy Aging Adults.** LEAH FOSTICK, *Ariel University Center*, HARVEY BABKOFF, *Bar-Ilan University*—A common complaint among aging adults, even with normal hearing, is difficulty in speech perception, especially when speech is rapid or accompanied by noise. The deficit in speech perception is usually accompanied by an age-related reduction in temporal processing. In several other populations, such as dyslexic readers and sleep deprived young adults, the reduction in temporal processing has been accompanied by a reduction in phonological awareness. In the current study we tested whether the reduction in temporal processing among the elderly, is also accompanied by a reduction in phonological awareness. Healthy aging adults with normal hearing showed significant reduction: in (1) auditory temporal processing; (2) speech perception in speech noise; and (3) reading non-words and spoonerism. When compared to dyslexic readers, the elderly performed better at temporal processing and phonological awareness. No difference was found between the elderly and sleep deprived young adults.

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#### 5:10-5:25 (125)

**Modeling Episodic Memory Declines in Alzheimer's dementia and Mild Cognitive Impairment: Differential Characterization and Early Identification.** CHARLES J. BRAINERD, VALERIE F. REYNA, ANNA E. KENNEY, CAROLINE J. GROSS and EMILY S. TAUB, *Cornell University*—Using a new theoretical and modeling approach, we are able to characterize changes in episodic memory processes in normal aging, mild cognitive impairment (MCI), and Alzheimer's dementia (AD), providing a developmental picture of retrieval declines in healthy aging vs. neurocognitive impairment. Consistent with the predictions of fuzzy-trace theory, these retrieval declines successfully forecast future transitions from normal functioning to MCI, from MCI to AD, and from MCI back to normal functioning (misdiagnosis). They were also better predictors than the genetic marker of AD and MCI (the e4 allele of the APOE genotype). Relative to healthy controls, MCI subjects had lost recollective retrieval capability, but their ability to retrieve information via reconstruction was completely spared and so was the familiarity of reconstructed information. Relative to MCI subjects, AD subjects had lost reconstructive capability and reconstructed information was less familiar to them. This differential pattern of retrieval declines in MCI versus AD is consistent with the known developmental course of brain pathology in these conditions.

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#### Explicit Memory II

**Grand Ballroom AB, Friday Afternoon, 3:50-5:25**

*Chaired by Kerry A. Chalmers, University of Newcastle*

#### 3:50-4:05 (126)

**Memory for foils: Effects of depth of processing and word frequency.** KERRY A. CHALMERS, *University of Newcastle*—Jacoby, Shimizu, Velanova, and Rhodes (2005) investigated memory for foils using a three-phase (Study, Test 1, Test 2) recognition paradigm. Based on the finding that deep encoding at study (rating for pleasantness vs. counting vowels) facilitated recognition of items that were foils at Test 1, but targets at Test 2, Jacoby et al. proposed their theory of Source Constrained Retrieval (SCR). The present research investigated whether a word frequency manipulation would produce results similar to the depth-of-processing manipulation used by Jacoby et al. 60 undergraduate students were assigned to either a deep or shallow encoding condition (a direct replication of Jacoby et al.'s study) or an intentional encoding condition with a word frequency manipulation. Depth-of-processing produced similar results to those reported by Jacoby et al. Both word frequency and depth-of-processing interacted with test phase. Implications of the results for the theory of SCR are discussed.

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4:10-4:25 (127)

**Validating a Two-High-Threshold Measurement Model for Confidence Rating Data in Recognition.** ARNDT BRÖDER, *University of Mannheim*, JULIA SCHÜTZ and CONSTANZE ROHRMEIER, *University of Bonn*—Signal detection models (SDT) as well as the Two-high-threshold model (2HTM) have been used successfully as measurement models in recognition tasks to disentangle memory performance and response biases. A popular method in recognition memory is to elicit confidence judgments about the presumed old-new status of an item, allowing for the easy construction of ROCs. Since the 2HTM assumes fewer latent memory states than response options are available in confidence ratings, the 2HTM has to be extended by a mapping function which models individual rating scale usage. Unpublished data from 2 experiments in Bröder & Schütz (2009) validate the core memory parameters of the model, and 3 new experiments show that the response mapping parameters are selectively affected by manipulations intended to affect rating scale use, and this is independent of overall old-new bias.

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4:30-4:45 (128)

**Remember/Know Judgments in Free Recall.** JOHN T. WIXTED and LAURA MICKES, *UC San Diego*—Although typically used with recognition, a few studies have used the Remember/Know procedure with free recall. In each case, participants gave Know judgments to a significant number of recalled items (items that were presumably not remembered on the basis of familiarity). What do these Know judgments mean? We investigated this issue using a source memory/free-recall procedure. For each word recalled, participants were asked to (a) make a confidence rating on a 5-point scale, (b) make a Remember/Know judgment, and (c) recollect a source detail. Many Know judgments were made to words recalled with high confidence and high accuracy, but source memory for these words was at chance. These results correspond to what is found using recognition, and they raise the possibility that Know judgments indicate the cue-dependent retrieval of item information. This idea is close to Tulving's original view, and it suggests a new interpretation of the meaning of "familiarity."

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4:50-5:05 (129)

**The Function of Spontaneous Reminding.** DOUGLAS L. HINTZMAN, *University of Oregon*—Standard memory paradigms, in which subjects deliberately learn and then try to remember, have fostered the erroneous view that retrieval of conscious memories is usually a voluntary act. I briefly review evidence for involuntary reminding from memory-judgment experiments. I then argue that involuntary reminding occurs far more often in everyday life than has been suggested by diary studies. The recollective contents of reminders may provide clues to their function. On this

basis, I argue that reminders are clues to possible regularities in an uncertain world, and that the evolutionary purpose of memory was to develop and maintain a spatio-temporal record of our interactions with the environment.

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5:10-5:25 (130)

**Effects of Correspondence Between Encoding and Retrieval Organization in Part-List and in Collaborative Recall Paradigms.** LEONEL GARCIA-MARQUES, *University of Lisbon*, MARGARIDA V. GARRIDO, *ISCTE-Lisbon University Institute*, DAVID L. HAMILTON, *University of California, Santa Barbara*, MARIO A. FERREIRA, *University of Lisbon*—Memory research has shown that recall performance can be impaired when a part of the studied list is presented at recall (Slamecka, 1968) or when the recall is carried out in a collaborative way (Weldon & Bellinger, 1997). We varied the correspondence between item organization at encoding and at retrieval, either by manipulating the organization of part-list cues (Experiment 1) or by providing, at encoding, participants in the same collaborative-recall sessions with stimulus items that were organized in the same or in a different way (Experiment 2). Results showed that when the organization of the cues provided during recall, either by part-list cueing or by fellow collaborative group members, did not correspond to the organization of the stimulus items at encoding, recall was impaired. These results replicate the part-list cueing and the collaborative inhibition effects, respectively. However, when encoding and retrieval organization corresponded, these effects disappeared or were greatly reduced.

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### Implicit Learning and Memory

Metropolitan A, Saturday Morning, 8:00-9:35

Chaired by Randall K. Jamieson, *University of Manitoba*

8:00-8:15 (131)

**The Holographic Exemplar Model: A Retrospective Account of Judgement in the Artificial Grammar Task.** RANDALL K. JAMIESON, *University of Manitoba*—In an artificial grammar experiment, participants study strings of letters ordered according to the rules of an artificial grammar. At test, they are given the task of sorting novel grammatical from ungrammatical test strings. Whereas people sort the two classes of test items successfully, they fail to articulate the grammar. I present new data and a model to explain performance. The model's representation assumptions follow from Murdock's (1995) TODAM model. Each letter-string is a data structure constructed using recursive and noncommutative circular convolution. The model's retrieval assumptions follow from Hintzman's (1986) Minerva 2 model. Presenting a probe to memory retrieves items that are similar to it. Judgement of grammaticality is a function of the similarity between a probe and the aggregate of the retrieved items. The model

captures peoples' performance, assuming no knowledge of grammatical rules. I discuss the importance of stimulus representation for modeling learning of structure. I conclude that judgement of grammaticality is best understood as retrospective inference.

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8:20-8:35 (132)

**Multi-Sensory Statistical Learning Within and Across Time.** ARIT GLICKSOHN and ASHER COHEN, *The Hebrew University* (Read by Asher Cohen)—Statistical learning concerns detection of regularities distributed in space/time. We examine multi-sensory learning over time. In a preliminary experiment, subjects were familiarized with either a single visual stream composed of 'triplets' – reoccurring successive shapes, or a single auditory stream composed of 'words' – reoccurring syllables. Tests contrasting a triplet / word with random shapes / syllables revealed a similar rate of unisensory visual and auditory learning. In Experiments 2-3 Subjects were familiarized with a combined Audio-Visual stream, where each shape appeared simultaneously with a syllable, and each triplet uniquely matched a word. When subjects were tested on separate visual and auditory tests (Experiment 2), they showed a much reduced learning, particularly in the auditory domain. However, when subjects were tested on a multi-sensory test contrasting an old word-triplet combination with a novel word-triplet combination (Experiment 3), they showed a very high rate of learning. Subsequent experiments reveal that the strongest learning occurs between simultaneous stimuli either within or across senses, and that it can mask learning regularities across time within modalities. Multisensory learning across time is minimal. We suggest that learning requires grouping cues, and that temporal cues dominate other within-modality grouping cues.

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8:40-8:55 (133)

**Inhibition in Part-Set Cuing: Semantic and Episodic Effects on Lexical Decisions.** WILLIAM J. MUNTEAN and DANIEL R. KIMBALL, *University of Oklahoma* (Read by Daniel R. Kimball)—Part-set cuing—cueing memory with a subset of studied items—often impairs memory for the remaining items. Inhibition theory posits that part-set cues impair access to the representations of the remaining items themselves. To test the generality of this account, we investigated the effect on lexical decision RTs of part-set cues that bore an episodic and/or semantic relationship to studied words. Two groups studied lists comprising exemplars from multiple categories; part-set cues comprised either studied exemplars (semantically and episodically related to studied words) or unstudied exemplars from studied categories (semantically related only). Another group studied lists of unrelated words; part-set cues comprised studied words (episodically related only). Compared to uncued lists, lexical decision RTs were only

slower when part-set cues were both semantically and episodically related to studied words, challenging the generality of the inhibitory account. Modified inhibition accounts (e.g., episodic inhibition, Racsmany & Conway, 2006) are considered.

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9:00-9:15 (134)

**Going Gaga: Investigating the Song Stuck in My Head.** IRA E. HYMAN, NAOMI K. BURLAND, HOLLYANN M. DUSKIN, ALLISON F. GOTZ, MEGAN C. COOK and REBECCA F. ROUNDHILL, *Western Washington University*—Having a song stuck in one's head is a commonly experienced intrusive thought. We explored intrusive mental music using three different methodologies: a survey, diary studies, and manipulated experiments. Using the survey, we found that people report a variety of songs getting stuck, like the songs, know them well, and re-experience the music. Through the diary studies and experiments, we have also found that liked songs more frequently get stuck. In addition, we have evidence for a Zeigarnik effect: Songs that start to play in someone's head are very likely to return later as intrusive mental music. Like other intrusive thoughts and memories, songs usually return in response to particular environmental cues. The song stuck in my head phenomenon may provide an accessible means for studying intrusive thoughts.

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9:20-9:35 (135)

**Latent Inhibition in Flavor-Preference Conditioning.** GEOFFREY HALL, *University of York*, DAVID GARCIA and FELISA GONZALEZ, *University of Granada*—In 3 three experiments, using rats as the subjects, we investigated the effects of preexposure to the to-be-conditioned flavor on the acquisition (or expression) of a sucrose-based preference for that flavor. The results demonstrated the occurrence of a latent inhibition effect that was critically dependent on the motivational state of the animal at time of test (there was no effect if the animal was not hungry). These findings support the view that flavor-preference conditioning may involve a form of learning different from standard classical conditioning. Their implications for theories of latent inhibition will also be considered.

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#### Social and Emotional Aspects of Attention

Willow AB, Saturday Morning, 8:00-9:35

Chaired by Steven B. Most, *University of Delaware*

8:00-8:15 (136)

**How Emotional Distractors Impair Perception: A Mechanistic Distinction Between Emotion-Induced Blindness and the Attentional Blink.** STEVEN B. MOST and BRIANA L. KENNEDY, *University of Delaware*—Emotional distractors impair perception of targets that appear soon afterwards, an effect known as emotion-induced

blindness (EIB). Although EIB is phenomenally similar to the “attentional blink” (AB), here we present evidence that EIB and the AB differ mechanistically. Participants viewed rapid sequential presentations of images and, on each trial, identified the one image surrounded by a blue border. Either a neutral or emotional distractor appeared 3, 5, 7, or 9 serial positions before the target, and participants’ tendencies to misreport temporally neighboring items as the actual target were used to assess whether attentional selection was suppressed, delayed, or diffused following an emotional distractor. Whereas previous work found that all three temporal characteristics underlie the AB, we found that EIB is characterized only by attentional suppression. In addition to suggesting mechanistic differences between EIB and the AB, these findings support suggestions that EIB reflects spatiotemporal competition between targets and emotional distractors.

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#### 8:20-8:35 (137)

**Strategic Relevance Modulates The Threat Superiority Effect.** ISABELLE BLANCHETTE and FRÉDÉRIC LANGLOIS, *Université du Québec à Trois-Rivières*—We examined whether the threat superiority effect, the preferential allocation of attention towards threatening stimuli, is modulated by one important strategic factor: task relevance. We used a cueing paradigm where the threat value of cues was manipulated with an embedded evaluative conditioning procedure. Participants (N=58) completed one block where cues were irrelevant (50% valid trials) and one where cues were relevant (70% valid). Threatening cues attracted attention more than neutral cues only when cues were relevant. In the 70% valid condition, threatening cues led to an increased cueing effect (faster RTs for valid than invalid trials) compared to neutral cues. This was not the case in the 50% condition. This differential cognitive effect occurred despite increased skin conductance responses to conditioned threat cues in all conditions. Results question the automaticity of the threat superiority effect and show that it may be modulated by strategic factors, at least in non-anxious individuals.

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#### 8:40-8:55 (138)

**Speeded Processing of Primed Features During Emotional Arousal.** ARNI KRISTJÁNSSON and BERGLIND ÓLADÓTTIR, *University of Iceland*, STEVEN B. MOST, *University of Delaware*—Failures of attentional processing following presentation of emotion-inducing stimuli are well documented. Such stimuli also lead to automatic behavior. Will such automaticity following presentation of emotion inducing stimuli also occur for visual attention? A well-known automatic effect upon attention is priming of pop-out visual search. We presented emotion-inducing and neutral photographs in-between trials of pop-out visual search. Visual search performance was less efficient following presentation of emotional pictures

than neutral pictures, but the effect of target repetition (priming of pop-out) interacted with the effect of picture type such that performance became similar for the two picture types with increased priming. In extreme cases, for observers showing large effects of picture type, search performance following long between-trial priming build-up was more efficient following emotional pictures than following neutral pictures. Search performance is harmed following emotion inducing stimuli, but if observers perform the pre-potent (primed) task, this detrimental effect may be overcome.

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#### 9:00-9:15 (139)

**Keep Smiling! Positive Affect Reduces Cognitive Conflict and Behavioral Adjustment.** HENK VAN STEENBERGEN, GUIDO P.H. BAND, SERGE A.R.B. ROMBOUTS, SANDER NIEUWENHUIS and BERNHARD HOMMEL, *Leiden University* (Read by Bernhard Hommel)—Cognitive conflict plays an important role in tuning cognitive control to the situation at hand. But how do control systems know that a conflict exists? We discuss 3 experiments suggesting that conflict induces negative affect, which in turn triggers control operations: Experiment 1 showed that positive affect produced by unexpected reward can overwrite these affective signals and prevent adaptation and Experiment 2 demonstrated that inducing positive mood in a block-wise fashion has the same effect, independent of changes in arousal. Experiment 3, using fMRI, extended this observation to cartoon-induced humor. Humor had a systematic impact on the mesolimbic reward circuitry and modulated the anterior cingulate cortex (ACC)—the key region in registering conflict: it decreased in activation after funny as compared to neutral cartoons and predicted cognitive adaptation after neutral but not after funny cartoons. Moreover, the functional connectivity between ACC and reward-related areas was reduced after funny cartoons.

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#### 9:20-9:35 (140)

**Social Attention Effects Do Not Depend On Mental-state Attribution.** GEOFF G. COLE, *University of Essex*, DANIEL T. SMITH, *University of Durham*, REBECCA-HCLAIRE BILLING, *University of Essex*—Theory of mind is said to be possessed by an individual if they impute mental states to others. Some authors have argued that such mental-state attributions contribute to social attention phenomena in which observation of where an individual is looking can influence the observer’s response (i.e., perspective taking & gaze cuing). We assessed the mentalistic account of social attention by carrying out two perspective taking and three gaze cuing experiments. Critically, either the individual in the display (e.g., the gaze cuing face) could see the same thing as the participant (i.e., target) or had their view obstructed by a physical barrier. We found robust perspective taking and gaze cuing effects even when the

observed model in the display could not see the same thing as the participant. We argue that automatic shifts of attention induced by an observed individual can account for social attention findings rather than mental-state attribution.

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#### Event Cognition

**Grand Ballroom C, Saturday Morning, 8:00-9:55**

*Chaired by Gabriel A. Radvansky, University of Notre Dame*

**8:00-8:15 (141)**

**Event Boundaries Can Improve Memory.** GABRIEL A. RADVANSKY, ANDREA K. TAMPLIN, SABINE A. KRAWIETZ and ALEXIS N. THOMPSON, *University of Notre Dame*—One important aim of research on event cognition is to assess how the structure of information in events can influence various cognitive processes. The aim of this study was to assess how event structure can influence the ease with which information is remembered. Two experiments were done that explored the impact of event boundaries on memory. In one experiment, people studied 20 item word lists. For half of these lists, there was an event boundary (a change in location) halfway through. The task was to recall the entire list of words. In a second experiment, people read narratives. For half of these stories, there was an event boundary (of various types) halfway through. The task was to recall the stories after being given the title and the first sentence. The results of both of these experiments revealed that people remembered more, in both cases, when there was an event boundary compared to when there was not. This is interpreted in terms of how event boundaries are used to parse and organizing incoming information, and how this organizational structure can be exploited to aid in memory retrieval processes.

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**8:20-8:35 (142)**

**Attention to Manner of Motion and Moving Parts in Object Categorization.** ALAN W. KERSTEN, *Florida Atlantic University*—This research demonstrates that people spontaneously utilize manner of motion when categorizing objects, so long as they are attending to the relevant parts. Participants played a video game in which they shot down enemy creatures while allowing friendly creatures to pass through unharmed. Participants were instructed that the parts of the friendly creatures all matched in color, whereas one part of the enemy creatures mismatched. For half of the participants, the part that mismatched was a leg of the creature, whereas for half it was the head or tail. Participants were not instructed that the way a creature moved its legs in relation to its body was also diagnostic. To test whether participants utilized this manner of motion cue, catch trials were inserted in which enemy creatures moved like friendly creatures and vice versa. Participants for whom leg color was diagnostic were less accurate at shooting down enemy creatures when they moved like friendly creatures, even when participants revealed no explicit knowledge of the manner of motion cue. Participants for whom head and tail

color were diagnostic revealed no effect of the manner of motion cue. Implications will be discussed regarding the role of motion in object recognition.

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**8:40-8:55 (143)**

**Event Representation and Competition Between Distinct Representations of the Same Objects.** GERRY T. M. ALTMANN, *University of York*, NICHOLAS C. HINDY and EMILY KALENIK, *University of Pennsylvania*, YUKI KAMIDE, *University of Dundee*, GITTE JOERGENSEN, *University of York*, SHARON L. THOMPSON-SCHILL, *University of Pennsylvania*—On reading “the squirrel will crack the acorn” we must keep track of multiple representational instantiations of the acorn—before it was cracked and after. How do we maintain these distinct representations? We used fMRI to test the hypothesis that such multiple representations engender competition and conflict (relative to “the squirrel will sniff the acorn”). We monitored the effect of reading such sentences on left inferior frontal gyrus (IFG), previously demonstrated to be central in resolving competition. We observed increased activity in voxels in the left IFG that were associated with color conflict in a Stroop task. We also used eye movements and the visual world paradigm to test the hypothesis that this competition leads to a net reduction in activation of the object’s representation(s); we found that multiple instantiations of the same object reduce accessibility of that object.

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**9:00-9:15 (144)**

**Has Something Happened? Detecting Regime Change in Time Series Data.** NIGEL HARVEY, MATT TWYMAN and MAARTEN SPEEKENBRINK, *University College London*—Changes in the level, trend, variance or other feature of a data stream imply that something has happened to the process producing it. Such regime change may, in turn, indicate that some action needs to be taken or that some earlier action was or was not effective. We report experiments designed to investigate factors that influence people’s ability to detect regime change in time series data. In our first experiment, we varied the degree of positive first-order autocorrelation (AR1) in graphically presented noisy series and asked people to detect changes in the mean level of those series. Higher degrees of autocorrelation produced a higher false alarm rate but had negligible effect on miss rate. We also report results from follow-up experiments in which we examined the effects of higher order autocorrelation and data format (graphical versus tabular) on detection of changes in the mean level of series.

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9:20-9:35 (145)

**Acquiring Information from Film: Subtitles and Soundtrack Working Together (or Not).** RICHARD J. HARRIS, RACHEL PEOPLES and TYREL W. WILLIMON, *Kansas State University*—In a study of acquiring information from captions and soundtracks in film, participants watched a clip from *Sense and Sensibility* with either English Sound and Captions, English Sound + No Captions, No Sound + English Captions, English Sound + Thai Captions, English Sound + Korean Captions, English Sound + Portuguese Captions, or Portuguese Sound + English Captions and then performed a recognition memory test on their comprehension of the clip. Results showed that English Sound and Captions led to the best memory but that subtitles alone were better than sound alone. It was also better to have the subtitles in one's own language and the soundtrack in a foreign language than the reverse. Also, there was no evidence of a picture-sound processing trade off or a distraction effect from trying to read unfamiliar captions.

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9:40-9:55 (146)

**Memories of Parental Loss.** SAMI GULGOZ and PINAR OZTOP, *Koc University*—Memory for parental loss was studied as a type of traumatic memory investigating influences of participant age, age of memory, importance of loss, expectancy, and impact of loss. Interviews were conducted with 69 participants. When compared with memory of other sad events parental loss memories exhibited higher level of phenomenological characteristics. Childhood loss correlated more with physical and financial changes, whereas loss during adolescence was related to psychological changes. Loss experienced at earlier ages was correlated with greater impact on daily life. The level of surprise in loss related to life changes but not with any memory characteristics. Participants who experienced loss at an earlier age remembered it more vividly, although vividness decreased with time since loss. Loss with higher impact on physical circumstances and psychological well-being was remembered more frequently. Results suggest that memory of traumatic events rely on the consequences of the event rather than the event itself.

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### Memory Models

**Grand Ballroom AB, Saturday Morning, 8:00-9:35**

*Chaired by Sean M. Polyn, Vanderbilt University*

8:00-8:15 (147)

**Neural and Cognitive Dynamics of Source Context in Memory Search and Task-Switching.** SEAN M. POLYN, JAMES E. KRAGEL, KRISTEN E. MCCABE, JOSHUA D. MCCLUEY and NEAL W. MORTON, *Vanderbilt University*—The Context Maintenance and Retrieval model (CMR; Polyn et al., 2009) proposes that an internally maintained context representation, sensitive to the source characteristics of the studied material, guides memory

retrieval. Neural results using fMRI support the importance of source context: Patterns of task-related neural activity distinguish two encoding tasks during study, and task representations are reactivated during memory search when an item studied using a particular task is recalled. In two behavioral studies, we test whether the influence of source context persists in the face of disruption from an inter-item distraction task, as predicted by CMR. During free recall, we find that source organization is not diminished by math distraction. In contrast to several theories of task performance, we find that the switch cost elicited by the shift between two verbal encoding tasks persists despite the performance of several seconds of math distraction between the two verbal tasks.

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8:20-8:35 (148)

**Modeling Fan Effects on the Time Course of Associative Recognition.** DARRYL W. SCHNEIDER and JOHN R. ANDERSON, *Carnegie Mellon University*—We investigated the time course of associative recognition using the response signal procedure. We examined the effects of associative fan (the number of associations that an item has with other items in memory) on speed-accuracy tradeoff functions obtained in a previous response signal experiment involving briefly studied materials and in a new experiment involving well-learned materials. High fan lowered asymptotic accuracy and/or the rate of rise in accuracy across lags. We developed an ACT-R model for the response signal procedure to explain these effects. The model assumes that high fan results in weak associative activation that slows memory retrieval, thereby decreasing the probability that retrieval finishes in time and producing a speed-accuracy tradeoff function. The model provided an excellent account of the data, yielding quantitative fits that were as good as those of the best descriptive model for response signal data.

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8:40-8:55 (149)

**Categorization-based and Recognition-Based Memory Scanning.** ROBERT M. NOSOFSKY and STEPHEN E. DENTON, *Indiana University*—According to the exemplar-based random-walk (EBRW) model of memory scanning (Nosofsky, Little, Donkin, & Fific, 2011), categorization and recognition reflect the same psychological processes. Both involve a random-walk decision process driven by retrieved exemplars. Here, we test whether the EBRW accounts for both categorization- and recognition-based memory scanning, while allowing only for adaptive changes in criterion settings across tasks. Subjects are presented with memory sets composed of statistical distortions of a prototype that defines a category. At test, they are probed with either old members of the category, new statistical distortions of the prototype, or unrelated random patterns. Subjects are required to either categorize the test probes or to recognize them. The theoretical goal is to predict both the categorization and recognition choice probabilities and

response times as a function of fundamental variables such as size of the memory set, type of test probe, and the lag with which positive probes were presented. The work unites the previously disparate fields of perceptual categorization and memory scanning.

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#### 9:00-9:15 (150)

**Modeling Confidence and Response Time.** ROGER RATCLIFF, *The Ohio State University*, JEFFREY J. STARNES, *University of Massachusetts Amherst*—I describe a model for confidence judgments in perception and memory that deals with response confidence and response time distributions. The model assumes a distributed representation of memory strength and the areas between confidence criteria drive diffusion processes, one process for each confidence category. The new model updates an earlier model (Ratcliff & Starnes, 2009, *Psychological Review*) with a new decision mechanism in which when one accumulator takes a step up, the others take steps down so the sum of the steps down equals the size of the step up. The model is fit to recognition memory data including quantiles of RT distributions and ROC functions and the modification allows the model to fit changes in the position of RT distributions as a function of confidence. The model fits data from individual subjects and accounts for puzzling nonlinear z-ROC functions as well as other experimental manipulations.

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#### 9:20-9:35 (151)

**A Stochastic Detection and Retrieval Model for the Study of Metacognition.** YOONHEE JANG, *University of California, San Diego*, THOMAS S. WALLSTEN, *University of Maryland, College Park*, DAVID E. HUBER, *University of California, San Diego* (Read by David E. Huber)—We present a signal detection-like model termed the stochastic detection and retrieval model (SDRM) for use in studying metacognition. Focusing on paradigms that relate retrieval and confidence judgments, the SDRM measures (1) variance in the retrieval process; (2) variance in the confidence process; (3) the extent to which different sources of information underlie each response; (4) simple bias (i.e., increasing or decreasing confidence criteria across conditions); and (5) metacognitive bias (i.e., contraction or expansion of the confidence criteria across conditions). In contrast to gamma correlations, the SDRM can distinguish among all of these attributes. To demonstrate the SDRM's usefulness, we investigated Judgments of Learning (JOLs) followed by cued-recall. Through a series of nested and non-nested model comparisons applied to a new experiment, the SDRM determined that a reduction in variance during the JOL process is the most likely explanation of the delayed-JOL effect, and a tighter correlation between information underlying JOLs and recall is the most likely explanation of the testing-JOL effect.

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#### Perception II

#### Grand Ballroom D, Saturday Morning, 8:00-9:35

Chaired by Timothy L. Hubbard, *Texas Christian University*

#### 8:00-8:15 (152)

**Relative Velocity and Relative Strength of Illusory Line Motion.** TIMOTHY L. HUBBARD, *Texas Christian University*, SUSAN E. RUPPEL, *University of South Carolina, Upstate*—In illusory line motion (ILM), presentation of a cue is followed by presentation of a stationary line, and the line is perceived to "unfold" or "extend" away from the cue. Effects of expectations and uncertainty regarding where the cue or the line would be presented were measured in three experiments, and ratings of relative velocity of ILM and ratings of relative strength of ILM were collected. The findings were that (a) relative velocity and relative strength decreased with increases in stimulus onset asynchrony from 50 to 450 milliseconds, (b) relative velocity and relative strength were not influenced by whether ILM moved from one end of the line to the other or from both ends toward the middle of the line, (c) increased uncertainty regarding where the line would appear did not influence relative strength or relative velocity, and (d) valid pre-cues resulted in faster relative velocity than did invalid pre-cues, but pre-cue validity did not influence relative strength.

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#### 8:20-8:35 (153)

**The Focus of Attention Within the First Glance at a Scene.** MONICA S. CASTELHANO, *Queen's University*—The current study investigated where attention is deployed within the first glance at a scene and how this changes over time. I examined whether processing information from the foreground vs. background changes in priority over the duration of the first fixation. Participants viewed a class of scenes in which the central block of objects belong to one scene type (foreground), but the surrounding structure belongs to another scene type (background). Using the Contextual Bias paradigm (Castelhano & Henderson, 2008), target objects could be consistent with either the foreground, the background, or inconsistent with either part of the scene. Exposure duration was manipulated to examine which area was favoured over time. Contrary to previous studies, results revealed information in the foreground was prioritized over the background. Results will be discussed in terms of pre-attentive and attentive scene processing (Li et al., 2002; Wolfe et al., 2011).

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8:40-8:55 (154)

**Heuristic Spatial Updating Across Abrupt Perspective Changes in Dynamic Scenes.** MARKUS HUFF, *University of Tübingen*, STEPHAN SCHWAN, *Knowledge Media Research Center Tübingen*—Four experiments examined the mental integration of two viewpoints on dynamic scenes across filmic cuts. Stimuli consisted of two shots each showing a car driving by. They were ambiguous with regard to their interpretation: the cars could either drive in the same or in different directions. As the viewpoint deviation was 90° in either direction both interpretations were equally probable. However, in Experiment 1 participants preferred an interpretation that was inline with a heuristic hypothesis: If the cars shared the same screen direction participants responded with “same direction”. In Experiments 2 and 3, we replicated this result using stimuli that increased the likelihood of the non-heuristic interpretation by decreasing the corresponding viewpoint deviation to 60°. In Experiment 4, we introduced environmental cues that disambiguated the scenes such that the driving directions were either congruent or incongruent to the heuristic hypothesis. Whereas congruent stimuli replicated results of Experiment 1 incongruent stimuli led to the opposite interpretation. In addition, incongruent stimuli prolonged reaction times suggesting heuristic processes with congruent and alignment processes with incongruent stimuli.

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9:00-9:15 (155)

**Color, Music, and Emotion.** STEPHEN E. PALMER, THOMAS A. LANGLOIS, TAWNY TSANG and KAREN B. SCHLOSS, *U.C. Berkeley*, DANIEL J. LEVITIN, *McGill University*—Arnheim’s (1986) speculation that different aesthetic domains can be related through common emotional associations was tested by having Ps pick the 5 colors that went best (and the 5 that went worst) with 18 classical orchestral music selections defined by composer (Bach/Mozart/Brahms), tempo (slow/medium/fast), and mode (major/minor). Ps also rated each musical selection and each color for its emotional associations (happy-sad, lively-dreary, strong-weak, angry-calm). Faster music in the major mode was associated with lighter, more saturated, yellower colors, whereas slower music in the minor mode was associated with darker, desaturated, bluer colors. Better-controlled musical samples (single-line Mozart piano melodies) produced more refined mappings between music and colors. Emotional mediation was suggested by very high correlations (.89 to .98) between emotional ratings of the music and emotional ratings of the associated colors (e.g., happy colors go with happy music and dreary colors go with dreary music). Emotional mediation was confirmed by finding similarly high correlations when people picked the colors that went best/worst with emotional faces and body poses.

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9:20-9:35 (156)

**Auditory Perceptual Learning through Multimodal Training.** ESTELLA H. LIU and BARBARA A. CHURCH and EDUARDO MERCADO III, *University at Buffalo, The State University of New York* (Read by Eduardo Mercado III)—Training individuals to make fine distinctions among similar stimuli can gradually increase their ability to recognize such distinctions. Although such training traditionally has involved unimodal discrimination tasks, recent work suggests that training with redundant multimodal stimuli can facilitate perceptual learning. We examined how multimodal training impacted perceptual learning associated with detecting small differences in the amplitude modulation of sounds. Participants were trained to detect increasing or decreasing amplitude modulation either with or without concurrent presentations of growing or shrinking disks. Multimodal training led to faster and more robust learning than unimodal training, after a single session of training. The benefits of multimodal training were only evident when visual and auditory changes were congruent. These results suggest that multimodal perceptual training with stimuli that reflect statistical regularities in the environment can augment perceptual learning.

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### Bilingualism

**Metropolitan B, Saturday Morning, 8:00-9:55**

Chaired by Kenneth Paap, *San Francisco State University*

8:00-8:15 (157)

**There Is No Bilingual Advantage in Executive Processing for Young Adults.** KENNETH PAAP, JENESIS IMAI, CARLOS URTECHO, EDGAR ALCAINE, JAMES KEENAN, *San Francisco State University*—Building on the study we reported last year three large-scale studies compared bilinguals to monolinguals on 11 measures of executive attention, monitoring, and switching in non-verbal tasks. Each measure compares a neutral or congruent baseline to an attention-demanding condition. For each of the 11 measures there was no main effect of group and a highly significant main effect of the amount of attention required. The critical marker for a bilingual advantage in executive processing, the Group x Attention interaction, was never significant. Tasks include Anti-saccade (Study 1), Simon (Studies 1, 2, & 3), Flanker (Study 3), and Switching (Studies 1, 2, and 3). The Switching task yields both measures of mixing costs and switching costs. For the Simon and Flanker task performance was analyzed across three blocks and although there was a main effect of block (responses became faster), there was never a Group x Attention x Block interaction. Participants were all SFSU students and the vast majority were psychology majors. The two groups performed identically on the Ravens Advanced Matrices test. In an English language task of Homograph Suppression (Study 2) that presumably requires substantial conflict resolution there was a bilingual disadvantage even if the groups were perfectly matched on overall task accuracy.

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8:20-8:35 (158)

**Cross-Language Similarity in Second Language Learning: An Eye-Tracking Study.** ALBA TUNINETTI, NATASHA TOKOWICZ and TESSA WARREN, *University of Pittsburgh* (Read by Natasha Tokowicz)—How do second-language learners process second language (L2) syntax? Using online (eye-tracking) and offline (grammaticality judgment) measures, we examine how L2 learners of English process grammaticality in syntactic structures that are formed similarly or differently in L1 and L2. Native Arabic and native Mandarin Chinese speakers who were studying English as an L2 read grammatical and ungrammatical English sentences. Their reading behavior was compared to that of monolingual English speakers. L2 learners showed greater sensitivity when ungrammatical structures were formed similarly across languages than when they were formed differently, in accordance with positive transfer models. Native English speakers showed sensitivity to all types of ungrammatical sentences. These results provide important considerations for models of second language acquisition and bilingualism, such as the Unified Competition Model (MacWhinney, 2005) and the Shallow Structure Hypothesis (Clahsen & Felser, 2006). Email: Natasha Tokowicz, [tokowicz@pitt.edu](mailto:tokowicz@pitt.edu)

8:40-8:55 (159)

**The Bilingual Re-Ordered Access Model of Homonym Processing.** ANA I. SCHWARTZ, *University of Texas at El Paso*, ANA B. AREAS DA LUZ FONTES, *Universidade Federal do Rio Grande do Sul*—A new model of bilingual homonym processing is proposed. The Bilingual ReOrdered Access Model (B-RAM), an extension of the monolingual Re-Ordered Access Model (Duffy et al., 1988), assumes that the time-course of homonym meaning activation for bilinguals is influenced by the relative frequency of the meaning, contextual support and cross-language lexical activation. I will present eye-movement data from highly-proficient Spanish-English bilinguals reading English sentences containing homonyms that were either cognates with Spanish) or non-cognates as well as non-homonym cognates and non-cognates. In neutral contexts processing times reflected competition between the subordinate and dominant meanings for the homonym cognates only, suggesting that the additional activation of the subordinate meaning from the non-target language allowed it to compete early with the dominant meaning. This competition was eliminated in contexts biasing the subordinate meaning, suggesting convergent activation across languages and from context allowed competition to be bypassed, a pattern opposite that for non-cognate homonyms. Email: Anna I. Schwartz, [aischwartz@utep.edu](mailto:aischwartz@utep.edu)

9:00-9:15 (160)

**Knowledge of a Second Language Influences Auditory Word Recognition in the Native Language.** WOUTER DUYCK, EVELYNE LAGROU and ROBERT J. HARTSUIKER, *Ghent University*—Few studies have

addressed whether lexical access in bilingual auditory word recognition is language selective. In the present study, we investigated whether listening to a second language (L2) is influenced by knowledge of the native language (L1) and vice versa. Additionally, we investigated whether the listener's selectivity of lexical access is influenced by the speaker's L1. With this aim, Dutch-English bilinguals completed an English (Experiment 1) and a Dutch (Experiment 3) auditory lexical decision task. As a control, the English auditory lexical decision task was also completed by English monolinguals (Experiment 2). Targets were pronounced by a native Dutch speaker with English as the L2 (Experiments 1A, 2A, and 3A) or by a native English speaker with Dutch as the L2 (Experiments 1B, 2B, and 3B). In all experiments, Dutch-English bilinguals recognized interlingual homophones (e.g., lief [sweet]–leaf /li:f/) significantly slower than matched control words, whereas the English monolinguals showed no effect. These results indicate (a) non-selective lexical access in bilingual auditory word recognition (b) language-specific subphonological cues do not annul cross-lingual interactions.

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9:20-9:35 (161)

**Qualitative Differences in Semantic Processing During Native and Non-Native Sentence Comprehension as Revealed by ERPs.** CHERYL A. FRENCK-MESTRE, *Centre National de Recherche Scientifique*, HAYDEE CARRASCO, *Université de Provence*, SNEED ELISA, *SIM University*—Debate has long waged over the underlying linguistic processes revealed by the various ERP components. In particular, the significance of the P600 has been a polemic topic. Recently, several studies have shown that the violation of thematic constraints can provoke a P600 effect. Herein we provide clear evidence that purely semantic anomalies can elicit a P600 effect in addition to the classical N400 effect. The P600 was observed, however, only in native speakers. For non-native speakers, whereas a classical N400 was found to semantic violations no subsequent P600 appeared. This pattern was found in 3 independent experiments with independent participant populations (3 groups of French native speakers, 2 groups of English-French learners and a group of Spanish-French learners) as well as for various semantic manipulations, attesting to the robust nature of the finding. These data imply that the P600 is a hallmark of revision processes but is in no way limited to the computation of syntactic dependencies. Moreover, the difference in ERP patterns for native and non-native processing provides novel information about how the two groups may differ as concerns their capacity to deploy attention during on-line processing.

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9:40-9:55 (162)

**What Predicts Faster Literacy Acquisition in a Second Language?** RAM FROST, ALONA NARKISS, LIRON AFEK and NOAM SIEGELMAN, *Hebrew University of Jerusalem*—The process of learning a second language involves not only the acquisition of another lexicon, but also the assimilation of novel statistical regularities, which are characteristic to the new acquired language. By this theoretical approach, a significant barrier to attainment of proficiency in a foreign language concerns the degree of dissimilarity between the statistical properties of the native language and the newly acquired one. Using a longitudinal approach, we tracked the process of Hebrew reading acquisition of young adults whose native language was English, mapping their increased assimilation of Semitic root structure, as revealed by morphological priming. We were specifically concerned with individual differences predicting fast acquisition of Semitic reading markers. Consonant with the growing literature relating statistical learning to linguistic skills our results show robust correlations between reading performance in Hebrew and performance in some tasks of statistical learning.  
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### Human Learning and Instruction II

**Grand Ballroom AB, Saturday Morning, 10:00-11:55**

*Chaired by Peter F. Delaney, University of North Carolina at Greensboro*

10:00-10:15 (163)

**Does Summarizing A Text Improve Memory for Its Content?** ARIE SPIRGEL and PETER F. DELANEY, *University of North Carolina at Greensboro* (Read by Peter F. Delaney)—Many educators argue that writing a summary is a great way to enhance learning. From a cognitive psychology perspective, writing a summary of a science text seems like an ideal way to capitalize on the testing effect in the classroom. Surprisingly, however, six experiments with college students failed to find any memory benefits of summarizing over restudying. Points in the summaries were remembered a lot better than points not put in the summaries. However, students were not good at picking out what the important points were, and while they wrote a lot, they produced few relevant points in their summaries. The "copy and delete" strategy used by most summary writers, coupled with difficulties identifying what is important from a text, may explain why no testing effects emerge following summarizing. Effective implementation of testing in the classroom may require tests that better guide students as to what is important.  
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10:20-10:35 (164)

**How Difficulty of Retrieval During Learning Affects Subsequent Memory.** LILI SAHAKYAN and HANNAH E. HENDRICKS, *UNCG*—Using a variant of the "list-before-last" paradigm (Shiffrin, 1970; Jang & Huber, 2008), we investigated how the level of difficulty involved in

retrieving a previously-studied list affects the recall of the current list. Participants studied three lists (List 1, Target List, and List 2). Between encoding of Target list and List 2, they either engaged in List 1 retrieval, or solved math. After List 2, participants recalled the Target list. In some experiments, List 1 retrieval difficulty was manipulated by providing varying number of letter cues from that list; in other studies, it was manipulated via delay, where List 1 was studied either in the same session as the remaining lists, or it was studied several hours prior to it. We examined List 1 recall as a function of retrieval difficulty, as well as its impact on the recall of Target list, List 2 intrusions, and the first recall probabilities.

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10:40-10:55 (165)

**Semantic Information Activated During Retrieval Contributes to Later Retention: Support for the Mediator Effectiveness Hypothesis of the Testing Effect.** SHANA K. CARPENTER, *Iowa State University*—According to previous research, tests enhance retention more than restudy opportunities because they promote mediating information—i.e., a word or concept that links a cue to a target (Pyc & Rawson, 2010). Although testing enhances retention of mediators that participants were asked to generate, it is unknown whether mediators are spontaneously activated during testing, and how they contribute to retention. In the current study, participants learned cue-target pairs through testing (Mother: \_\_\_\_\_) or restudying (Mother: Child), and then were tested over these items and a never-before-presented item that was strongly associated with the cue (Father)—i.e., the semantic mediator. Compared to participants who learned the items through restudying, those who learned through testing exhibited higher false alarms to semantic mediators (Experiment 1), and were more likely to recall the target from the semantic mediator (Experiment 2). Semantic information may therefore be one type of natural mediator that is activated during testing.  
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11:00-11:15 (166)

**University Students' Opinions About the Mathematics They Studied in Grades K-12.** PATRICIA BAGGETT, *New Mexico State University*, ANDRZEJ EHRENFEUCHT and MICHAEL MAIN, *University of Colorado*—Three hundred fifty-seven undergraduate students from five classes in two universities answered an anonymous questionnaire about the value of the K-12 mathematics they learned and about their experiences in math classes they took before college. The roles of the students' understanding of the material and the knowledge and attitudes of their teachers were prominent in the answers in all five classes. But the large diversity of students' concerns, comments, and opinions within and between groups shows that it may be impossible to create one school curriculum in mathematics that is acceptable to the majority of students. In the talk we

will present the reasons for this research, the questionnaires, a description of the subjects, a summary of the data, conclusions, and our plan for a follow-up study.

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#### 11:20-11:35 (167)

**Transfer of the Testing Effect: How Powerful Is It?** JESSICA M. LOGAN, *Rice University*, GUNES AVCI, *Baylor College of Medicine*—Testing knowledge typically produces better retention of information compared to re-studying, referred to as the testing effect. In a factorial design, we examined transfer of the testing effect, including whether the type of initial testing – factual or conceptual – affected performance on final testing (again, either factual or conceptual) and assessed retention over significant delays, from 1 week to a full semester. Despite poorer initial test performance, using conceptual questions on initial tests produced superior retention across these time spans regardless of the type of final test (factual or conceptual). Indeed, factual format testing produced better short term performance but resulted in significantly greater forgetting over time compared to conceptual format testing. The findings of the study support the retrieval hypothesis of the testing effect, rather than the transfer-appropriate processing framework. Additionally, the practical implications of the study are discussed in relation to educational practices.

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#### 11:40-11:55 (168)

**Why Do Some Children Benefit More from Testing Than Others? Gist Trace Processing to Explain the Testing Effect.** SAMANTHA BOUWMEESTER and PETER P. VERKOEIJEN, *Erasmus University Rotterdam* (Read by Peter P. Verkoeijen)—Retrieval practice of previously studied information seems to be more effective in the long run than restudying the information – a phenomenon called the testing effect. In the present study, we investigated whether individual differences in the testing effect can be attributed to variation in gist trace processing. One-hundred-thirty-one participants (seven to thirteen years old children) studied twelve DRM word lists in a within-subject design with learning (restudying vs. taking an intervening free recall test) as a factor. Each of the participants took a final yes/no recognition test one week after the study-phase. A latent class analysis on the final-test data revealed three classes. One class of children did not show a testing effect. In the other two classes strong testing effects emerged, but the magnitude of the effect differed in these two classes. Furthermore, the three classes differed in false recognition of semantically related distractors, suggesting that the testing effect is related to differences in gist processing. We interpreted our findings in terms of a recently proposed explanation of the testing effect.

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### Animal Learning and Cognition Metropolitan B, Saturday Morning, 10:20-11:55

Chaired by Robert G. Cook, *Tufts University*

#### 10:20-10:35 (169)

**Adaptive Experimentation: Outsourcing Stimulus Control to the Animal.** ROBERT G. COOK and MUHAMMAD A. QADRI, *Tufts University*—Using a new adaptive experimental technique, a pigeon was repeatedly tested on an intermediate brightness discrimination. Using a continuous hill-climbing algorithm that simultaneously varied 14 parameters (e.g., size, shape, density of component elements), the structure of successive trials were generated depending on the pigeon's success with prior trials of similar composition. The pigeon's accuracy improved as the composition of the daily trials evolved over sessions. Despite different initial conditions, certain factors consistently converged in similar patterns that indicated the bird's preferred solution. For the present case, those displays having a few, large, distributed, high contrast elements were best. This form of subject-driven experimentation offers a promising new technique for actively exploring the potential solution space of any complex discrimination by animals.

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#### 10:40-10:55 (170)

**Training Set Size and Response Location Effects on Same/Different Judgments in Humans.** JEFFREY S. KATZ and JOHN F. MAGNOTTI, *Auburn University*, ANTHONY A. WRIGHT, *University of Texas Medical School at Houston*—Humans were trained and tested in a simultaneous same/different task. The experimental parameters mimicked those used for nonhuman animals as closely as possible, including no verbal instructions about the nature of the task. The main manipulations were set size and choice response locations. In one condition the “same” response was to the test picture and the “different” response was to a white rectangle. In another condition those responses were reversed. During acquisition response biases/preferences emerged depending on response location and set size. Transfer was complete to all training set sizes (2, 8, trial unique) following learning. Comparisons with similar experiments with nonhumans and their implications will be discussed.

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#### 11:00-11:15 (171)

**A “Hybrid” Test of Self-Control in Chimpanzees and Capuchin Monkeys.** MICHAEL J. BERAN, THEODORE A. EVANS, JESSICA BRAMLETT and JOSEPH MCINTYRE, *Georgia State University*, ELSA ADDESSI and FABIO PAGLIERI, *CNR, Istituto di Scienze e Tecnologie della Cognizione*—The “hybrid” self-control task is designed to assess whether choices of a larger/later outcome in a delay discounting test actually reflect self-control or may reflect impulsivity. Participants chose

between two sets of food items. Choice of the smaller amount led to delivery of that whole amount immediately. Choice of the larger amount, however, led to accumulation of those items, one at a time, as long as the items were not taken. A self-control response, therefore, would include not only selecting the larger set but also waiting until more food items accumulated than were available in the immediate set. Capuchin monkeys and chimpanzees typically chose the larger reward, but only chimpanzees accumulated most or all of the items. Capuchin monkeys failed to wait for a number of items to accumulate to justify their choice of that set, indicating that choice of the larger/later option may not reflect self-control in this species. These results have important implications for test paradigms used to assess self-control in nonhuman animals.

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#### 11:20-11:35 (172)

**Spatial Pavlovian Conditioning.** FEDERICO SANABRIA and GABRIEL J. MAZUR, *Arizona State University*—Associative learning research has traditionally focused on how conditioned stimuli (CS) disambiguate the temporal-but not spatial-location of unconditioned stimuli (US). A series of experiments demonstrate that spatial overlap and correlation of CS and US are sufficient to elicit a sign-tracking conditioned response (CR) in pigeons. This demonstration was conducted under temporal parameters that, by themselves, did not support sign-tracking. These results suggest that spatial and temporal relations between stimuli contribute to their association. If stimuli are not too distant in one dimension, a CR may be elicited by the proximity of the stimuli in the other dimension.

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#### 11:40-11:55 (173)

**Understanding the Renewal Effect: What Is Context Specific?** RALPH R. MILLER, GONZALO MIGUEZ, MARIO A. LABORDA, BRIDGET L. MCCONNELL and CODY W. POLACK, *SUNY - Binghamton*—When a cue is paired with an outcome in Phase 1 and extinguished or trained as a conditioned inhibitor in Phase 2, behavior consistent with Phase 2 treatment is observed if the cue is tested soon after training in the context in which Phase 2 treatment occurred. But if testing occurs in a context different from that of Phase 2, behavior is observed that is more in accord with Phase 1 treatment (i.e., renewal occurs). Renewal has been explained as being due to either the second-learned association being context specific or the memory of nonreinforcement being context specific. Two ways to differentiate between these accounts include nonreinforcement followed by reinforcement (e.g., latent inhibition) and conditioned inhibition training followed by reinforcement of the conditioned inhibitor. These methods have yielded contrasting results. We find that expectancy of the outcome during the nonreinforced trials of Phase 1 determines which account prevails. When there is no expectation of the reinforcer (as in latent inhibition

treatment), memory of nonreinforcement is context specific. When there is an expectation of the reinforcer (as in conditioned inhibition treatment), memory of the last-learned association is context specific.

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#### Task Switching

**Willow AB, Saturday Morning, 10:00-11:15**

*Chaired by Ulrich Mayr, University of Oregon*

#### 10:00-10:15 (174)

**A Long-Term-Memory Account of Asymmetric Task-Selection Costs.** ULRICH MAYR, DAVE KUHNS and ASHLEY BERNIS, *University of Oregon*—Task switch costs and in particular the switch-cost asymmetry (i.e., the fact that costs are larger when switching from a non-dominant to a dominant task than vice versa) is usually explained in terms of trial-to-trial carry-over of task-specific control settings. We propose and test here the alternative idea that asymmetric selection costs arise from LTM traces of past selection instances, which (a) are particularly potent when encoded under conditions of high conflict and (b) are particularly likely to interfere if for some reason the current task set is difficult to maintain in working memory (e.g., because it is not dominant, a task switch needs to occur, a long inter-trial delay, or a short interruption through some other activity). Consistent with these assumptions we show across three experiments that the cost asymmetry arises even after short interruptions of an otherwise single-task block—but only when participants had experience with performing the competing task and that experience had included high-conflict trials.

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#### 10:20-10:35 (175)

**Effects of Task Complexity and Number of Possible Tasks On Task-set Reconfiguration.** FELICE VAN 'T WOUT, AURELIU LAVRIC and STEPHEN MONSELL, *University of Exeter* (Read by Stephen Monsell)—In task-switching experiments the participant must bring one of several active task-sets into a “most-active” state where it, not the previous task-set, controls processing. At least part of this task-set reconfiguration process can be carried out in anticipation of a change of task, as reflected in the reduction of switch costs with opportunity for preparation. In separate sets of experiments we have investigated the effects of the complexity of the task (number of S-R rules required) and the number of active tasks from which the current one must be retrieved. Task set preparation was more effective with only two S-R rules than with more, suggesting a low limit on the effective capacity of “focal” procedural working memory. Task-set preparation did not depend on the number of tasks currently active (three versus five), provided task recency and frequency were controlled.

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**10:40-10:55 (176)**

**Relationship between Task-Switching and Task-Mixing Costs.** GIJSBERT STOET and DARYL B. O'CONNOR, and MARK T. CONNER, *University of Leeds*—In task-switching studies, there are different ways to express task-switching difficulties, for example as switching costs and mixing costs. Little is known about their exact relationship and distribution in the typically developed population. Therefore, we conducted a large study (n=240, uniform distribution of gender and age, 18-39) to explore this. Each participant carried out 192 trials of two computer tasks in pure and mixed blocks. Most interestingly, we found a considerable variation in types of costs; people that were good at task-switching were typically bad at task-mixing and vice versa (task-switching and task-mixing costs are negatively correlated). It appears that people can trade off one type of cost against the other. We discuss how to resolve the methodological problems this trade-off can cause for comparative studies. We will also discuss how these costs vary as a function of age and gender.  
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**11:00-11:15 (177)**

**Congruency of Cue Transitions and Task Transition in Task Switching.** ANDRE VANDIERENDONCK and BAPTIST LIEFOOGHE, *Ghent University, Belgium*—Transition cuing with registration of cue interpretation besides task execution (double registration) has previously shown a cue-task congruency effect in cue interpretation. By varying type and modality of the indication response, the present study aimed to clarify whether this congruency effect depends on procedural features. In two transition cuing experiments with double registration, the cue interpretation response was either a choice response indicating the task or a simple response indicating when the to-be-performed task is known. Experiment 1 used manual indication responses and observed a congruency effect in the indication response for the choice-response condition and in the execution response for the simple-response condition with an overall delay of execution responding. Experiment 2 used verbal indication responses and found the same pattern of results, with smaller but still robust congruency effects and no execution delay in the simple-response condition. The findings confirm that the congruency effect is a genuine part of task switching but that it can be augmented by overlaps between the indication and the execution response. Implications for our understanding of task switching more generally are discussed.  
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**Embodied Cognition****Metropolitan A, Saturday Morning, 10:00-11:55***Chaired by Penny M. Pexman, University of Calgary***10:00-10:15 (178)**

**Embodied Semantic Processing: The Neural Correlates of the Body-Object Interaction Effect.** PENNY M. PEXMAN, IAN S. HARGREAVES and GEMMA A. LEONARD, *University of Calgary*, PAUL D. SIAKALUK, *University of Northern British Columbia*, BRADLEY G. GOODYEAR, *University of Calgary*—The Body-Object Interaction variable (BOI) measures people's perceptions of the ease with which a human body can physically interact with a word's referent. Responses are typically faster for high BOI words (e.g., BELT) than for low BOI words (e.g., ROOF) in lexical and semantic tasks (e.g., Siakaluk et al., 2008). This BOI effect has been interpreted as evidence that bodily experience is part of lexical semantic knowledge, and in the present study we tested this assumption. Participants made semantic judgments about high and low BOI words while we monitored their cortical activity using event-related fMRI. Results showed that high BOI words were associated with greater activation in the left inferior parietal lobule (supramarginal gyrus, BA 40), a sensory association area involved in kinesthetic memory. These results thus suggest that the BOI variable does measure relative bodily experience, and that this experience is relevant to semantic processing.  
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**10:20-10:35 (179)**

**Electrophysiology of Embodied Attention: Hand Influences on Visual N1, P1, and P3.** CATHERINE L. REED, *Claremont McKenna College*, BENJAMIN E. BREKKE, *Pitzer College*, DAVID S. LELAND, *University of Wisconsin - Eau Claire*, ALAN S. HARTLEY, *Scripps College*—Previous work has demonstrated faster behavioral responses when visual targets appear near the palm (Hand condition) than when the hand is kept on the lap (No Hand condition), suggesting biased attention toward the region of space near the hand. We predicted corresponding electrophysiological effects: an increase in the amplitude of attention-sensitive ERP components, i.e., early sensory components (P1, N1), later cognitive/goal-related components (P3), or both. Participants performed a visual go/no-go (50/50) task in the Hand and No Hand conditions. When the hand was up, targets elicited faster response times and greater ERP mean amplitude in the 115-145 (P1), 120-190 (N1), 350-450 (P3), and 450-650 (late wave) millisecond windows. Findings support an embodied theory of spatial attention in which the hand facilitates both bottom-up visual processing and top-down goal-related cognition as part of directing attention toward stimuli in actionable space.  
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**10:40-10:55 (180)****Spraction: Integrating Space, Action, and Abstraction.**

BARBARA TVERSKY, *Columbia Teachers College/Stanford*—People organize their worlds, putting things in lines, piles, orders, one-to-one correspondences and more. Public spaces like cities as well as private spaces like work spaces and rooms are similarly organized. These organizations create regular patterns that are good gestalts, different from the patterns nature creates and so recognizable as products of sentient minds. The organizations reflect abstractions, orders, one-to-one correspondences, groupings, into categories and hierarchies. They unintentionally communicate these abstractions to others, who can use the spatial organizations to infer their rationales. These organizations are incorporated into diagrams and the actions that create them embodied by gestures, creating interacting loops of the internal and the external, of space, abstraction, and action--spraction--that can be entered anywhere. Evidence and implications of these speculations will be presented.

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**11:00-11:15 (181)**

**Embodied Cognition in Skateboarding Produces Superior Performance in the Physics Judgment Task of Predicting Fastest Slope.** MICHAEL K. MCBEATH, TYLER S. MILLER and NICHOLAS G. ZAUTRA, *Arizona State University*—We examined if embodied cognition associated with self-movement in skateboarding provides superior insight in physics problem-solving. We first confirmed work by Rohrer that people in general are worse than random at predicting which of several differing slopes provides the faster route for a rolling ball. We then confirmed that experienced skateboarders performed significantly better than chance when asked the equivalent question in the context of choosing the faster of two skateboarding routes in a timed race. Specifically, skateboarders were less prone to select a shorter but slower more constant-sloped route. When self-action is coupled to physics problem-solving in this manner, it appears to facilitate access to gut-level knowledge of the overall speed advantage gained by descending more sharply earlier. The findings support a physics pedagogy in which students imagine “being the ball” to allow themselves to utilize embodied cognitive resources to best solve this type of action physics problem.

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**11:20-11:35 (182)**

**Modulating Body Action Space with Positive Socio-Emotional Contexts.** AVA J. SENKFOR, *Wayne State School of Medicine*—A growing literature suggests that positive socio-emotional material can aid attentional and mnemonic abilities (“positivity bias”). However, less is known about the influence of socio-emotional material on motion perception. Examined here are the beneficial effects of socio-emotional contexts (hiring/firing news) on motion

perception. Three groups of adults (18-35 years old) viewed biological motion animations (emotionally positive, negative, or neutral) that varied by movement patterns, direction (towards or away from the body), and distance. Participants made relative distance-from-motion judgments. The “positivity bias” predicts only a gain from positive contexts. A top-level finding revealed higher accuracies in the positive socio-emotional context than the neutral context - a “positivity bias” - which was greatest for inward movements. The negative socio-emotional context did not differ from the neutral context. The inward/outward asymmetry strongly suggests the activation of a body action space that can be modulated by socio-emotional contexts.

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**11:40-11:55 (183)**

**The Influence of Effector on Embodiment.** SHULAN LU, PAWEENA KOSITO, PRATYUSH KOTTURU and RACHEL BAILEY, *Texas A & M University - Commerce*—How do people develop their embodiment in virtual environments and thus determine the grounding of actions that are comparable to their real world experiences? This work investigated the role of effector in perception and action. Participants watched as an avatar cut a vegetable, and then moved the effector to the location at which they wanted the vegetable to be cut next. In Experiment 1, it took participants significantly longer to initiate the actions when they did cutting in Wiimote than mouse. In Experiment 2, participants with significant Wiimoting experiences tended to take longer time to initiate the cutting than those with little experiences. In Experiment 3, the same pattern was replicated with left handed people using Wiimote in right hands compared with right handed people using Wiimote in their dominate hands. This work demonstrated how effectors and motor fluency with the effectors influence the embodiment in virtual environments.

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**Speech Perception I**

**Grand Ballroom D, Saturday Morning, 10:00-11:55**

*Chaired by Kathleen Rastle, University of London*

**10:00-10:15 (184)**

**Orthography Influences the Perception and Production of Speech.** KATHLEEN RASTLE, SAMANTHA F. MCCORMICK, LINDA BAYLISS and COLIN J. DAVIS, *Royal Holloway, University of London*—One of the most intriguing questions in language research concerns the extent to which orthographic information impacts upon the perception and production of spoken words. We addressed this question in a 3-day word learning study. Participants were trained to criterion on a set of associations between novel pictures and novel spoken words. Spelling-to-sound consistent or inconsistent spellings were introduced on a second day of training, and the influence of these spellings on speech processing was assessed on the third day. Results showed for the first time significant orthographic effects on

speech perception and speech production in a situation in which spelling-sound consistency was manipulated with perfect experimental control. Subsequent experiments suggested that the effect of orthography arises through feedback in later stages of processing. Results are discussed in terms of a highly interactive language system in which there is a rapid and automatic flow of activation in both directions between orthographic and phonological representations.

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#### 10:20-10:35 (185)

**Vocal Alignment as a Function of Social Expectations.** SABRINA K. SIDARAS and LYNNE C. NYGAARD, *Emory University* (Read by Lynne C. Nygaard)—During spoken communication, individuals change the way they speak based on vocal characteristics of their interlocutors. Although evidence suggests that vocal alignment is due to underlying perceptual-motor mechanisms, social expectations also influence the degree of alignment. The present experiments investigated how social variables interact with perceptual-motor processing in speech by determining if alignment occurs automatically in a minimal social context when social expectations or stereotypes are primed. Participants shadowed a list of spoken words produced by an ambiguous aged speaker in a neutral speaking rate and were either primed with pictures and narratives of an older or a younger person. When primed with social stereotypes about a speaker's age, illusory accommodation to speaking rate occurred. Participants accommodated towards an expected vocal behavior, rather than to the vocal characteristics actually present in the acoustic signal. These findings have implications for how social mechanisms influence perceptual-motor processing during vocal alignment.

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#### 10:40-10:55 (186)

**Modulation Sensitivity in the Perceptual Organization of Speech.** ROBERT E. REMEZ, EMILY F. THOMAS, KATHRYN R. DUBOWSKI, STAVROULA M. KOINIS, NATALIE A. C. PORTER and NINA U. PADDU, *Barnard College*—Speech exhibits linguistic organization at different timescales: breath groups, clauses, phrases, words, syllables, segments. Attributes at each grain are resolved perceptually, yet the coincidence of the syllable train and some measures of temporal resolution has favored this unit in perceptual organization. Is modulation sensitivity for speech pitched at a rate of 3-8 Hz? New measures of natural and sine-wave sentences subjected to temporal distortion of varying degree were used to test the claim. These intelligibility measures corroborated both classic and recent findings that the grain of modulation sensitivity is far finer, nearly 20 Hz, and more approximate to the linguistic constituent of the phonetic segment than to the syllable. A comparison of natural and sine-wave measures revealed a slight advantage for natural speech, an effect of intelligibility independent of modulation, attributable to stationary spectra immune to temporal distortion. Implications for accounts of perceptual

organization will be discussed.

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#### 11:00-11:15 (187)

**Predictability Guides the Allocation of Temporally Selective Attention during Speech Processing.** LISA D. SANDERS and LORI B. ASTHEIMER, *University of Massachusetts, Amherst*—Listeners direct temporally selective attention to the initial portions of words in continuous speech. As a result, word onsets and speech-like attention probes presented during the initial segments of words elicit larger amplitude auditory evoked potentials. In a series of studies in which predictability was manipulated in natural and artificial speech, larger auditory evoked potentials were evident by 100 ms after onset for segments that could not be predicted from the preceding context. These results indicate that listeners allocate attention to sounds when they are unable to predict what they are likely to hear next. Differences in predictability may therefore account for differences in the extent to which attention is directed to word-initial and other segments in speech. The ability to make predictions about upcoming speech sounds and allocate attention accordingly likely contributes to efficient speech processing by allowing listeners to preferentially process the most informative segments in speech.

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#### 11:20-11:35 (188)

**Anticipatory Eye Movements in the Visual World Paradigm: Saccade Targeting, not Saccade Speeding.** ADRIAN STAUB, *University of Massachusetts Amherst*, MATTHEW ABBOTT, *University of California San Diego*—In a well-known study Visual World study, Altmann and Kamide (1999) found that listeners make anticipatory eye movements on the basis of a verb's selectional restrictions; e.g., shortly after hearing the The boy will eat..., listeners showed an increased probability of fixating a cake. Subsequent studies have demonstrated similar anticipatory effects on the basis of other kinds of linguistic information. Here we present two experiments designed to assess how such anticipatory effects should be understood in terms of underlying parameters of eye movement control. Using photographs of scenes as visual stimuli, rather than clip-art images, we replicated the classic Altmann and Kamide effect. The critical new finding is that while there was an increased probability of making an early saccade to the cake after hearing eat, there was no effect on the duration of individual fixations. Specifically, it appears that listeners do not truncate an eye fixation to look to the cake after hearing eat; rather, they make a saccade to the cake rather than to another location. We suggest that these results have implications for the development of a detailed 'linking hypothesis' relating language processing to eye movement control.

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11:40-11:55 (190)

**Artificial Language Learning: Automatic or Cognitively Costly?** SVEN L. MATTYS and LINDA STEFANSODOTTIR, *University of Bristol*—Listeners rely on transitional probabilities to extract new words from an unknown language. The extent to which this form of statistical learning is automatic vs. resource-demanding is unclear. In this presentation, we review the evidence suggesting that artificial language learning (ALL) can happen without focused attention but not when cognitive resources are heavily recruited for another task. We then provide empirical evidence that the click-detection technique recently proposed by Gomez, Bion, and Mehler (2010, *Language and Cognitive Processes*) has the potential to tease apart the conditions under which ALL is resource-demanding from those under which it is automatic. We continue with a series of experiments in which the short-term-memory capacity needed for ALL is analyzed by orthogonally manipulating speech rate and the complexity of a concurrent memory load. The results confirm that ALL can proceed without a high level of focused attention (“incidental” learning); however, ALL can be severely disrupted by divided attention and, especially, by a concurrent memory load.

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**Judgment and Decision Making III**  
**Grand Ballroom C, Saturday Morning, 10:20-11:55**

*Chaired by Andreas Wilke, Clarkson University*

10:20-10:35 (191)

**Performance Benefits of Depression: Sequential Decision Making in a Healthy and a Clinically Depressed Sample.** ANDREAS WILKE, *Clarkson University, USA*, BETTINA VON HELVERSEN, *University of Basel, Switzerland*, TIM JOHNSON, *Willamette University, USA*—Previous research reported conflicting results concerning the influence of depression on cognitive task performance. Whereas some studies reported that depression enhances performance, other studies reported negative or null effects. These discrepant findings appear to result from task variation, as well as the severity and treatment status of participant depression. To better understand these moderating factors, we study the performance of individuals—in a complex sequential decision task similar to the secretary problem—who are nondepressed, depressed, and recovering from a major depressive episode. We find that depressed individuals perform better than do nondepressed individuals. Formal modeling of participants’ decision strategies suggested that acutely depressed participants had higher thresholds for accepting options and made better choices than either healthy participants or those recovering from depression.

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10:40-10:55 (192)

**Psychometrical Investigations of Fast Value Integration in Multi-alternative Decisions.** MARIUS USHER, *Tel-Aviv University*, KONSTANTINOS TSESTOS, *University College London*—Value integration is essential in the construction of preferences to novel choice alternatives, as illustrated in a number of experimental paradigms, from attitude formation, to Iowa Gambling task and experienced based decisions. Here we examined the processes of fast value integration by requiring observers to make decisions between two or three alternatives, characterised by fast (350 ms. or 550 ms.) sequences of pairs or triples of numerical values. At the end of the sequence presentation, the observers had to decide which alternative has the highest average, or from which they prefer to receive an additional sample. The results show a remarkable ability for fast value integration, as indicated by the fact that accuracy improves with sequence length. This process, however, is subject to order (recency) effects, as well as to decoy (attraction and similarity) effects, which are induced by temporal correlations. The results are discussed with a number of computational models.

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11:00-11:15 (193)

**Cognitive Niches: An Ecological Model of Strategy Selection.** JULIAN N. MAREWSKI, *University of Lausanne*, LAEL J. SCHOOLER, *Max Planck Institute for Human Development* (Read by Lael J. Schooler)—How do people select among different strategies to accomplish a given task? We propose a quantitative model that predicts how selection emerges through the interplay among strategies, cognitive capacities, and the environment. This interplay carves out for each strategy a cognitive niche, that is, a limited number of situations in which the strategy can be applied, simplifying strategy selection. To illustrate our proposal, we consider selection in the context of the simple heuristics framework, and ACT-R. From the heuristics framework, we adopt the thesis that people make decisions by selecting from a repertoire of simple decision strategies that exploit regularities in the environment and draw on cognitive capacities, such as memory and time perception. ACT-R provides a quantitative theory of how these capacities adapt to the environment. We consider the choice between strategies that operate on the accessibility of memories and those that depend on knowledge about the world. Based on Internet statistics, our model predicts people’s recognition of real-world objects, the distributional characteristics of recognition speed, and the cognitive niches of decision strategies, including those of the fluency and recognition heuristics.

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**11:20-11:35 (194)**

**On the Nature of Decision States: Theory and Data.** JAMES L. MCCLELLAND, *Stanford University*, MARIUS USHER, *Tel Aviv University*, JUAN GAO, *Stanford University*—We explore the characteristics of decision states, inspired by features of the Leaky Competing Accumulator Model of decision making. According to the model, the integration of evidence relevant to a decision between two or more alternatives is subject to leakage and mutual inhibition, as well as a non-linearity at 0 activation. When inhibition is stronger than leak, the model exhibits a bifurcation, such that one of the alternatives tends to dominate the others, whose activations then fall to 0. This leaves the system in a decision state that has elements of discreteness -- one alternative is the winner -- but also elements of continuity -- the strength of activation of the winner is dependent on the strength of its support. Furthermore, the non-linearity at 0 creates a situation in which the decision state is reversible, especially when only weakly supported, and thus allows further evidence to result in what amounts to a change of mind. The talk will point to some of the virtues of decision states of this type, and review evidence that decision states can have these features. Email: James L. McClelland, [mcclelland@stanford.edu](mailto:mcclelland@stanford.edu)

**11:40-11:55 (195)**

**Temporal Discounting: Contextual Effects with a Focus on Loss.** MARY KAY STEVENSON and NICOLE GIM, *California State University East Bay*—Using a multi-faceted approach to temporal discounting theory, these studies examine how context can alter the perception of future outcomes. In the first study, discounting rates are obtained from a judgment paradigm and designs that manipulate the context of the outcomes or time frame. A shift the magnitudes of the outcomes results in a qualitatively different context effect than shifting the time frame. Furthermore, the direction of the shift is a critical design feature. In the second study, the stimulus structure provides a comparison of the temporal impact of gains and losses when they are combined and when they are presented alone. The impact of event structure on the discounting of gains and losses is described for both a judgment task and a strength of preference task. These results are discussed within a general theory of temporal discounting and a multi-faceted approach to experimental design. Email: Mary Kay Stevenson, [marykayste@gmail.com](mailto:marykayste@gmail.com)

**Word Recognition**

**Metropolitan A, Saturday Afternoon, 1:30-2:45**

*Chaired by Marcus Taft, University of New South Wales*

**1:30-1:45 (196)**

**The Role of Syllable Structure in Assigning Letters to their Position in Visual Word Recognition.** MARCUS TAFT, *University of New South Wales, Sydney, Australia*—Letter assignment in word recognition has been explored by examining either interference to nonword lexical decision responses when the transposition of two letters forms a real

word (e.g., the "TL" nonword VOKDA), or priming by a masked TL nonword of lexical decision responses to its baseword (e.g., vokda-VODKA). Only recently has it been suggested that syllabic structure might play a role in letter assignment, with the status of a consonant as syllable onset or coda being taken into account. The experiments reported here examine TL interference and priming effects when the onset/coda structure differs between the baseword and its TL derivation. TL effects are shown to be stronger when two medial consonants form a coda and an onset in the baseword (e.g., the D and K of VODKA; the B and R of ZEBRA) than when they form a complex coda (e.g., the ND of PANDA). Because the last condition only differs from the others if the syllable is defined orthographically in terms of maximization of the coda, these results are taken as support for the representation of words in terms of such a syllable structure. A model is presented whereby letters are assigned to an onset or coda slot in an attempt to match with the stored syllabic structure.

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**1:50-2:05 (197)**

**Electrophysiological Evidence of Different Loci for Word Frequency and Case Mixing in Visual Word Recognition.** PHILIP A. ALLEN, *University of Akron*, MEI-CHING LIEN and CAITLIN CRAWFORD, *Oregon State University*—Word frequency and case mixing likely affect different processing stages in visual word recognition. Some studies argue that word frequency affects an earlier perceptual stage and case mixing affects a later central stage (e.g., Rheingold, Yang, & Rayner, 2010). Others have suggested otherwise (e.g., Allen, Smith, Lien, Kaut, & Canfield, 2009). The present study used the N170 (an earlier peak 140-240 ms after stimulus onset related to structural encoding) and P3 (a later peak around 400-600 ms after stimulus onset related to stimulus categorization) components of event-related potentials to determine the locus of word frequency and case mixing effects. Participants performed lexical decisions where word frequency (high vs. low) and case type (consistent lowercase vs. mixing case) were varied. The N170 was sensitive to case mixing, but the P3 was sensitive to word frequency and lexicality. These results suggest that case mixing affects an earlier processing stage than word frequency. Email: Philip A. Allen, [paallen@uakron.edu](mailto:paallen@uakron.edu)

**2:10-2:25 (198)**

**From Visual Encoding To Meaning: Processing Numbers, Letters and Pictures.** MANUEL CARREIRAS, NICOLA MOLINARO and PHILLIP MONAHAN, *Basque Center on Cognition, Brain and Language*, PAIVI HELENIUS, *Low Temperature Lab*, JON ANDONI DUÑABEITIA, *Basque Center on Cognition, Brain and Language*—How visual strings and words are recognized and accessed is still under debate. Effects in left occipitotemporal cortex for words compared to symbols but not to consonant strings were reported 140 ms after the

onset. The current experiment investigates the underlying spatial and temporal brain dynamics of word, number and picture processing. Native speakers of Spanish (n=14) performed a go/no-go task to visually presented words, numbers and pictures. The evoked neuromagnetic activity was recorded using a 306-channel whole-head Elekta MEG system. ECD waveforms were calculated based on sensor-level data. Dipolar activity in occipito-temporal areas ~150 ms showed a maximum amplitude for words compared to numbers and pictures. Later, between 300 and 500 ms, we found stronger amplitudes for dipoles localized to left MTG for words compared to numbers and pictures. These findings support the role of the left ventral-lateral pathway as a critical network involved in expert word recognition.

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2:30-2:45 (199)

**Visual Word Recognition: What Processing can Occur Prior to Task Set Implementation?** DEREK BESNER and SHANNON O'MALLEY, *University of Waterloo*—Data from the Task Set procedure developed by Besner and Care (2003) undermines the widespread belief that sublexical spelling-sound conversion and lexical/semantic activation all occur without intention, are ballistic, and consume no resources.

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#### Language Production

**Grand Ballroom D, Saturday Afternoon, 1:30-2:45**

*Chaired by Padraig G. O'Seaghdha, Lehigh University*

1:30-1:45 (200)

**A Goal-Setting Theory of Preparation for Word Production.** PADRAIG G. O'SEAGHDHA and ALEXANDRA K. FRAZER, *Lehigh University*—Form preparation, the benefit in cyclic naming of advance knowledge of a shared portion of the form of a small set of response words, has proved extremely useful in revealing underlying processes of phonological encoding. However, it lacks a satisfactory theoretical account of diffuse preparation for several words, and some previous conclusions may not generalize to more sensitive tests. We propose a higher level goal setting theory in which preparation is represented outside the production pathway. Unlike previous accounts, the goal setting view allows for graded, globally adjustable preparation. The supporting evidence includes: a) that form preparation is persistent and stable in the face of unexpected, inconsistent targets; b) that it generalizes to new consistent items; c) that it occurs at a reduced level for non-unanimous sets in ecologically valid tasks such as picture naming; and d) that it can increase or emerge over testing blocks.

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1:50-2:05 (201)

**Frequency Drives Lexical Access in Reading but not in Speaking: The Frequency-Lag Hypothesis.** TAMAR H. GOALLN, TIMOTHY J. SLATTERY and DIANE GOLDENBERG, *UCSD*, EVA VAN ASSCHE and WOUTER DUYCK, *Ghent University*, KEITH RAYNER *UCSD*—To contrast mechanisms of lexical access in production versus comprehension we compared effects of frequency (high, low), context (none, low-constraining, high-constraining), and English proficiency level (monolinguals, Spanish-English bilinguals, Dutch-English bilinguals), on picture naming, lexical decision, and eye fixation times. Semantic constraint effects were larger in production than in reading. Frequency effects were larger in production than in reading without constraining context, but larger in reading than in production with constraining context. Bilingual disadvantages were modulated by frequency in production but not in eye fixation times, were not smaller in low-constraining context, and were reduced by high-constraining context only in production at the lowest English proficiency level. These results challenge existing accounts of bilingual disadvantages, and reveal fundamentally different processes during lexical access across modalities, entailing a primarily semantically driven search in production, but a frequency driven search in comprehension. The apparently more interactive process in production than comprehension could simply reflect a greater number of frequency-sensitive processing stages in production.

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2:10-2:25 (202)

**Predictors of Sequential Object Naming: Visual Layout and Working Memory.** ANTJE S. MEYER and AGNIESZKA E. KONOPKA, *Max Planck Institute for Psycholinguistics*—A central issue in speech production research is how speakers coordinate the lexical retrieval processes for successive words of an utterance with each other. We investigated this question by examining whether the time speakers needed to name the first of two objects depended on its relationship to the second object. We found that speakers named the first object more slowly and looked at it for a longer time when the objects belonged to the same semantic category than when they were unrelated. However, this semantic interference effect only arose when the objects appeared immediately adjacent to each other, but not when they were presented further apart. The size of the semantic interference effect on the speech onset latencies depended on the speakers' spatial working memory span. These results highlight that spatial variables (e.g. the size and distance between stimuli) can affect the time course of the speakers' speech planning processes.

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2:30-2:45 (203)

**Self-Reported Frequency, Content, and Functions of Inner Speech.** ALAIN MORIN, BOB UTTL and BREANNE HAMPER, *Mount Royal University*—This study obtained information about the frequency, content, and functions of inner speech by asking 380 participants what they typically say to themselves using an open-format thought-listing procedure. Participants mostly reported talking to themselves about themselves—i.e., evaluating the self, emotions, physical appearance, and relationships. Self-reported inner speech was also about individuals close to the self (family, friends, and intimate partner) and one's immediate physical environment. Participants listed inner speech about school, work, sports, and leisure activities. The inner speech functions of self-regulation and mnemonic aid were often mentioned. This represents the first study to explicitly examine self-reported inner speech frequency, content, and functions in adult participants.  
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### Causal Reasoning

Willow AB, Saturday Afternoon, 1:30-2:45

Chaired by Woo-kyoung Ahn, Yale University

1:30-1:45 (204)

**Causal Imprinting in Causal Structure Learning.** ERIC G. TAYLOR and WOO-KYOUNG AHN, *Yale University* (Read by Woo-kyoung Ahn)—Suppose you observe that children using a nightlight (A) are more likely to develop myopia (B), and infer that A causes B (Quinn, et al. 1999). Later you discover that parents' myopia (C) explains away the A-B contingency. Normatively, one should now disbelieve that A causes B. Nonetheless, participants who observed a positive A-B contingency (Phase-1), followed by evidence that A and B were independent given C (Phase-2), persisted in believing that A causes B. We call this difficulty in revising initially learned causal structures, "causal imprinting." Causal imprinting was not due to difficulty in learning common-causes, since those who observed only the Phase-2 evidence showed little belief in A causing B (Spellman, 1996). Causal imprinting was also found across various stimuli, procedures, and dependent measures. To infer people's assumptions about the unknown status of C during Phase-1, we compared various Bayesian models (Griffiths & Tenenbaum, 2005) to the data.  
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1:50-2:05 (205)

**Causal Perception and the Feeling of Force.** PHILLIP WOLFF, SAMUEL RITTER and KEVIN J. HOLMES, *Emory University*—When people see causal events, do they infer the presence of forces? This question was addressed in a series of experiments in which participants indicated whether a small robotic arm exerted a force against their hands while they watched photorealistic animations of causal and non-causal events. The causal scenes depicted collisions (Experiment 1), shattering events (Experiment 2), and social interactions (Experiment 3), as well as situations

in which the forces were in static equilibrium (Experiment 4). In each of these experiments, participants were faster to detect a physical force against their hands after watching causal than non-causal events. Moreover, the speed of their responses correlated positively with the magnitude of the forces depicted in the scenes. The results suggest that although forces are not visible, they are nevertheless inferred during the perception of causal events and experienced in a manner that is similar to the feeling of forces against the skin. Implications for theories of causation will be discussed.

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2:10-2:25 (206)

**Models of Elemental Causal Diagnostic Reasoning.** MICHAEL R. WALDMANN and RALF MAYRHOFER, *University of Göttingen*, BJÖRN MEDER, *Max Planck Institute for Human Development*—Many otherwise competing theories of elemental diagnostic reasoning share the normative assumption that inferences from a single effect to its probable cause should reflect the objective conditional probability observed in the learning data (i.e.,  $P(\text{cause}|\text{effect})$ ). A fundamental shortcoming of this approach is that it neglects that people confronted with causal inference tasks may interpret the observed data as error-prone evidence for the underlying causal models. We have developed variants of normative models of causal diagnostic inference that take into account uncertainty about the assumed generating causal models and their parameters (i.e., causal strength). We empirically tested these models of diagnostic inference in several experiments in which subjects were confronted with sets of cause-effect exemplars with varying contingencies and base rates. The results show that people indeed take into account the uncertainty of evidence, and are capable of differentiating between predictive and different types of diagnostic causal inferences.

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2:30-2:45 (207)

**Causal Reasoning, Counterfactual Reasoning, and the Consequences of Knowledge.** BARBARA A. SPELLMAN and ELIZABETH A. GILBERT, *University of Virginia*, ELIZABETH R. TENNEY, *Haas School of Business, UC Berkeley*, CHRISTOPHER R. HOLLAND, *University of Virginia*—When assessing causation or culpability, why do people care about what an actor knew? For instance, the legal system often punishes actors who merely "knew" or "should have known" that something bad could possibly happen – even if they neither wanted nor intended it to occur. We demonstrate that people judge an actor with knowledge to be more causal than one without knowledge, and that when determining causality people consider specific counterfactuals – especially what actors with similar or different knowledge would be likely to do. Consistent with our theory of causal judgment (Spellman, Kincannon, & Stose, 2005) and the notion of "counterfactual potency",



we show that counterfactuals may be the mechanism for these effects. Specifically, when an actor has knowledge, people are more likely to construct counterfactuals that the actor could control, and such counterfactuals increase causal ratings. A similar analysis may explain morality effects in causal reasoning.

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### Metamemory II

**Metropolitan B, Saturday Afternoon, 1:30-2:45**

*Chaired by Janet Metcalfe, Columbia University*

**1:30-1:45 (208)**

**New Findings Concerning People's Hypercorrection of High Confidence Errors.** JANET METCALFE, *Columbia University*—When people make an error with high confidence (indicating, presumably that they believe the response to be true) it might be supposed that that error would be highly entrenched and very difficult to overwrite. In contrast to this prediction, the finding that high confidence errors are particularly easy to correct--the so-called hypercorrection effect--has now been replicated many times. Two explanations have been proposed for this counterintuitive finding. The first is the attentional explanation, which says that when people find out that they are wrong about something that they strongly believed was true, they are surprised and rally their attention to better encode and remember the correction. The second is the 'knew it all along' explanation. The errors people make with high confidence are often strongly related to the correct answer, and people claim--upon receiving corrective feedback--that they 'knew it all along.' Data will be presented that bear on both of these explanations. Data will also be presented on hypercorrection in children and on the lack of hypercorrection in older adults.

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**1:50-2:05 (209)**

**An Attributional Account of the Production Effect in a List-Discrimination Task.** GLEN E. BODNER and ALEXANDER TAIKH, *University of Calgary*—The production effect refers to a memory advantage for words studied aloud over words studied silently (MacLeod, Gopie, Hourihan, Neary, & Ozubko, 2010). Using a list-discrimination task, Ozubko and MacLeod (2010) provided support for a distinctiveness account of the production effect. According to the distinctiveness account, saying some words aloud at study can render them distinct at test relative to words read silently--but participants will only try to recollect this distinctive information at test if it is diagnostic of list source. We report several new findings in this task, including reverse production effects, that better support an attributional account. According to the attributional account, assignment of an item to a list source is jointly determined by memory information, knowledge of the composition of each list, and a bias to attribute less-familiar items to the less-recent list.

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**2:10-2:25 (210)**

**Information Seeking Behavior in the Pigeon.** LEYRE CASTRO and EDWARD A. WASSERMAN, *The University of Iowa*—Metacognition includes seeking additional information when current information is insufficient. Behaviors suggesting metacognition have been reported in monkeys, dolphins, and rats; however, conclusive evidence of metacognition has been noticeably absent in pigeons. We trained pigeons on a same-different discrimination between arrays containing 12 items (low difficulty), 4 items (intermediate difficulty), and 2 items (high difficulty). We included an "increase" button which pigeons could use to increase the number of items in the array and a "go" button which would simply allow birds to make their discriminative choice. With few items, pigeons exhibited higher accuracy when allowed to increase the number of items than when forced to respond. Critically, pigeons' choice of the "increase" button rose as the number of items was reduced. In addition, some pigeons showed immediate transfer for using the "increase" button on novel brightness and size discrimination tasks. Implications for associative and metacognitive explanations will be discussed.

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**2:30-2:45 (211)**

**Neural Correlates of Metacognitive Monitoring During Episodic and Semantic Retrieval.** ARTHUR P. SHIMAMURA and JEREMY A. ELMAN, *UC Berkeley*—In neuroimaging studies, memory retrieval is marked by activity in the posterior parietal cortex (PPC). Specifically, the PPC is active when previously studied items are correctly recognized as old compared to items correctly recognized as new. Here, we considered two questions: 1) does PPC activity monitor feeling of knowing (FOK) in addition to recognition judgments and 2) does PPC activity monitor retrieval of semantic knowledge as well as recently learned (episodic) information? Prior to scanning, subjects were given the answers to obscure facts (The name of the number two wood golf club is BRASSIE). In the scanner, FOK was assessed for these "episodic" facts as well as for other general information "semantic" facts. Overall, strong FOK ratings recruited a network that included PPC, temporal cortex, and prefrontal cortex. Whereas episodic retrieval involved heightened ventral PPC activity, semantic retrieval involved heightened mid-temporal activity. Findings are couched in terms of CoBRA (Cortical Binding of Relational Activity), a new theory of episodic retrieval.

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**Working Memory III****Grand Ballroom C, Saturday Afternoon, 1:30-2:45***Chaired by Edward K. Vogel, University of Oregon***1:30-1:45 (212)**

**Variation in Short Term Memory Capacity Determines the Maximal Bandwidth for Acquiring Long Term Memories.** EDWARD K. VOGEL and KEISUKE FUKUDA, *University of Oregon*—How much information from the environment can be encoded into long term memory (LTM) in a single pass through short term memory (STM)? We examined whether an individual's STM capacity sets his or her maximal bandwidth for LTM storage by testing LTM recognition performance for novel and repeated arrays of objects that were originally presented as part of a STM change detection task. Across several experiments, we found that an individual's STM capacity strongly predicted his or her success on both incidental and intentional LTM recognition tasks that tested memory for either individual objects from the array or its spatial configuration. Moreover, high capacity STM individuals required less encoding time and fewer repetitions to build stronger LTM representations than did low capacity individuals. Together, these results indicate that the individual's STM capacity sets the maximal bandwidth of information storage into LTM and strongly support classic "gateway" models of memory.

Email: Edward K. Vogel, [vogel@uoregon.edu](mailto:vogel@uoregon.edu)**1:50-2:05 (213)**

**Individual Differences in Working Memory: Where Do They Come From?** PIERRE BARROUILLET and ANNALISA LUCIDI, *University of Geneva*—Working memory (WM) capacity is a good predictor of high-level cognitive abilities. However, the sources of individual differences in WM capacity are still undecided. According to the time-based resource-sharing model, performance in WM span tasks depends on processing efficiency, which determines the time during which the intervening task prevents attention from counteracting temporal decay of memory traces, and efficiency of the refreshing mechanisms, which restore memory traces as soon as attention is available. In three experiments, high and low WM span individuals performed a complex span task in which they maintained series of letters while solving arithmetic problems. The difference in WM spans between the two groups was reduced when equating processing times, and eliminated when the time available to reactivate memory traces was tailored to the processing speed of each group. This suggests that WM performance depends on processing efficiency and on the capacity to reactivate memory traces.

Email: Pierre Barrouillet, [pierre.barrouillet@unige.ch](mailto:pierre.barrouillet@unige.ch)**2:10-2:25 (214)**

**Rethinking Buffer Operations in a Dual-Store Model.** MELISSA LEHMAN, *Purdue University*, KENNETH J. MALMBERG, *University of South Florida* (Read by

Kenneth J Malmberg)—Controversy has surrounded dual-store models of memory since they were originally proposed. Often ignored in the debate (at least lately), however, is the role control processes play in encoding and retrieval. In this talk, we will present the results of several experiments that implicate buffer operations in the structure of memory traces and the construction of retrieval cues used to probe memory. Specifically, we will show how the length and structure of study lists systematically affect the form of the serial position curve, the probabilities and latencies of items first recalled, and the conditional recall probabilities for immediate, delayed, and continuous distractor free recall procedures. Finally, we will describe the Lehman & Malmberg (2009) model of buffer operations that predicted these finding a priori and discuss the implications of the present findings for single-store models of memory.

Email: Kenneth J. Malmberg, [malmberg@usf.edu](mailto:malmberg@usf.edu)**2:30-2:45 (215)**

**Activating a Memory Set and Searching It Have Different Effects on Time Production.** RICHARD SCHWEICKERT and ZHUANGZHUANG XI, *Purdue University*, CHARLES VIAU-QUESNEL, *Laval University*, MOTONORI YAMAGUCHI, *Vanderbilt University*, CLAUDETTE FORTIN, *Laval University*—When a subject searches short-term memory and concurrently produces a given time interval, increasing memory-set size increases the produced interval. This shows timing requires some working memory resource. Suppose a subject learns more than one memory-set. Logically, activating one of the memory-sets requires some working memory resource. If it is the same resource as required by search, then activating a memory set will increase a concurrently produced time interval. Three experiments are reported. In the first, activating a memory-set had no effect on a concurrently produced time interval. In the second, unexpectedly, activating a memory set had a different effect on time production for set sizes three and six. To follow up, we used a paradigm of Conway and Engle (1994) with more control over memory-set activation. Subjects learned four memory-sets, of sizes 3, 4, 5 and 6. Set-size had an effect on time production, but activating a memory set did not.

Email: Richard Schweickert, [swike@psych.purdue.edu](mailto:swike@psych.purdue.edu)**SYMPOSIUM II**

**Wayfinding in the Seattle Public Library: What Can We Learn About Navigational Styles?**

**Grand Ballroom AB, Saturday Afternoon, 2:00-4:10**

*Chaired by Laura Carlson, University of Notre Dame  
Amy Shelton, Johns Hopkins University*

**2:00-2:10 (216)**

**Introduction.** LAURA CARLSON, *University of Notre Dame*.



**2:10-2:30 (217)**

**Neural Bases of Navigation.** HUGO SPIERS, *University College London*-This talk will discuss the navigational guidance systems in the human brain as identified with neuroimaging and a real-world navigation task. Volunteers visited London's Soho district (UK) and learned the layout and points of interest with a guided tour. On the next day, volunteers were scanned with functional magnetic resonance imaging while they performed a navigation task that involved watching first-person-view movies and making choices about the direction to goals at street junctions. Over the period of navigation, activity in the hippocampus tracked the straight-line Euclidean distance to the goal, but at decision points it switched to coding future paths to the goal, supporting computational models of hippocampal function. We are currently exploring the brain dynamics of navigation in conjunction with space syntax measures extracted from the environment as a way to better understand the interface between design features and navigation.

Email: Hugo Spiers, [h.spiers@ucl.ac.uk](mailto:h.spiers@ucl.ac.uk)

**2:30-2:50 (218)**

**Navigation Across Development.** DAVID UTTAL and LEI YUAN, *Northwestern University*-This talk will discuss the cognitive and developmental factors that influence individual differences in wayfinding. We will report research on the development of individual differences in spatial cognition and navigation and consider both the possible causes of these differences as well as their likely developmental course. Some studies suggest that reliable individual differences in spatial cognition can be observed even by age 5, and we will consider whether, and how, these differences could affect navigation. We will also discuss work on whether adults acquire survey-like representations of space as suggested in the literature and will consider whether there are indications of developmental antecedents of these individual differences. Finally, we will consider influences on the developmental expression of individual differences in navigation, including how experiences, interests, and even personality differences may influence how people explore and learn from their environments.

Email: David Uttal, [duttal@northwestern.edu](mailto:duttal@northwestern.edu)

**2:50-3:10 (219)**

**Space Analysis of Seattle Central Public Library.** CHRISTOPH HÖLSCHKE, *University of Freiburg*, RUTH CONROY DALTON, *Northumbria University* and MARTIN BRÖSAMLE, *University of Freiburg*-This talk will describe the space syntax framework used to analyze the space and structure of buildings to provide an index of navigability. An analysis of the Seattle Public Library will be presented that associates building design features with particular wayfinding strategies. Previous work in our group has identified spatial properties that guide navigation decisions. Interestingly, these features are differentially used as a function of a user's familiarity with the building (for example, first-time visitor versus regular patron). Such spatial features include visibility of the entrance and the

central intersections throughout the building, appropriateness of signage, complexity of the layout arrangement, and vertical connections in multi-level structures. To identify wayfinding challenges in the Seattle Public Library, we discuss a formal analysis of these features in this building and present an appraisal by a wayfinding design expert who performs a cognitive walkthrough with design guidelines.

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**3:10-3:30 (220)**

**Wayfinding in the Seattle Public Library: Methodology.**

LAURA CARLSON, *University of Notre Dame*-This talk will describe the methods and tasks employed in a pre-psychonomic workshop conducted at the Seattle Public Library. We will collect data in a series of wayfinding tasks from 48 pre-registered participants who have never visited this building. Prior to entering the library, each participant will receive a card with four wayfinding tasks, such as "enter the library and find your way to the stacks housing psychology journals." The tasks are designed to vary in navigational complexity based on the space syntax and cognitive walkthrough analyses and to offer tests of hypotheses about how the challenges they pose impact different possible strategies. After the wayfinding tasks, participants will provide feedback on their navigational experiences and complete a battery of wayfinding and individual difference assessments. This comprehensive approach will enable us to assess the interaction among the building design features and the underlying spatial skills and abilities of the user.

Email: Laura Carlson, [lcarlson@nd.edu](mailto:lcarlson@nd.edu)

**3:30-3:50 (221)**

**Wayfinding in the Seattle Public Library: Data.**

AMY SHELTON, *Johns Hopkins University*- This talk will present the data from the pre-psychonomic workshop conducted in the Seattle Public Library. Wayfinding strategies stemming from animal models of spatial learning will be used to identify classes of participants, and we will examine how differences in strategy and spatial ability interact with building design features. Given the known variability in the reaction to navigation in this setting, we expect that we will have differences in both navigational success and types of information people use. We will attempt to link these experiential data to measures that have been used in the lab to differentiate individuals during navigation, including tasks and inventories that have known differences in their relationships to underlying brain mechanisms. Finally, we will discuss how taking this approach has enlightened our understanding of how to bridge question-driven laboratory studies of navigation to the real-world spaces where people face these challenges.

Email: Amy Shelton, [ashelton@jhu.edu](mailto:ashelton@jhu.edu)

3:50-4:10 (222)

**Wayfinding in the Seattle Public Library: Discussant.**

MARY HEGARTY, *University of California, Santa Barbara*—While research to date has documented large individual differences in wayfinding, and has led to the development of self-report measures of both navigation ability and navigational styles, this talk will argue that our understanding of individual differences in wayfinding needs to be informed by the cognitive, developmental and neurobiological factors discussed in this symposium. Importantly, we need ways of objectively measuring individual differences in navigation styles, and these measures need to be informed both by controlled laboratory studies and observations of navigation difficulties in real environments. The talk will therefore argue for the utility of blending a targeted case study approach with experimental examinations of individual differences and insights from neuroscience.

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**Letter and Word Processing II**

**Metropolitan A, Saturday Afternoon, 3:10-4:25**

*Chaired by Curt Burgess, University of California, Riverside*

3:10-3:25 (223)

**The Temporal Nature of the Semantics of Cuing in the Game of Password.** CURT BURGESS and JUSTIN ESTEP, *University of California, Riverside*—The HAL (Hyperspace Analog to Language) memory model has previously been used to understand semantic and associative priming, grammatical categorization and various other memory and language phenomena. In the current study, the HAL model was used to investigate effects in a dynamic language exchange. Participants completed a game of Password in which one participant is given a target word and must give cues to help the other participant guess the target word. Distances computed using the HAL model were used to determine how the contextual similarity of the cues to the target word, guesses to the target word, and guesses to the cues changed over time. The goal of the study was to gain information about how dynamic language exchanges emerge over time, how people might steer each other to a particular concept, as well as how a contextual similarity model can help us learn about these phenomena and the extent to which it can predict human behavior.

Email: Curt Burgess, [curt@ucr.edu](mailto:curt@ucr.edu)

3:30-3:45 (224)

**Multiple Primings of Homograph Meanings: A Transfer Analysis.**

DAVID S. GORFEIN, *University of Texas-Dallas*, VINCENT R. BROWN, *Hofstra University*, and WILLIAM SCHWEINLE, *University of South Dakota*—Studies of lexical ambiguity have most often focused on the effect of a single priming event on subsequent performance requiring the processing of the same ambiguous word (homograph). The current study varies the number of priming events for both balanced (relatively equal occurring

meanings) and unbalanced homographs. We examine performance both across priming trials and in transfer conditions. Results are discussed contrasting activation versus inhibition models of homograph processing.

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3:50-4:05 (225)

**The Semantic Priming Project: A Mega-Study.**

KEITH A. HUTCHISON, *Montana State University*, DAVID A. BALOTA, *Washington University*, JAMES H. NEELY, *University at Albany*, MICHAEL J. CORTESE, *University of Nebraska, Omaha*, EMILY R. COHEN-SHIKORA, *Washington University*, MELVIN J. YAP, *National University of Singapore*, CHI-SHING TSE, *Chinese University of Hong Kong*—Speeded naming and lexical decision data for 1,661 target words following related and unrelated primes were collected from 768 subjects across 4 different universities. These behavioral measures have been integrated with demographic information for each subject and descriptive characteristics for every item. Participants also completed portions of the Woodcock-Johnson reading battery, three attentional control tasks, and a circadian rhythm measure. These data are available at a user-friendly internet-based repository (<http://spp.montana.edu>). This website includes a search engine designed to generate lists of priming items with specific characteristics (e.g., length, frequency, associative strength, latent semantic similarity, priming effect in standardized or raw RTs). We will illustrate the types of questions that can be addressed via the Semantic Priming Project, and present first pass regression analyses of targeted variables. These data represent the largest behavioral database on semantic priming and are available to researchers to aid in selecting stimuli, testing theories, and reducing potential confounds in their studies.

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4:10-4:25 (226)

**Toward a Full Account of Item Variance in Printed Word Naming.**

ARNAUD REY, PIERRE COURRIEU, SYLVAIN MADEC and JONATHAN GRAINGER, *Laboratoire de Psychologie Cognitive - CNRS - Université de Provence, Marseille, France*—Since the seminal study by Spieler and Balota (1997), accounting for variance in item databases has become a major challenge for testing models of single word reading. In the present study, based on a recently published large-scale naming database using French disyllabic words, we collected a new database composed of 100 participants that performed a naming and delayed naming task on a sample of the word list used in the previous database. The comparison between the latencies of the previous and the new databases together with the combination of the naming and delayed naming latencies provide important additional pieces of information concerning the respective role of perceptual and output articulatory processes in naming. Altogether, these data bring us closer to a full understanding of item variance in single word naming.

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## Psycholinguistics II

Metropolitan B, Saturday Afternoon, 3:10-4:25

Chaired by Gail Mauner, University at Buffalo

3:10-3:25 (227)

**Verb Semantic Similarity Affects Syntactic Priming.** EUNKYUNG YI, JEAN-PIERRE KOENIG and GAIL MAUNER, *University at Buffalo* (Read by Gail Mauner)—We investigated whether the degree of semantic overlap between verbs in Prepositional Dative target (PDT) and Double Object prime (DOP) sentences affects syntactic priming. Participants read PDT sentences followed by DOP sentences presented via Rapid Serial Visual Presentation and then recalled them in reverse order following prime sentence fragment (up to the verb). Semantic similarity between verbs in PDT-DOP pairs was either high (promise-guarantee) or low (promise-bounce). Intransitive sentences served as prime controls. We hypothesized that syntactic priming would be strongest when verbs were most similar in meaning. The dependent variable was whether participants shifted the syntactic structure of PDTs to a DO structure. The results of a mixed effects logistic regression model revealed that PDTs shifted to DO structures most often when verbs in DOPs were highly semantically similar. These results are important because they demonstrate that verb semantic similarity plays a role in syntactic priming and language production.

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3:30-3:45 (228)

**Greater Priming Effects with Proper than Common Name Homophones on Proper Name Retrieval.** DEBORAH M. BURKE, BRETT ERSPAMER, *Pomona College* and ELIZABETH GRAHAM, *Claremont Graduate School*—The Tip-of-the-tongue experience (TOTs) is the temporary failure to retrieve a well known word. TOTs increase with aging during adulthood, especially for proper names. Under the Transmission Deficit (TD) model, TOTs occur when connections from semantic to phonological representations are too weak to transmit sufficient activation for retrieval. Consistent with this model, we show that prior production of homophones decreases TOTs and increases correct name retrieval when participants name pictures of famous people, with no awareness of the homophonic overlap. This priming effect on retrieval of the target name (e.g., Sharon Stone) was greater when the homophone prime was a proper name (e.g., Oliver Stone) rather than a common noun (e.g., stone as in rock). Under the TD model, proper names have more complex representations, which increases their vulnerability to retrieval failures. Proper name homophones were more effective at reducing TOTs for proper names because their representation overlaps the target name at more than a phonological level, unlike a common name homophone. The greater overlap means that more connections are strengthened in the representation of the target name with proper name primes.

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3:50-4:05 (229)

**Processing Novel and Lexicalized Finnish Compound Words.** ALEXANDER POLLATSEK, *University of Massachusetts, Amherst*, RAYMOND BERTRAM and JUKKA HYÖNÄ, *University of Turku*—Participants read sentences which contained novel and lexicalized two-constituent compound words while their eye movements were measured. The frequency of the first constituent of the compounds was varied factorially and the frequency of the lexicalized compounds was equated. The sentences prior to the target word were matched across conditions. Lexicality and first constituent frequency had large effects on gaze durations on the target word and the constituent frequency effect was larger for the novel words. These results together with those of Pollatsek, Slattery, and Juhasz (2008) indicate that first constituent frequency has an effect in two stages: in the initial encoding of the compound and in the construction of meaning for the novel compound. A general model of the relationship of the processing of polymorphemic words to how they are fixated is presented.

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4:10-4:25 (230)

**Interference and Working Memory in Sentence Comprehension.** YINGYING TAN and RANDI C. MARTIN, *Rice University*, JULIE A. VAN DYKE, *Haskins Laboratories* (Read by Randi C. Martin)—During sentence processing, interference effects occur when comprehenders have to retrieve earlier information to link with later information across intervening material with semantic or syntactic features that partially match the target information. The working memory resources involved in retrieval and interference resolution were investigated using an individual differences approach. Ninety-six subjects read sentences in a self-paced, phrase-by-phrase fashion followed by a comprehension question. The degree of semantic and syntactic interference in the intervening material was manipulated factorially. Semantic interference effects were negatively correlated with semantic retention capacity, even after partialling out vocabulary knowledge. Syntactic interference was related only to reading span, a complex measure which involves syntactic processing. A measure of phonological retention capacity was found to be unrelated to any of the interference effects. The results are consistent with a multiple capacities approach to verbal working memory that includes separable phonological, semantic, and syntactic components, with only the latter two being relevant for sentence comprehension.

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**Eyewitness Memory****Grand Ballroom D, Saturday Afternoon, 3:10-4:25***Chaired by Ayanna K. Thomas, Tufts University***3:10-3:25 (231)**

**Why Retrieval Enhances Suggestibility? The Role of Attentional Allocation.** AYANNA K. THOMAS, *Tufts University*, JOHN B. BULEVICH, *Stockton College*, LEAMARIE GORDON, *Tufts University*—Taking a test after witnessing a crime leads to increased susceptibility to misleading post-event information. This phenomenon, known as Retrieval Enhanced Suggestibility (RES), illustrates a situation in which testing actually hurts memory. In the present study we examined how testing affected the attentional allocated to post-event information. We hypothesized that testing would affect the allocation of attention to specific details within the narrative, resulting in improved encoding. RES would result because learning of information in the narrative would be enhanced. We found that participants who received a test prior to the narrative, spent more time reading sentences with misleading information than participants who did not take an intervening test. Further, we found that retrieval processes were central to the enhanced learning of the post-event narrative. Finally, retrieval led to improved learning of the narrative as compared to manipulations designed to direct attention to narrative processing.

Email: Ayanna K Thomas, [ayanna.thomas@tufts.edu](mailto:ayanna.thomas@tufts.edu)**3:30-3:45 (232)**

**What Can We Learn from Real-Life Lineups from Experiments Using Real-Life Lineups?** GEOFFREY R. LOFTUS, *University of Washington*, GARY L. WELLS, *Iowa State University*, MARC STAHL, *Cook County Public Defenders*—Two suggestions, both contrary to common current practice, have been made for improving reliability of a police lineup: first that lineups be conducted double blind, i.e., without the lineup administrator knowing who the suspect is, and second that lineups be presented sequentially; i.e., that lineup members be shown one at a time rather than all at once. A recent experiment, using actual police lineups in three Illinois cities, demonstrates directly that implementation of these two suggestions reduces police influence on witnesses, thereby improving lineup reliability. A mathematical theory of witness memory and choice, applied to the Illinois data, demonstrates that, compared to non-double blind simultaneous lineups, using double-blind sequential lineups decreases the rate of falsely identifying innocent suspects disproportionately to the associated decrease in the rate of correctly identifying guilty suspects. Of the four possible lineup conditions—double-blind/not double-blind crossed with sequential/simultaneous presentation—the double-blind/sequential condition yields the highest probability of a correct identification and the lowest probability of a false identification when a witness makes an identification from the lineup.

Email: Geoffrey R. Loftus, [gloftus@u.washington.edu](mailto:gloftus@u.washington.edu)**3:50-4:05 (233)**

**Deconstructing the Simultaneous and Sequential Lineup Meta-Analysis.** SCOTT D. GRONLUND, *University of Oklahoma*, STEVEN E. CLARK, *UC Riverside*, CURT A. CARLSON, *Texas A&M University, Commerce*, CHARLES A. GOODSSELL, *Canisius College*—The link between mistaken eyewitness identification and false convictions is clear. One recommendation for reducing mistaken identifications is to change the way that identification lineups are conducted from the typical simultaneous (view all lineup members at once) to sequential (one at a time). We deconstruct a recent meta-analysis by Steblay, Dysart, and Wells (2011) that concluded sequential lineups result in “22% fewer errors.” The following factors raise questions about this conclusion: 1) Steblay et al. conflated identifications of any lineup foil with the specific error of a false identification of an innocent suspect. 2) Their conclusion relies heavily on a particular measure of probative value. 3) Their conclusion relies on dubious inclusion/exclusion criteria. 4) Studies that provided multiple simultaneous-sequential comparisons were compressed into single comparisons. Upon reanalysis, the extant research does not support Steblay et al.’s conclusion.

Email: Scott D. Gronlund, [sgronlund@ou.edu](mailto:sgronlund@ou.edu)**4:10-4:25 (234)**

**Aggregating Memories Across Individuals in the Presence of Systematic Distortions.** MARK STEYVERS and NICOLE BECKAGE, *University of California, Irvine*—Much of the research in memory builds on an assumption that the experimenter knows which stimuli were presented at study. However, in many real-world situations, such as cases involving eyewitness testimony, this kind of ground truth might not be available. The only observable data might consist of the verbal reports in the form of recognition or recall judgments. In this research, we focus on the computational problem of reconstructing the past by aggregating the retrieved memories from a number of individuals who have all witnessed the same set of events. A particularly challenging problem is to accurately reconstruct the past in the presence of systematic biases such as false memories as observed in the DRM paradigm. We introduce a probabilistic approach for aggregation that produces accurate reconstructions, even when the majority of individuals give the incorrect answer. The approach requires knowledge of pre-experimental associations between stimuli and a model for memory judgments such that false memories can be “explained away” by the model.

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**Reasoning and Problem Solving****Willow AB, Saturday Afternoon, 3:10-4:25***Chaired by Russell Revlin, University of California Santa Barbara***3:10-3:25 (235)**

**Set-Size and Group Consistency in a Belief Revision Paradigm.** ALEXANDRA Y. CHAMBERS and RUSSELL REVLIN, *Psychology, UC Santa Barbara* (Read by Russell Revlin)—In the present studies, reasoners consider rules of the form All A are B and a modus ponens (A, therefore B) or modus tollens (not B, therefore not A) inference which follows logically. The belief revision paradigm asks people to assume the logical outcome has been contradicted and that not B or A is actually true. Reasoners revise the initial set of statements to accommodate the assumption, and their choices are influenced by the believability and logical form of the statements. In principle, belief revision should not be affected by the presentation format (text-only or illustrated presentation). However, the three experiments reveal that presentation format influences the perceived size and consistency of the categories, which in turn alters commitment to retain individual propositions.

Email: Russell Revlin, [revlin@psych.ucsb.edu](mailto:revlin@psych.ucsb.edu)**3:30-3:45 (236)**

**Can Teaching the Mechanism of Global Warming Save Us Organisms? Studies in Climate Change Instruction.** DANIEL REINHOLZ, DAV CLARK and MICHAEL A. RANNEY, *University of California, Berkeley* (Read by Michael A. Ranney)—Compared to peer nations' residents, U.S. residents are markedly reluctant to accept evolution and (e.g., anthropogenic) climate change. Reinforced Theistic Manifest Destiny theory (RTMD; e.g., Ranney & Thanukos, 2011) explains such U.S.—exceptionalism by combining geopolitical history with six constructs: afterlife, deity, nationalism, creation, evolution, and global warming. In the present studies, we assessed the impact of a 400-word description of climate change's mechanism on participants' knowledge and attitudes. Before instruction, participants rarely understood that (a) the sunlight that Earth's surface absorbs (mostly visible wavelengths) differs from the infrared light that Earth subsequently emits, (b) and the infrared light is absorbed by greenhouse gases that (c) differ from other gases because greenhouse gases can be at least transiently asymmetrical. Between- and within-group contrasts showed both often-dramatic knowledge increases regarding these key concepts and increased climate change acceptance. Instruction-induced changes among RTMD relationships, and the role of surprise, will also be discussed.

Email: Michael A. Ranney, [ranney@berkeley.edu](mailto:ranney@berkeley.edu)**3:50-4:05 (237)****Sequential Eye-Movement Analysis Reveals Strategic Processing on Raven's Advanced Progressive Matrices.**

ALEXANDER A. PETROV, TAYLOR R. HAYES and PER B. SEDERBERG, *Ohio State University*—Eye-movement patterns contain important information about strategic information processing. Using the successor representation (SR, Dayan, 1993, *Neural Computation*) to capture statistical regularities in temporally extended fixation sequences, we were able to assess strategic shifts in eye-movement patterns and predict scores on Raven's Advanced Progressive Matrices (APM) test. Thirty-five participants completed two subsets of APM items on two separate days. Principal-component analysis of the SRs revealed individual differences in scanning patterns. The strongest principal component quantified the tendency to systematically scan the Raven matrix by rows; another component quantified the tendency to toggle to and from the response area. Leave-one-out cross validation demonstrated that these two components predicted 41% of the variance in Raven scores. These findings indicate that high-scoring individuals not only use a constructive matching strategy, but that they tend to process the problem systematically by rows, while low-scoring individuals tend to be less systematic and toggle more frequently.

Email: Alexander A. Petrov, [apetrov@alexpetrov.com](mailto:apetrov@alexpetrov.com)**4:10-4:25 (238)****The Effect of Activating Prior Knowledge on Matchstick Arithmetic Insight Problem Solving.**

TRINA C. KERSHAW, MEGAN E. SPEER and EVAN AMES, *University of Massachusetts Dartmouth*—The purpose of this experiment was to influence insight problem solving performance by activating relevant or irrelevant prior knowledge about arithmetic or Roman numerals. Participants completed one of four training exercises in which they corrected simple arithmetic problems, connected Roman numerals to their Arabic equivalents (both examples of irrelevant knowledge), altered numerals or operators within arithmetic problems, or constructed Roman numerals and operators out of matchsticks (both examples of relevant knowledge). There was also a control group that did not receive training. All participants then completed a sequence of matchstick arithmetic insight problems, in which one matchstick must be moved to make a correct answer. Each sequence began with a simple problem, then had three complex problems, then ended with four simple problems. We found, as also shown by Kershaw, Braasch, and Flynn (2010), that participants did worse on the simple problems after they had solved the three complex problems. However, initial analyses did not show any differences between the training groups. The results will be discussed in relation to theories of constraint relaxation in insight problem solving.

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**Visual Search****Grand Ballroom C, Saturday Afternoon, 3:10-4:25***Chaired by Jeremy M. Wolfe, Brigham & Women's Hospital / Harvard Medical School***3:10-3:25 (239)**

**Combining Visual Search and Memory Search in the Same Task.** JEREMY M. WOLFE, *Brigham & Women's Hospital / Harvard Medical School*—You are at a salad bar that contains, let us say, 50 items. You are holding in memory a list of 10 items that you want to include in your salad. Assembling this lunch requires concurrent searches through the visual scene and the contents of memory. How do you do that? A literature from the 60s and 70s asked this question for letters and numbers in small set sizes. Here, we use diverse objects and larger set sizes (up to 100 objects held in memory). Reaction times increase linearly with visual set size. They increase linearly with the log of memory set size. This logarithmic compression saves the task from disaster. Otherwise, even at a brisk 25 msec/item, our searches for one of 100 items in a visual set of 16 would have taken at least 40 seconds each. Suppose you search through a set of digits for a letter or a set of letters for a digit. Is that a logarithmic search through a memory set of 26 letters (10 for digits)? In fact, searches for these categorically-defined targets are much more efficient. Obviously, this means that we learn to make categories out of heterogeneous sets of items. How long does that take? We do not know but, with diverse objects, 1000 trials is not enough.

Email: Jeremy M. Wolfe, [wolfe@search.bwh.harvard.edu](mailto:wolfe@search.bwh.harvard.edu)**3:30-3:45 (240)**

**Visual Working Memory Content Biases the Allocation of Gaze During Search Through Natural Scenes.** ANDREW HOLLINGWORTH and MACHI MATSUKURA, *University of Iowa*—The ability to find objects in natural scenes is central to the completion of most real-world tasks (e.g., making tea requires finding the kettle, the teapot, a spoon, etc.). How is attention guided within natural scenes toward the locations of task-relevant objects? In the present study, we examined the role of visual working memory (VWM) in guiding eye movements during visual search. Participants searched for small letter targets within photographs of natural scenes. Simultaneously, they maintained a color value in VWM. The remembered color was manipulated so that it matched or did not match the color of an object in the scene. Although letter targets never appeared on memory-matching objects, matching objects were fixated significantly earlier than equivalent non-matching objects, indicating that gaze was biased toward scene features matching the current content of VWM. Template-based, guided search therefore appears to be a plausible mechanism by which top-down guidance can be exerted over visual search in scenes.

Email: Andrew Hollingworth, [andrew-hollingworth@uiowa.edu](mailto:andrew-hollingworth@uiowa.edu)**3:50-4:05 (241)**

**What Does it Take to Guide Search for a Range of Colors?** MICHAEL J. STROUD, *Merrimack College*, TAMARYN MENNEER, *University of Southampton*, ELINA KAPLAN and KYLE R. CAVE, *University of Massachusetts*, NICK DONNELLY, *University of Southampton* (Read by Kyle R Cave)—Many experiments demonstrate attentional guidance to items with a specific color. For some real-world search tasks, the target colors are not precisely known, and any item with a color within a range of values should be attended and checked. Thus, we might expect that the target representation guiding search could specify a range of similar colors. Nevertheless, in most of our experiments tracking eye movements, search is often poorly guided if the target colors vary across a range. However, guidance is reasonably effective if subjects are told to search for a specific set of colors that are distributed across the target range, and if these colors rarely appear as distractors. These results show that a range can be effectively represented for guiding search if featural information is very informative about target presence, and if the subject is accurately informed about which colors will and will not appear as targets.

Email: Kyle R. Cave, [kcave@psych.umass.edu](mailto:kcave@psych.umass.edu)**4:10-4:25 (242)**

**Perceptual Learning Via Attentional Cueing.** MICHAEL C. MOZER, *University of Colorado*, HAROLD PASHLER and JASON JONES, *UC San Diego*, ROBERT LINDSEY, *University of Colorado*—Our goal is to improve training in tasks requiring exploration of complex visual environments (e.g., driving) by building models of experts and using these models to cue novices where to look in a given context. Does appropriate cueing support learning? Novices may prove lazy and come to rely on the cues instead of learning to direct attention appropriately. We evaluated the effect of cueing by training participants to saccade to an invisible target in one corner of a series of 'context' displays. When the mapping of contexts to target corners was systematic (i.e., contextual cueing), participants improved over repeated presentations. The critical manipulation involved providing attentional cues to direct saccades to the target corner. When testing without cues, performance was the same whether or not cues were provided during training, indicating that the cues did not affect learning. However, cueing cut the time for training in half.

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**Business Meeting**

**Grand Ballroom AB, Saturday Evening, 4:30-5:45**

*Chaired by Reed Hunt, University of Texas at San Antonio*

**Funding Opportunities: Behavior at NIH's OBSSR and NCCAM.**

JOHN GLOWA, NCCAM/NIH

**Presentation of the Journal of Experimental Psychology Awards.**

JEREMY WOLFE, *Brigham and Women's Hospital/Harvard Medical School*

**JEP: Animal Behavior Processes.**

FABIAN A. SOTO, *University of Iowa*. For the article: Soto, F. A., & Wasserman, E. A. (2010). Integrality/separability of stimulus dimensions and multidimensional generalization in pigeons. *Journal of Experimental Psychology: Animal Behavior Processes*, 36, 194-205

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**JEP: Applied**

AMY E. CROOK, *Rice University*. For the article: Crook, A. E., & Beier, M. E. (2010). When training with a partner is inferior to training alone: The importance of dyad type and interaction quality. *Journal of Experimental Psychology: Applied*, 16, 335-348.

Email: Amy Crook, [crook@rice.edu](mailto:crook@rice.edu)

**JEP: General**

SARA M. LEVENS, *Stanford University*. For the article: Levens, S. M., & Gotlib, I. (2010). Updating positive and negative stimuli in working memory in depression. *Journal of Experimental Psychology: General*, 139, 654-664.

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**JEP: Human Perception and Performance**

MARC OUELLET, *Universidad de Granada*. For the article: Ouellet, M., Santiago, J., Funes, M. J., & Lupiáñez, J. (2010). Thinking about the future moves attention to the right. *Journal of Experimental Psychology: Human Perception and Performance*, 36, 17-24.

Email: Marc Ouellet, [mouellet@ugr.es](mailto:mouellet@ugr.es)

**JEP: Learning, Memory, & Cognition**

ILKE ÖZTEKIN, *Koc University*. For the article: Öztekin, I., & McElree, B. (2010). Relationship between measures of working memory capacity and the timecourse of short-term memory retrieval and interference resolution. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 36, 383-397.

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**Business of the Psychonomic Society.**

REED HUNT, *University of Texas at San Antonio*.

**Cognitive Control II**

**Willow AB, Sunday Morning, 8:00-9:15**

*Chaired by Eric-Jan Wagenmakers, University of Amsterdam*

**8:00-8:15 (251)**

**Testing Theories of Post-Error Slowing.** GILLES DUTILH, *University of Amsterdam*, JOACHIM VANDEKERCKHOVE, *University of Leuven*, BIRTE U. FORSTMANN, *University of Amsterdam*, EMMANUEL KEULEERS and MARC BRYSSBAERT, *University of Ghent*, ERIC-JAN WAGENMAKERS, *University of Amsterdam* (Read by Eric-Jan Wagenmakers)—People tend to slow down after they make an error. This phenomenon, generally referred to as post-error slowing, has been hypothesized to reflect perceptual distraction, time wasted on irrelevant processes, a priori bias against the response made in error, increased variability in a priori bias, or an increase in response caution. Although the response caution interpretation has dominated the empirical literature, little research has attempted to test this interpretation in the context of a formal process model. Here we used the drift diffusion model to isolate and identify the psychological processes responsible for post-error slowing. In a lexical decision data set comprised of 1,094,886 responses we found that post-error slowing was associated with an increase in response caution and -to a lesser extent- a change in response bias. In the present data set, we found no evidence that post-error slowing is caused by perceptual distraction or time wasted on irrelevant processes. These results support a response monitoring account of post-error slowing.

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**8:20-8:35 (252)**

**Item-Specific Control Modulates Color-Word Stroop Interference.** JULIE M. BUGG, *DePauw University*, KEITH A. HUTCHISON, *Montana State University*—In a 50% congruent list, Stroop interference is reduced for mostly incongruent relative to mostly congruent items (i.e., the item-specific proportion congruence (ISPC) effect). Extant evidence strongly supports the contingency learning account of ISPC effects in the color-word Stroop task. According to this account, ISPC effects are unrelated to proportion congruency and instead reflect learning of stimulus (word) -response contingencies. We present novel evidence demonstrating that ISPC effects also reflect item-specific control. In Experiment 1, colors are assigned to mostly congruent or mostly incongruent sets, and an ISPC effect is obtained that cannot be explained by differential response contingencies. In Experiment 2, words are assigned to mostly congruent or mostly incongruent sets. We find that the mechanism underlying ISPC effects depends on set size, with a smaller set size promoting use of contingency learning and a larger set size promoting use of item-specific control. These findings support the view that ISPC effects also reflect item-by-item modulation of the word's influence on color-naming.

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8:40-8:55 (253)

**Electrophysiological Evidence for Hierarchical Error Detection in Skilled Typewriting.** GORDON D. LOGAN, *Vanderbilt University*, A. EVE MILLER and DAVID L. STRAYER, *University of Utah*—Previously, we claimed that skilled typewriting is controlled by two hierarchically-nested feedback loops, an outer loop that processes word-level feedback and an inner loop that processes letter-level feedback. Here we provide electrophysiological evidence for these two feedback loops. Skilled typists typed single letters or single words and their responses were echoed on the screen. We recorded the error related negativity (ERN) in the electroencephalogram while they typed. We found ERNs when typists made errors typing single letters but no ERN time-locked to the erroneous response when typists made errors typing words. We found ERNs time-locked to the last letter of an erroneously-typed word regardless of where the error occurred. This suggests that the process that generates the ERN monitors the completion of the goal: typing a single letter in the single letter task or a whole word in the word task. The results support the two-loop theory of typewriting.

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9:00-9:15 (254)

**Conflict Adaptation During Verbal Response Selection.** F—XAVIER ALARIO, *Aix-Marseille Université & CNRS*, RACHEL OSTRAND, *University of California, San Diego, USA*, MATHIAS THOENIG, *Université de Lausanne*, BORÍS BURLE, *Aix-Marseille Université & CNRS*—A paradigmatic manifestation of cognitive control is the adaptation phenomena that occur during conflict resolution tasks. When participants respond to a visual stimulus carrying conflicting information (e.g. target and distracting arrows pointing in different directions), latencies are longer than in the absence of such conflict. An adaptation (aka Gratton) effect occurs when the magnitude of the conflict effect in a given trial is modulated by the nature (conflict vs. no conflict) of the preceding trial. We set out to distinguish adaptation to conflict from effects of stimulus or response repetition, and from performance effects (i.e. auto-correlation naturally present in response time series). To do so, we resorted to a verbal Stroop task with eighth different targets and distractors, and we conducted advanced data processing at the single trial level. The results of two experiments show that adaptation occurs for current conflict trials only, in the absence of stimulus or response repetition, and that it lasts several trials. Finally, conflict induced by subliminal distractors did not result in adaptation. These results have consequences for our understanding of the control operations reflected by adaptation effects.

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### Methodological and Analytical Innovations for Choice Tasks

**Grand Ballroom C, Sunday Morning, 8:00-9:15**

*Chaired by Joseph G. Johnson, Miami University*

8:00-8:15 (255)

**Interactive Eye Tracking Captures Dynamic Attention in Choice Tasks.** ANA M. FRANCO-WATKINS, *Auburn University* and JOSEPH G. JOHNSON, *Miami University*—To better measure cognitive processes such as attention and working memory during decision making, we introduce a new decision moving-window paradigm that combines the advantages of methods in decision research (mouse-tracking with contingent information display) and other cognitive domains (eye-tracking paradigms from reading and scene perception). Information about choice options is initially occluded, but displayed contingent on eye-fixations; this allows us to draw inferences regarding attention allocation during choice tasks. We demonstrate the effectiveness of this methodology in a series of empirical studies, and show how it compares to standard eye-tracking (without occlusion of information) and mouse-tracking methods. We introduce the development of new sequential analysis metrics to capture cognitive processes in complex tasks that are made possible by this paradigm. Finally, we outline the practical, theoretical, and analytic advantages of this method and how it can advance both decision research as well as inform other cognitive domains.

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8:20-8:35 (256)

**Response Dynamics in Decision Making: Tracking the Online Development of Preferences.** JOSEPH G. JOHNSON and GREGORY J. KOOP, *Miami University*—Cognitive scientists capitalize on the robust reciprocal connection between the motor and cognitive systems to study online response formation for tasks such as perceptual discrimination and identification. We extend this “action dynamics” paradigm to more complex higher-order tasks including risky choice and moral decision making. Specifically, we record the continuous motor trajectory that produces an ultimate choice response rather than just the discrete choice itself. Using empirical results from multiple studies, we introduce this innovative paradigm and the new analyses it affords, including: indices of competition, online preference reversal, and dynamic measures such as velocity. We assess the implications for popular theoretical claims (e.g. risk/loss aversion) and contributions to model comparison. Furthermore, we present an exciting new twist on the paradigm involving time-locked eye-tracking to associate attentional changes with response trajectory characteristics, thereby fully informing models (e.g. sequential sampling) that relate attention and intention across a variety of cognitive tasks.

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8:40-8:55 (257)

**Multiple-Measure Maximum Likelihood: An Application to Choice Tasks.** ANDREAS GLÖCKNER, MARC JEKEL and SUSANN FIEDLER, *Max Planck Institute for Research on Collective Goods*—In contrast to classic judgment and decision models, contemporary process models provide testable predictions on multiple dependent measures such as response times, confidence, information search, arousal, etc. This results in a methodological and a statistical challenge. First, it becomes harder to identify tasks that optimally differentiate between competing models, especially when they make similar predictions in many respects. Second, the fit between data and predictions on multiple dependent measures (including binary and continuous data) has to be integrated into an overall evaluation for each model. We present an integrative approach that solves both issues at the same time. It is based on a maximum likelihood method for integrating multiple measures into a single likelihood index for model evaluation, and a multidimensional method to systematically select the most diagnostic stimuli. Our method can be extended to any cognitive task wherein competing theories make predictions across any set of dependent measures.

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9:00-9:15 (258)

**A Response Time Methodology for Identifying Mental Architecture in Choice Tasks.** MARIO FIFIC, *Max Planck Institute for Human Development*, JÖRG RIESKAMP, *University of Basel*—Beyond simply testing specific strategies, we seek to determine a more fine-grained structure of mental processes involved in choice tasks. For this purpose we designed a paired-comparison inferential choice task utilizing system factorial technology (SFT). SFT is based on analyzing response times (RT) and allows for identification of important mental architecture features, such as order (serial vs. parallel) and amount (restricted vs. exhaustive search) of processing. These features are not only descriptively important, but can also differentiate among claims made by competing theoretical approaches. SFT revealed distinct, ecologically efficient patterns in our results: behavior based on serial cue-by-cue processing in non-compensatory environments, but parallel exhaustive processing of all cues in compensatory environments. The SFT test and RT patterns allowed for unique insights into the mind's fundamental processing structure in choice tasks which could not be achieved by solely analyzing choice outcomes or simpler measures of RT (e.g. mean differences).

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Concepts and Categories II

Metropolitan A, Sunday Morning, 8:00-9:55

Chaired by Andy J. Wills, *University of Exeter*

8:00-8:15 (259)

**Deliberative Processing and Overall Similarity in Free Classification.** ANDY J. WILLS, *University of Exeter*, CHRIS A. LONGMORE, *University of Hull*, FRASER N. MILTON, *University of Exeter*—The idea that deliberative (analytic) processing employs a smaller subset of the available information than non-deliberative (non-analytic) processing is commonly found in studies of categorization (Kemler Nelson, 1984), reasoning (Sloman, 1996), and complex decision-making (Dijksterhuis, Bos, Nordgren & van Baaren, 2006). In contrast, Milton and Wills (2004) proposed that, in a free classification procedure, deliberative thought can be associated with using all the available information (an overall similarity classification). Across six free classification experiments employing a match-to-standards procedure, we report that the effects of concurrent load, working memory capacity, instructions, and impulsivity, all support the idea that overall similarity classification can be deliberative. The relationship between our results and those found by other investigators is discussed.

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8:20-8:35 (260)

**Presentation Order Effects on Category Learning and Category Generalization.** FABIEN MATHY, *Université de Franche-Comté* and JACOB FELDMAN, *Rutgers University*—To compare rule- vs. exemplar-based learning models, we presented participants with three categorization tasks while manipulating the presentation order of training items. Exp. 1 examined the effect of constant orders across blocks (with the negative examples interleaved). In Exp. 2 and Exp. 3, constant fully-blocked orders were administered (with all the negative examples separated from the positive examples). The rule-based presentation order systematically facilitated learning relative to other orders. In Exp. 3, we found different generalization patterns for the 5-4 category structure as a function of presentation order. To account for the effects of order, we propose a new exemplar model that incorporates the temporal distance between the stimuli to account for the distortion of the stimulus space induced by presentation order. In addition to the effect of order our results suggest that categorization learning involves a process of rule-based abstraction.

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8:40-8:55 (261)

**Complexity and Knowledge Partitioning in Categorization.** DANIEL R. LITTLE and DAVID K. SEWELL, *The University of Melbourne*—There are two complementary motives thought to drive category learning: the minimization of error and the minimization of complexity. Typically in categorization, the minimization of error is accomplished by a single optimal strategy. An important exception are the knowledge partitioning experiments which contain categories that can be learned via one of two optimal strategies: a knowledge partitioning (KP) strategy based on the context-gated application of one of two possible rules and a context insensitive (CI) strategy based on the simultaneous utilization of multiple stimulus dimensions without context. We provide a minimum description length analysis of the representations acquired by these strategies demonstrating that in all of the knowledge partitioning experiments tested to date, the KP representations are more complex than the CI representations. In addition, we present an experiment demonstrating that the KP strategy is a serial strategy (i.e., context is processed first prior to application of the context-specific rule), which may offset the increased complexity of the representations acquired using this strategy.

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9:00-9:15 (262)

**Perceiving Ethical Issues: Competition between Surface and Deep Features.** MITCHELL RABINOWITZ, EMMA FIALKOV and MARGO JACKSON, *Fordham University*—This research investigated how students with two levels of training in the field of psychology (ethics course; no ethics course) represent common ethical scenarios. A triad judgment task was used with three types of triads sampled: 1) similar surface (story narrative) - unrelated, 2) similar structural features (underlying ethical dilemma) - unrelated, and 3) similar surface - similar structural. Students were asked to choose which source problem “goes best” with the target problem for each triad. The results showed that when there was competition between surface and structural features, participants were not as likely to choose the structural features. While the pattern of results were the same for both participants with or without ethics training, students with ethics training were more likely to perceive the structural similarities. The data is interpreted in the framework of a production deficiency and a competition model of features.

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9:20-9:35 (263)

**Pressure, Stress, and Cognition: Using Categorization As A Model Task to Investigate the Stress-Cognition Relationship.** SHAWN W. ELL, STEVE HUTCHINSON and SHANNON K. MCCOY, *University of Maine*—Pressure and stress have a profound impact on cognition. Although pressure and stress are often used synonymously, pressure may not necessarily be stressful. To investigate this

question, physiological markers of stress were recorded during a categorization task with control (i.e., do your best) or pressure instructions (i.e., you and your partner will earn a bonus if you perform well). Pressure impaired accuracy and increased task engagement, but was not stressful. In a second experiment, we used the Trier Social Stress Test to increase stress reactivity and demonstrated that the relationship between stress and cognitive performance may depend on the system recruited for the task. Increased stress reactivity predicted enhanced performance on an information-integration task (learning depends primarily upon a procedural-based system) and a trend for impaired performance on a rule-based task (learning depends primarily upon a hypothesis-testing system). In sum, stress reactivity and cognitive systems should both be considered in order to understand the relationship between stress, pressure, and cognition.

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9:40-9:55 (264)

**Expertise and Political Categorization.** EVAN HEIT and STEPHEN P. NICHOLSON, *University of California, Merced*—A nationally representative sample of adults completed two political categorization tasks. The first was to identify the political parties for person descriptions with information given about demographics and stands on issues. For these descriptions, objective probability of party membership was determined from national survey data. The second task was to decide whether to vote for each person. On the identification task, judgments about whether a person is a Democrat were almost a perfect mirror image of judgments of whether a person is a Republican,  $r = -.9977$ . In the aggregate, respondents were very successful in the identification task. The correlation between average identification responses and objective probabilities was .96. The mean correlation at the individual level was .62 and the median was .75. Likewise, respondents were successful at voting in terms of their own party interests. Success at these two tasks was positively correlated with a measure of political knowledge. The pattern of responses was also influenced by the political party of the respondent; in effect, feature weights depended on party membership. Taken together, the results point to a competent although polarized electorate.

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Face Perception and Recognition

Grand Ballroom D, Sunday Morning, 8:00-9:55

Chaired by Claus-Christian Carbon, *University of Bamberg*

8:00-8:15 (265)

**The Adaptivity of Aesthetic Dimensions in the Domains of Art and Design.** CLAUS-CHRISTIAN CARBON, *University of Bamberg*—Personal taste develops over time and is highly susceptible for Zeitgeist-dependent effects. The present paper investigates such developments within the framework of visual adaptation. For instance, the



idiosyncratic style of Amedeo Modigliani who employed manneristic face elongation, was used as an adaptor. In a test-adaptation-retest design, participants rated the liking of a number of portraits by various artists (systematically varied to the amount of Modiglian-esque distortion on 11 levels) from a variety of very different historical epochs. In the adaptation-phase they were exposed to Modiglianis. In the retest, the whole appreciation space shifted towards stimuli that were structurally similar in the style to Modigliani. The talk qualifies and discusses such style-based adaptation effects by comparing them with long-term adaptation effects in the domain of product design to reveal their common cognitive basis and to develop a theory of aesthetic synchronization across persons and cultures.

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8:20-8:35 (266)

**Configurality in Three Face Tasks: Combining Inferences From Multiple Applications of General Recognition Theory.** NATALIE MESTRY and TAMARYN MENNEER, *University of Southampton*, MICHAEL J. WENGER, *University of Oklahoma*, NICK DONNELLY, *University of Southampton* (Read by Nick Donnelly)—General Recognition Theory (GRT) provides a framework for addressing hypotheses regarding the sources of configurality and assessing data with respect to potential perceptual and decisional interactions in multidimensional stimuli. Experimental data were collected using three separate face manipulations: feature size; feature identity and feature orientation (Thatcher illusion) and were assessed using GRT to test for configural processing. Two techniques were adopted for drawing inferences from the data: standard marginal analyses, and a probit approach. Interactions of dimensions (eyes and mouths) were found at the between-stimulus perceptual level and the decisional level across both techniques. However, the probit approach allows for direct estimation of within-stimulus correlation of dimensions (the strongest marker of configurality), and was the only technique to reveal such interactions. Consistent with previous research, interactions at the decisional level were most prominent in the feature identity task, while within-stimulus perceptual interactions occurred most frequently in the Thatcher task.

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8:40-8:55 (267)

**Capacity of Visual Working Memory for Faces of Acquired Familiarity.** GARY C—W. SHYI and SHIH-CHIE CHUAN, *National Chung Cheng University*—Recent studies have shown that people can store a greater number of familiar (celebrity) faces than stranger faces in visual working memory (VWM). In three experiments we investigated whether faces of acquired familiarity can also increase the storage capacity of VWM. In Experiment 1, we used a change-detection task to assess the VWM capacity of faces and replicated the previous finding that famous faces

exhibited greater VWM capacity than stranger faces did. In Experiments 2A and 2B, stranger faces were familiarized at two levels of repeated exposure, coupled with variation in facial expression. Results showed that, compared to novel faces, faces with acquired familiarity can yield greater VWM capacity provided there were sufficiently frequent exposure and expression variation. In Experiment 3, VWM capacity of faces with acquired familiarity was compared with that of celebrity faces. Results showed no difference in VWM capacity between faces with relatively strong acquired familiarity and celebrity faces. In conclusion, these findings not only demonstrate acquired familiarity can increase VWM capacity of faces but also have implications for how stranger faces can be transformed into familiar ones.

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9:00-9:15 (268)

**The Disproportionate Face Inversion Effect: A Memory Retrieval Phenomenon?** MELISSA PRINCE and ANDREW HEATHCOTE, *University of Newcastle, Australia* (Read by Andrew Heathcote)—One of the primary pieces of evidence to suggest that faces are encoded in a qualitatively different way to other visual stimuli is the Disproportionate Face Inversion Effect (DFIE; i.e., the finding that inversion disproportionately affects face recognition). However, when Loftus, Oberg and Dillon (2004) examined the DFIE using Bamber's (1979) state-trace analysis, they found evidence for a one-dimensional encoding of unfamiliar faces when inversion only occurred during the study (encoding) phase of a recognition memory task. They therefore, suggested that inversion may only affect face processing when a face is retrieved from memory. We tested this explanation by varying (between-subjects) the phase in which inversion was manipulated: (a) encoding, (b) retrieval or (c) both. Results showed that with more precise individual measurement and an experimental design optimally calibrated for state-trace analysis, all three conditions revealed strong multi-dimensional evidence and hence that the DFIE is not restricted to memory retrieval.

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9:20-9:35 (269)

**The Value in Subjective Judgments for Correct Rejections of Rearranged Face Pairs.** TODD C. JONES, BO WANG and STEVEN P. GRAHAM, *Victoria University of Wellington*—We present the results of associative recognition memory experiments for faces in which study repetition was manipulated and recognition confidence judgments were solicited. Study repetition increased confidence that intact (target) and rearranged (lure) pairs were studied, which is consistent with a single-process model based on familiarity, but did not decrease “very sure new” responses for rearranged pairs, which is mildly inconsistent with a single-process model. Despite the lack of clear evidence for a role of recollection on hit and

false alarm rates, follow-up judgments for “very sure new” responses indicate that study repetition can shift the reason for strongly confident rejections of rearranged face pairs from having very low item or pair familiarity to knowing that a face was presented with a different face in the study phase. Thus, the subjective data provide useful information undetected by the hit rates, false alarm rates, and the confidence judgments.

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#### 9:40-9:55 (270)

**Familiarity and Associative Recognition of Faces, Patterns and Words.** JAMES C. BARTLETT, MITCHELL A. MELTZER and JOSHUA A. ARDUENGO, *University of Texas at Dallas*—Associative recognition is operationalized as discrimination between (a) intact copies of studied items and (b) “conjunctions” that recombine the parts of studied items. Such discrimination often involves recollection, but recent studies suggest that it depends on familiarity in conditions that allow configural/holistic processing. However, these studies have focused on ROC shapes and subjective ratings (confidence, remember-know) that can be variously interpreted. Here we examine intact/conjunction discrimination in an “exclusion” task (recognize only intact items), and an inclusion task (recognize both intact items and conjunctions). We compared faces, visual patterns and pseudo-compound words, matching exclusion task performance across stimulus class. With visual patterns and pseudo-compound words, discrimination was greater in the exclusion task. With faces, however, no difference was found, as there was substantial intact/conjunction discrimination in the inclusion task. Associative recognition of faces appears to be special in that it involves configural-holistic processing that causes conjunctions to appear unfamiliar.

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#### Speech Perception II

##### Metropolitan B, Sunday Morning, 8:00-9:35

*Chaired by Matthew Goldrick, Northwestern University*

#### 8:00-8:15 (271)

**The Nature of the Statistics in Statistical Learning.** JEFFREY SCHECTER and MATTHEW GOLDRICK, *Northwestern University* (Read by Matthew Goldrick)—Statistical learning is critical for language learning. What is the nature of the statistics learners utilize? We focus on learning the distribution of sound sequences (phonotactic probability). To acquire phonotactic probability distributions, learners could attend to the number of distinct instances of a sequence (token frequency; in running speech, /su/ is encountered more often than /zu/) and/or the number of unique phonological forms containing a sequence (type frequency; /su/ is found in more distinct syllables than /zu/). As these are highly correlated in natural speech, an implicit learning paradigm (Bernard & Fisher, 2010) was used to dissociate these factors. We first show that in this paradigm participants can successfully acquire phonotactic probability

distributions. Subsequent experiments show that type frequency dominates learning. Type-based distributions are acquired in the absence of differences in token frequency, but not vice versa. When these two types of statistics are anti-correlated, participants prefer sequences with high type but low token frequency.

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#### 8:20-8:35 (272)

**Compensation for Complete Assimilation in Speech Perception: The Case of Korean Labial-to-Velar Assimilation.** HOLGER MITTERER, *Max Planck Institute for Psycholinguistics*, SAHYANG KIM, *Department of English Education, Hongik University, Seoul*, TAEHONG CHO, *Department of English Language and Literature, Hanyang University, Seoul*—In connected speech, phonological assimilation to neighboring words can lead to pronunciation variants (e.g., ‘garden bench’→ ‘gardembench’). A large body of literature suggests that listeners use the phonetic context to reconstruct the intended word for assimilation types that often lead to incomplete assimilations (e.g., the assimilated [m] in ‘garde[n/m]’ carries phonetic cues for both the underlying ‘n’ and the assimilated [m]). In the current paper, we show that a similar context effect is observed for an assimilation that is often complete, Korean labial-to-velar place assimilation. Korean listeners accept a word with a surface velar consonant as a word with an underlying labial more readily if the context licenses the change as a labial-to-velar assimilation. In contrast to the context effects for incomplete assimilations, the context effect seems to rely completely on learning the assimilation pattern in one’s native language: Dutch listeners, unfamiliar with this assimilation, showed no such context effect.

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#### 8:40-8:55 (273)

**Sentence Recognition in Switching Background Languages.** ANN R. BRADLOW and SUSANNE BROUWER, *Northwestern University*—Previous research has shown better speech-in-speech recognition accuracy when competing speech is in a different language rather than the same language as the target speech (e.g. Van Engen & Bradlow, 2007). This study compared English sentence recognition by native English listeners when the background language randomly switched between English and Dutch versus when there was only one language in the background (English or Dutch). Preliminary results replicated the background language effect by showing significantly better performance when the background speech was in Dutch than in English. Importantly, performance in the mixed-background-language condition was intermediate. Specifically, listeners performed better on the English-background trials in the mixed than in the English only condition, but they also performed worse on Dutch-background trials in the mixed than in the Dutch only condition. Thus, the switch between target-masker mismatch



and match over the course of the mixed condition had a neutralizing influence on the background language effect, suggesting that speech stream segregation is sensitive to language-related masker characteristics that extend beyond the time-scale of individual target sentences.

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#### 9:00-9:15 (274)

**Accents, Assimilation, and Auditory Adjustments.** ARTHUR G. SAMUEL, *Basque Center on Cognition, Brain, and Language; Ikerbasque; Stony Brook University*; TANYA KRALJIC, *Pennsylvania University; Nuance Communications*—When listeners receive ambiguous phonetic input, lexical context is used both to resolve the phonetic ambiguity, and to adjust associated perceptual representations. For example, if the pronunciation of /s/ in “Tennessee” is somewhat “sh”-like, lexical context drives perception of the segment toward /s/, and expands the /s/ category. Kraljic, Brennan, & Samuel (2008) exposed listeners to such ambiguous /s/ segments, but only before /tr/ (as in “abstract”); in the participants’ dialect, because of assimilation, /s/ before /tr/ is typically produced as such an ambiguous sound. The same ambiguous segments that generated retuning in other contexts did not do so in the /str/ context. Kraljic et al. noted that the blocking of adjustment could either be due to dialect per se, or to assimilation. Here we test a case of dialect without assimilation, and a case of assimilation without dialect. The results favor blocking based on assimilation, rather than dialect.

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#### 9:20-9:35 (275)

**Modulating Body Action Space with Positive Socio-Emotional Contexts.** AVA J. SENKFOR, *Wayne State School of Medicine*—A growing literature suggests that positive socio-emotional material can aid attentional and mnemonic abilities (“positivity bias”). However, less is known about the influence of socio-emotional material on motion perception. Examined here are the beneficial effects of socio-emotional contexts (hiring/firing news) on motion perception. Three groups of adults (18-35 years old) viewed biological motion animations (emotionally positive, negative, or neutral) that varied by movement patterns, direction (towards or away from the body), and distance. Participants made relative distance-from-motion judgments. The “positivity bias” predicts only a gain from positive contexts. A top-level finding revealed higher accuracies in the positive socio-emotional context than the neutral context - a “positivity bias” - which was greatest for inward movements. The negative socio-emotional context did not differ from the neutral context. The inward/outward asymmetry strongly suggests the activation of a body action space that can be modulated by socio-emotional contexts.

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#### Explicit Memory III

**Grand Ballroom AB, Sunday Morning, 8:00-9:15**

*Chaired by Benjamin C. Storm, University of Illinois at Chicago*

#### 8:00-8:15 (276)

**Thinking Can Cause Forgetting: Memory Dynamics in Creative Problem Solving.** BENJAMIN C. STORM, *University of Illinois at Chicago*; GENNA ANGELLO, *Texas A&M University*; ELIZABETH LIGON BJORK, *University of California, Los Angeles*—Research on retrieval-induced forgetting has shown that retrieval can cause the forgetting of related or competing items in memory (Anderson, Bjork, & Bjork, 1994). We present evidence that an analogous phenomenon occurs in the context of creative problem solving. Employing the Remote Associates Test (Mednick, 1962), we show that attempting to generate a novel common associate to three cue words can cause the forgetting of other strong associates related to those cue words. This problem-solving-induced forgetting occurred even when participants failed to generate a viable solution, increased in magnitude when participants spent additional time problem solving, and was positively correlated with problem-solving success on a separate set of problems. Taken together with recent work by Storm and Angello (2010), these findings implicate an important role for forgetting in overcoming fixation in creative problem solving.

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#### 8:20-8:35 (277)

**Associative Interference in Memory for Recency.** I.P.L. MCLAREN and R.P. MCLAREN, *University of Exeter*; C.A. LONGMORE, *University of Hull*; S. MONSELL, *University of Exeter*—How do we know whether we recently saw a perceptual object? In the experimental paradigm in which a short list is followed immediately by a recognition probe, effects of both positive and negative probe recency suggest that we discriminate recency via the “trace strength” of the probed item (Monsell, 1978). A substrate for trace strength is provided by an elemental-associative account (e.g. McLaren, 1994). This makes predictions about the effects of within-list inter-item similarity on positive probe decisions. We examined such decisions following lists composed of a pair of faces and a pair of letter strings, each pair being unrelated, very similar or identical. As predicted by the elemental-associative account, we found that the effect of retroactive interference (being followed by an item of the same type) was far greater than the equivalent proactive interference effect, and the retroactive interference effect was a non-monotonic function of inter-item similarity.

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8:40-8:55 (278)

**Blindness Increases Accuracy of Absolute Judgment of Recency for Sounds: An Expertise Effect?** ERIC LAURENT, CHARLINE VIENNET and FABIEN MATHY, *University of Franche-Comté, France*—Absolute Judgment Of Recency (AJOR) is a task designed to study the effect of time on memory. Studies on AJOR require participants to estimate the time or the number of items intervening between two identical items. JOR can usually be accounted for by a logarithmic function of time, although this observation typically has been applied to stimuli such as text (Hintzman, 2003) and pictures (Fozard, 1972). In this study, we further tested the memory of 12 blind vs. 12 normally-sighted individuals for auditory stimuli. Both the semantic properties (meaningful vs. non-meaningful) and the emotional content (emotional vs. non-emotional) of the stimuli were manipulated. Our results show that: 1) blind participants are more accurate than their normally-sighted counterparts; 2) AJOR and recognition are performed more accurately for meaningful stimuli; and 3) a log-like function accounts for the relationship between recency and AJOR.

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9:00-9:15 (279)

**Working Memory in Rats and Humans.** GENE A. BREWER, ITAMAR S. GRUNFELD and BRYAN W. CAMP, *Arizona State University*, LESLIE C. BAXTER, *Barrow Neurological Institute*, MICHAEL K. MCBEATH and HEATHER A. BIMONTE-NELSON, *Arizona State University*—The quintessential instrument used by animal researchers for measuring working memory in rodents is the radial-arm maze. We constructed an 11 arm human version of the radial-arm maze and assessed individual differences in maze ability, general-fluid intelligence, and working memory capacity. The purpose of this translational research was to provide a cross-species comparative benchmark for researchers to speculate about cognitive functions such as working memory and intelligence as well as their role in successfully accessing and using spatial memory to navigate maze-like environments. Human behavior in the maze paralleled that found in rodents and replicated previous research suggesting that short-term memory is a capacity limited buffer that can maintain  $7 \pm 2$  items. Furthermore, individual differences in working memory capacity were the primary predictor of navigational abilities with virtually no evidence of any independent contributions from general-fluid intelligence.

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### Selective Attention II

**Metropolitan A, Sunday Morning, 10:20-11:55**

*Chaired by Shaun P. Vecera, University of Iowa*

10:20-10:35 (280)

**Attentional Control Via Implicitly Learned Associations.** JOSHUA D. COSMAN and SHAUN P. VECERA, *University of Iowa* (Read by Shaun P. Vecera)—Some theories of attentional control suggest that attentional

capture is determined by a target template or instructional set. However, the necessity of voluntary, explicit attentional processes in driving feature-based control has yet to be explored. We asked if implicitly learned statistical regularities might instead control attention. Observers searched for a target on the basis of shape, while the target's color varied. Critically, the target appeared in one color more often (80%) than another (20%); distractors appeared equally in each of these colors. We observed larger capture for distractors matching the more probable target color than for those matching the less probable target color. Observers were unaware of target color contingencies, suggesting that attentional capture was not the result of an explicit set, but was instead based on associative links between the target and its likely color. We also demonstrated that this effect persisted for hundreds of trials once target color regularities were removed. We argue that feature-based attentional control need not be the result of top-down set but can arise from implicitly learned target-feature associations.

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10:40-10:55 (281)

**Target Detection At 13 ms/Picture in RSVP.** MARY C. POTTER, *Massachusetts Institute of Technology*, BRAD WYBLE, *Syracuse University*, EMILY MCCOURT, *Massachusetts Institute of Technology*—Detecting a picture in a rapid serial visual presentation (RSVP) on the basis of a verbal title given just before the sequence (e.g., people in a restaurant) is surprisingly easy at 100 ms/picture (Potter, 1975). Here participants searched a six-picture RSVP sequence presented for durations of 13, 27, 53, or 80 ms; the first and sixth picture were never targets. Detection of the named target was substantially above chance even at 13 ms. Regardless of detection, each target-present trial was followed by a forced choice test between two pictures, the target and a different picture that also matched the target title. Performance was significantly above chance at all durations, but only if the subject had reported detecting the target. In a second experiment without advance specification of target category, recognition immediately after the sequence was also above chance. The findings support a rapid feedforward model of visual comprehension.

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11:00-11:15 (282)

**Attentional Capture By Images That Match A Conceptual Target Set.** BRAD WYBLE, *Syracuse University*, CHARLES L. FOLK, *Villanova University*, MARY C. POTTER, *Massachusetts Institute of Technology*—It is well established that stimuli can capture attention if they possess a target defining feature such as a color or motion. In addition, categorical symbols such as letters or digits can direct attention when they are members of the target set. The present study explored whether images belonging to a conceptually specified target category, such as 'Sports equipment,' can also capture attention. In a task involving central RSVP of images and peripheral distractor

images, a potent capture effect was found for distractor images containing category relevant versus category irrelevant objects. The timing of this effect matched that of simpler features, with strong capture when distractors appeared 186ms prior to the target, and weak capture when presented simultaneously with it. Attentional control settings can extend beyond simple features to conceptual categories, and images can capture attention by virtue of conceptual content alone.

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#### 11:20-11:35 (283)

**Automatic Visual Selection.** JAN THEEUWES and ERIK VAN DER BURG, *Vrije Universiteit Amsterdam*—It is generally assumed that people are able to select at will the object they want to select. The present study shows that people cannot select one of two salient color singletons without interference from the other. Only when the color of the target singleton was repeated from one trial to the next, selection was perfect and no attentional capture by the irrelevant singleton was observed. This effect is due to automatic intertrial priming. In order to obtain priming one does not only have to select the target features but one also has to respond to it. Furthermore, the results indicate that priming is governed by the activation of target features on the previous trial and not by the suppression of distractor features. We conclude top-down attentional set cannot change the attentional weights in such a way that capture can be prevented. The weights can only be altered by automatic intertrial priming processes which are not under volitional top-down control.

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#### 11:40-11:55 (284)

**Covert Auditory Spatial Orienting To Externally and Monaurally Presented Sounds.** JOHN J. MCDONALD and CHRISTINA M. HULL, *Simon Fraser University*—Auditory spatial attention effects are largely contingent on the degree to which sound location is relevant to the task at hand. Whereas involuntary spatial attention effects are robust in location-based tasks, they are typically absent in nonspatial tasks. One exception to this empirical rule was highlighted in a recent study showing that spatially nonpredictive auditory cues can influence nonspatial discrimination performance when sounds are presented monaurally over headphones (Roberts, Summerfield, & Hall, 2009). In the present study, we asked whether this spatial cueing effect would generalize to sounds presented in external space. In Experiment 1, auditory cues and targets were presented monaurally and participants were required to judge whether the target tone was tuned or mistuned. Experiment 2 was identical, except that the sounds were presented from external loudspeakers positioned to the left and right of central fixation. The peripheral auditory cues influenced nonspatial discrimination performance in Experiment 1 (monaural) but not Experiment 2 (external). These results indicate that spatial relevance is a critical factor for covert orienting effects in external space.

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### Action and Perception II

Willow AB, Sunday Morning, 9:40-11:35

Chaired by J. Scott Jordan, *Illinois State University*

#### 9:40-9:55 (285)

**Spatial Perception During Joint Action: The "Other" as Potential Perturbation.** ANDREW KENNING, J. SCOTT JORDAN, COOPER CUTTING, JIM CLINTON and JUSTIN DURTSCHI, *Illinois State University* (Read by J. Scott Jordan)—The perceived vanishing point of a moving stimulus is displaced beyond the actual vanishing point. This forward displacement (FD) decreases with implied friction (i.e., the stimulus appears to move across a surface). The effect reverses when participants control stimulus movements (via right- and left-key presses). This reversal is consistent with economy-of-action (EOA) effects in which variables such as perceived pitch are influenced by the energy-demands implied by a stimulus (e.g., a steeper hill). The present talk presents experiments that reveal EOA effects when two participants control stimulus movements together, each having access to one of two control buttons. Specifically, FD increases across implied friction, regardless who controls the stimulus when it vanishes. Since participants are basically observers as the other participant controls the stimulus, the increase of FD during such observation indicates participants perceive the other-controlled stimulus movements in terms implied effort (i.e., EOA). In addition, FD is larger when it vanishes while the 'other' participant is in control of it. This self-other difference reveals the 'other' is present in the 'self's' action plans in terms of the potential disturbances

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#### 10:00-10:15 (286)

**Space Is Perceived From An Expanded Perspective.** FRANK H. DURGIN and ZHI LI, *Swarthmore College*—We have discovered that a variety of well-known distortions in the visual perception of large-scale (locomotor) space can be accounted for by simple geometrical transformations related to the expanded coding of angular perceptual variables like gaze declination and optical slant. Here we show that a parameter-free geometrical model originally developed to quantify hill perception can quantitatively account for the underestimation of distance and the overestimation of height. The expanded scaling of angular variables, which is at the core of our theory, is hypothesized to conform to principles of efficient coding and could contribute to precise coding for action. In contrast with negative accounts that assume space has no fixed scale and with relativistic accounts that assume space has many scales that are highly malleable, our data is consistent with a metric evaluation of space that is systematically biased in ways that are transparent (and may even be beneficial) to action.

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**10:20-10:35 (287)**

**Aging, Sequencing and Executive Control: Skill Moderation and its Limitations.** RALF T. KRAMPE, *University of Leuven, Belgium*—During 8 sessions young and older novices and amateur pianists performed unimanual four-finger sequences at their maximum tempos. Within each trial two sequences alternated according to a pre-specified AABB schema. Degree of ambiguity between alternating sequences and positions at which changes occurred were systematically varied. Our model explains latencies as the summed contribution four processes: (a) switching between motor chunks, (b) updating and initiating currently active motor chunks, (c) resolving ambiguities within active chunks, and (d) implementing unambiguous transitions between keystrokes. Although older novices had a higher tapping rate with individual or pairs of fingers, their sequencing speed was lower than that of young novices and, hardly faster than that of older novices after training. The critical component showing similar age effects in novices and amateur pianists related to switching.

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**10:40-10:55 (288)**

**Reaching for the Star: Rapid Reaching Influenced by Learned Reward and Probability.** JAMES T. ENNS and CRAIG S. CHAPMAN, *University of British Columbia*, JASON GALLIVAN, *University of Western Ontario*—Stimuli that are highly predictive of reward or loss in one context are readily associated with privileged perceptual processing in other contexts (Raymond & O'Brien, *Psych Science* 2010). Here we study how these associations extend to motor action tendencies as measured in a rapid reaching task (Chapman et al, *Cognition* 2010). Participants forced to begin reaching before they know the final target position show movement trajectories that are biased toward the side of space containing a greater number of targets, up to a limit of about 4. The present experiments explore the independent consequences of reward value (gain vs. loss) and reward probability (low vs. high) on these movement trajectories.

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**11:00-11:15 (289)**

**Interference for Motor Sequence and End Goal in Memory for Newly Acquired Actions: Evidence from Retrieval-Induced Forgetting.** IRENE REPPA, *Swansea University*, JO SAUNDERS, RHIAN WORTH—Retrieval of information can cause forgetting for related information. Retrieval-induced forgetting (RIF) effects have been found for semantic (e.g., fruit, vegetables) and episodic (e.g., shapes, colours) categories. To examine RIF in actions, participants learned unique touch-screen responses to ten novel objects. Correct object-related action sequences involved left or right hand button-pushing of one of four possible action buttons. After learning, participants practiced two of the ten object-related action sequences. Unpractised object-action sequences shared: neither hand nor end goal

associated with the practiced object (baseline); hand only; end goal (button) only; or both hand and end goal. Finally, memory and execution speed for all ten objects was measured. Relative to baseline, significant interference occurred for hand sharing, end goal sharing, and both hand and end goal sharing demonstrating RIF for newly acquired actions, goals, and motor sequences (lift hand and reach). RIF has been demonstrated to cut across memory systems and is diagnostic of remembered components of action.

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**11:20-11:35 (290)**

**The Simon Effect Under Situations with No Response Uncertainty.** J. TOBY MORDKOFF, *University of Iowa*—The traditional models of both simple and disjunctive RT assume that the one and only available response is prepared in advance of the reaction signal. The most popular model of the Simon Effect posits that the congruence of the irrelevant spatial information alters the speed of response selection. The conjunction of these two ideas would suggest that no Simon Effect will be found in either simple or disjunctive RT, but there are several published examples that disconfirm this prediction. Two possible explanations for this puzzling pattern will be introduced and evidence given that the presence of a Simon Effect depends on the lack of response preparation. The implications for both theory and the "hand-cued" method of collecting LRP data will be briefly discussed.

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**Reading Processes****Metropolitan B, Sunday Morning, 10:00-11:35**

Chaired by Simon P. Liversedge, *University of Southampton*

**10:00-10:15 (291)**

**Inhibitory Orthographic Neighborhood Effects during Reading in Chinese.** SIMON P. LIVERSEDGE, *University of Southampton*, JINGXIN WANG, JING TIAN and WEIJIN HAN, *Tianjin Normal University*, KEVIN B. PATERSON, *University of Leicester*—In alphabetic languages, a word's orthographic neighbors are known to influence lexical identification in priming tasks (Segui & Grainger, 1990; Davis & Lupker, 2006), and normal reading (Paterson, Liversedge, & Davis, 2009; Paterson, Alcock, & Liversedge, 2010). We investigated whether a Chinese prime character that differed in one or two strokes from a target character (and was therefore an orthographic neighbor of it) similarly influenced character identification. The relative frequency of prime and target characters was also manipulated. We carried out two lexical priming studies (60ms and 35ms primes), and an eye movement study in which the prime word preceded the target word in the sentence. Inhibitory priming effects were obtained regardless of relative prime/target frequency in all three experiments. The data demonstrate that robust orthographic (neighborhood) priming occurs at the level of the character in Chinese reading.

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## 10:20-10:35 (292)

**Common Brain Regions for Behavioral Predictors of Reading (Dis)ability.** KENNETH R. PUGH, JONATHAN PRESTON, NICOLE LANDI and EINAR MENCL, *Haskins Laboratories*, MARK SEIDENBERG, *University of Wisconsin-Madison*, STEPHEN J. FROST, *Haskins Laboratories*—Many studies have examined the specific neurobiological signatures of the major predictors of reading dis(ability), including phonological awareness (PA), print decoding, and rapid auditory processing. Rather than focus on their unique signatures, we explored the core common brain regions associated with these reading predictors in a large cohort of emergent readers ranging on a continuum from RD to superior readers. To accomplish this, we correlated behavioral indices of each skill with functional activation for print and then examined the intersection of the neurobiological correlates. This conjunction analysis revealed that individual differences in PA, print decoding, and rapid auditory processing were each positively correlated with print-related activation at canonical reading-related LH neo-cortical areas (including LH superior temporal gyri) as well as with sub-cortical loci (specifically, posterior aspects of thalamus centered in and around pulvinar). We suggest that the correlation of each of these measures with common brain regions highlights both the importance of these regions for reading and discuss possible roles for sub-cortical sites and their interactions with neo-cortex in reading development.

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## 10:40-10:55 (293)

**How Fast Can Predictability Influence Word Skipping During Reading?** DENIS DRIEGHE and GEMMA FITZSIMMONS, *University of Southampton*—In an eye-tracking experiment during reading, the extent to which a target word was predictable from the preceding context was varied. In the first two conditions, the target word was embedded in the same carrier sentence but the preceding sentence made the target word either predictable or unpredictable. The third condition was identical to the unpredictable condition but for the word preceding the target word which constrained the identity of the target word rendering it highly predictable. The two predictable conditions were matched on sentence completion ratio. This design allowed us to examine whether contextual predictability needs to gradually build up over the preceding context to have maximal impact on increasing word skipping or whether constraint exclusively originating from word n-1 is fast enough to have a similar impact. Results indicate that predictability needs to gradually build up to have maximal impact on skipping rates.

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## 11:00-11:15 (294)

**Spatio-temporal Dynamics and Interregional Synchronization During Letter- and Word-Reading.** NICOLAS BEDO, *University of British Columbia*, URS RIBARY, *Simon Fraser University*, LAWRENCE M. WARD, *University of British Columbia* (Read by Lawrence M. Ward)—The neural processes underlying letter- and word-reading are not yet completely understood. We aimed to study the interplay between local and long-distance neural dynamics involved at each stage of processing during reading. High-density EEG was used to record brain activity from healthy volunteers while they viewed sequences of three letters followed by a three-letter word, and responded as to whether or not they matched. Independent component analysis and dipole-fitting yielded neural sources previously identified as crucial to word-reading. Relative power and phase synchrony analyses performed on the independent components confirmed previously-established paths of activation involved in reading text. A chain of local power increases preceding changes in phase synchrony was found from early visual areas to the visual word form area, and from the latter to the right superior temporal gyrus. Modulations of gamma power and phase synchrony within and between these regions was also found, particularly for word presentation.

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## 11:20-11:35 (295)

**Comprehending Dialogue: The Use of Auditory and Visual Imagery during Silent Reading.** ALBRECHT W. INHOFF and BRADLEY SEYMOUR, *Binghamton University*, JOCHEN LAUBROCK and ANKE CAJAR, *University of Potsdam, Germany*—Eye movements were recorded during the reading of short plays that were rich in dialogue. In the first two experiments, eye-movement contingent presentation of speech was used to present spoken versions of dialogue when the eyes moved onto a corresponding dialogue segment. To-be-read dialogue segments altered between male and female story characters, and the auditorily perceived dialogue segment was either spoken by a male or female talker. In Experiment 3, the dialogue of female and male story characters was color-coded so that its hue either matched or mismatched readers' gender-specific color associations (no talking or color coding occurred in baseline conditions). Analyses of eye movements showed that the first few dialogue segments of a play were read more effectively when the gender of the story-character and the talker matched. After that, gender congruency influenced only the very first fixation on a dialogue segment. The color coding of dialogue revealed, by contrast, robust congruency effects throughout the reading of a play. The results indicate that the construction of a situation model of male-female dialogue during reading involves differential usage of gender-identifying auditory and visual perceptual features.

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**Letters and Word Processing III**  
**Grand Ballroom C, Sunday Morning, 9:40-11:35**  
*Chaired by Sachiko Kinoshita, Macquarie University*

**9:40-9:55 (296)**

**TrOuBles with OBs.** SACHIKO KINOSHITA, *Macquarie University*, DENNIS NORRIS, *MRC Cognition and Brain Sciences Unit*—A dominant class of letter position coding schemes suggests that letter order in an orthographic representation is coded in terms of Open Bigrams; ordered letter pairs that can span intervening letters (e.g., Dehaene, 2009; Whitney & Grainger, 2004). We used bigrams as masked primes in the orthographic same-different match task to investigate the effects of varying the number of letters intervening between the letters of the bigram and the effect of reversing the letters in bigrams. When the letters in a bigram are reversed they should have no orthographic overlap with the original bigrams. The experiments consistently showed that reversed bigrams produce robust priming, and adjacent and noncontiguous bigrams produce equal amounts of priming, even for bigrams spanning three intervening letters. The results challenge the assumption that letter order in words is coded by open bigrams.

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**10:00-10:15 (297)**

**Abstract Letter Representation: Evidence From Patterns of Neural Response Similarity.** DAVID ROTHLEIN and BRENDA RAPP, *Johns Hopkins University* (Read by Brenda Rapp)—Literate individuals recognize that r and R refer to the same letter. A common account of this posits case and font-invariant abstract letter identities (ALIs). To evaluate the ALI claim we developed a searchlight application of Representational Similarity Analysis (Kriegeskorte, 2008), examining the BOLD response from participants viewing single upper or lower case letters. We examined if the similarity of the neural response of voxels to different letters was predicted by: pixel overlap, letter-name similarity or cross-case identity (A/a). We found a topographically differentiated distribution of voxel response similarities, with brain areas exhibiting sensitivity exclusively to a single dimension of similarity. In particular, we found a region of the left fusiform gyrus that exhibited similarity of response to letters sharing cross-case identity but not to letter pairs with high pixel overlap or letter-name similarity. This constitutes strong evidence for the neural representation of abstract letter identities.

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**10:20-10:35 (298)**

**Cross-Format Physical Similarity Effects and Their Implications for the Numerical Cognition Architecture.** DALE J. COHEN, ERIN WARREN and DARYN BLANC-GOLDHAMMER, *University of North Carolina Wilmington*—The sound [fɪv] is visually depicted as a word “five” and as a digit “5.” Here, we assess whether auditory ([fɪv]) and visual word (“five”) symbols directly activate their associated digit (“5”) and/or quantity. In several

experiments, we demonstrate that auditory and the visual word symbols directly activate their associated digit representation without activating their associated quantity. In short, our data reveal cross-format physical similarity effects. We discuss our findings with respect to proposed architectures of numerical cognition.

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**10:40-10:55 (299)**

**Word Learning and the Lack of It.** WAYNE S. MURRAY, *University of Dundee*, MEREDITH MCKAGUE, *University of Melbourne*—Word learning is a natural part of language behaviour for both highly- and less-experienced users of a language. However, it remains unclear how we establish new lexical representations. A number of studies have addressed this issue, but invariably using ‘standard techniques’, such as naming, lexical decision, categorization, etc, leaving it unclear whether the results might be task- or strategy-specific. We report converging evidence from two studies employing techniques with the potential to unobtrusively tap into early basic reading processes – eye movement monitoring and same/different matching. The results across both tasks suggest a distinction between ‘familiarity’ and a fully-established lexical representation. Further, we find that with matching, it is the establishment of the representation and its characteristics, rather than experience per se, that contributes to task performance.

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**11:00-11:15 (300)**

**Learning About the ‘Nule’ in ‘Sleepnule’: Acquisition and Abstraction of Newly Learned Morphemes.** JAKKE TAMMINEN and MARJOLEIN MERKX, *Royal Holloway, University of London*, MATTHEW H. DAVIS, *MRC Cognition & Brain Sciences Unit*, KATHLEEN RASTLE, *Royal Holloway, University of London*—Knowledge of abstract morphemes is critical for the interpretation and creation of new words (e.g. untweetable). Two experiments investigated the acquisition of this knowledge using an artificial language approach. Participants learned novel affixes (e.g. -nule) embedded in new meaningful words (e.g. sleepnule is a participant in a study about sleep), then were tested to assess whether they had acquired abstract knowledge of the novel affixes. In a shadowing task conducted immediately or two days after training, participants in Experiment 1 showed an immediate benefit for novel affixes over untrained affixes with trained stems (sleepnule vs sleepnept). This benefit extended to novel affixes with untrained stems (buildnule vs buildnept) only in the delayed test, suggesting that abstraction of new morphemes requires offline memory consolidation. In a sentence priming task conducted a week after training, participants in Experiment 2 showed evidence of accessing the meanings of the novel affixes online with untrained

stems. These results suggest that participants can acquire context-independent, semantically-rich representations of novel affixes but that this process of abstraction is gradual and requires offline consolidation.

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#### 11:20-11:35 (301)

**Semantic Transparency Interacts with Affix Segmentability When Morphologically Complex Primes are Forward Masked.** LAURIE BETH FELDMAN, PATRICK A. O'CONNOR and JEFF M. BOSTWICK, *The University at Albany, SUNY*—Forward masked priming studies consistently show morphological facilitation after exhaustively decomposable semantically similar primes but facilitation after semantically dissimilar primes is contested (cf Rastle & Davis, 2009 with Feldman, O'Connor & Moscoso del Prado Martín, 2009). In the present study, we compare the effects of exhaustively and of ambiguously decomposable inflected primes paired with semantically similar or dissimilar targets. Results corroborate significant facilitation at an SOA of 50 ms for semantically and phonologically similar (FAKED-FAKE; FAKING-FAKE) relative to unrelated pairs and reveal significant inhibition for semantically and phonologically dissimilar (WAGED-WAG; WAGING-WAG) relative to unrelated pairs. Exhaustively and ambiguously decomposable pairs did not differ. The interaction of prime type by transparency calls into question a purely ortho-morphological account of early morphological processing where it is the appearance of morphological complexity that triggers decomposition and produces facilitation.

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#### Working Memory IV

**Grand Ballroom D, Sunday Morning, 10:20-11:55**

*Chaired by Klaus Oberauer, University of Zurich*

#### 10:20-10:35 (302)

**A Measurement Modelling Framework for Complex Working Memory Models.** KLAUS OBERAUER, *University of Zurich*, JARROLD CHRIS and FARRELL SIMON, *University of Bristol*, LEWANDOWSKY STEPHAN, *University of Western Australia*—Complex working memory tasks such as operation span involve processing of distractors concurrently with short-term retention of a set of items. Studies with these tasks have largely constrained analysis to overall performance. We introduce a framework for designing measurement models for estimating theoretically meaningful parameters. It can be applied to a variant of working-memory paradigms in which people recall by selecting items in order from a set of candidates, consisting of the items, the distractors, and not-presented lures. A measurement model consists of assumptions about mechanisms that, at retrieval, confer evidence to a subset of the candidates. For instance, strength of encoding of memory items adds evidence to all memory items but not to distractors and not-presented lures. Summed evidence is translated into selection probability by Luce's

choice rule. We apply the framework to experiments illustrating the measurement of parameters of theoretical interest, such as the strength of encoding of items and of distractors, the strength of item-position bindings and of distractor-position bindings, the removal of distractors from memory, and the modulation of interference by the similarity between items and distractors.

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#### 10:40-10:55 (303)

**Conjunction Specific Preview Benefit in Dynamic Object Reviewing.** JUN SAIKI, *Kyoto University*—It has been a debate whether feature-integrated object representations are formed in visual working memory. The current study provides evidence for feature-integrated representation using a modified object reviewing paradigm. Observers saw a preview display with two colored shapes, followed by a target object at one of the preview locations, and judged whether the target contains color or shape of preview objects regardless of their locations as quickly as possible. When both color and shape matched with preview objects, their feature-location combinations were systematically varied. When both target features matched preview features at the same location, RT was shorter than when none matched the location, but location match of a single feature did not show any RT benefit, consistent with the function of feature-integrated object representations. This conjunction-specific preview benefit was observed even with moving objects, suggesting that the effect reflects feature-binding in perceptual objects, not only at the shared location.

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#### 11:00-11:15 (304)

**Mechanisms of Proactive Interference in Visual Working Memory.** ANTHONY A. WRIGHT, *University of Texas Medical School at Houston*, JEFFREY S. KATZ, *Auburn University*, and WEI JI MA, *Baylor College of Medicine*—Four pigeons were tested for how far back in time proactive interference would affect delayed same/different performance with travel-slide pictures. Pictures repeated as many as 16 trials later produced proactive interference when tested within picture-unique baseline trials. Proactive interference functions showed greatest interference at the longer of two delays (10 s vs. 1 s) and on the immediately preceding trial with a gradual decline of interference with trial separation. A ratio of time intervals (time to current trial sample divided by time to interfering sample) is shown to account for and predict how sample-presentation times, intertrial-interval times and retention-delay times all contribute to proactive interference of visual memory. Implications of these results and model in other species' visual memory are discussed.

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**11:20-11:35 (305)**

**Discrete Resource Limits During Online Storage, Selection and Encoding.** EDWARD AWH, EDWARD F. ESTER, DAVID E. ANDERSON and EDWARD K. VOGEL, *University of Oregon*—There is a broad consensus that observers have limited capacity for the apprehension, selection and storage of visual information. Discrete resource models argue that capacity is constrained by an item limit, such that only a handful of items can be processed while no information is available regarding other relevant items. By contrast, continuous resource models argue that resources can be subdivided across an unlimited number of items. Here we present behavioral and electrophysiological evidence from a wide array of paradigms (memory, search, selection, subitization) where we have parametrically manipulated the number of relevant targets. In each case, we find positive evidence that simultaneous processing is constrained by a relatively small item limit ( $\approx 3$  items), as operationalized by discontinuities in behavioral performance and asymptotes in neural activity that is linked with behavioral success. We suggest that a common discrete resource may constrain online visual processing across multiple stages of processing.

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**11:40-11:55 (306)**

**Similarities and Differences Between Working Memory and Long-Term Memory: Evidence From Levels-of-Processing Effects On Working Memory.** NATHAN S. ROSE, FERGUS I.M. CRAIK and BRADLEY R. BUCHSBAUM, *Rotman Research Institute of Baycrest, University of Toronto*—Recent research has highlighted the role of long-term memory (LTM) in performance on working memory (WM) tasks. However, levels-of-processing – a hallmark LTM phenomenon – has (Loiza, McCabe, Youngblood, Rose, & Myerson, in press) and has not (Rose, Myerson, Roediger, & Hale, 2010) been found to affect WM. We conducted a meta-analysis on 8 experiments ( $N=322$ ) and found that the extent to which deeper processing benefits immediate recall on WM tasks largely depends on the amount of distraction produced by the processing task. We found similar results in an experiment with a Brown-Peterson task involving immediate recall of a single word following either deep or shallow processing and either a rehearsal-filled or distracter-filled delay. Immediate recall was unaffected by LOP when the word could be rehearsed, but it benefited from deeper processing when there was a distracter-filled delay. Taken together, these results suggest that the extent to which retrieval from secondary memory is involved in WM tasks depends on the amount of disruption to maintenance, consistent with the time-based resource sharing model (Barrouillet, Bernardin, & Camos, 2004).

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**Cognitive Skill Acquisition****Grand Ballroom AB, Sunday Morning, 9:40-11:35**

*Chaired by E. James Kehoe, University of New South Wales*

**9:40-9:55 (307)**

**Learning Dynamic Decision-Making using a Worked Example and Explanations.** E. JAMES KEHOE and HANNAH YEUNG, *University of New South Wales*, ROBERT WOOD, *University of Melbourne*—The effects of a factorial combination of a worked example and guidance in the form of a general strategy and its explanation in a dynamic decision-making task were investigated. Participants ran three successive business simulations, in which they managed a new airline route against a competitor over 10 cycles. For each cycle, the participants entered three decisions concerning marketing expenditure, the fare, and target capacity. The experimental manipulations were conducted during the first run of the simulation. In the subsequent runs, participants who had received the worked example showed the highest level of performance in terms of two outcome variables, namely, cumulative profit and market share. They also reported the lowest cognitive loads. Participants who did not receive a worked example showed very low levels of performance regardless of whether or not they received any form of guidance in the first run. Moreover, the addition of guidance did not appear to enhance the positive effect of the worked example. The results are discussed with regard to alternative information-processing theories of instructional design.

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**10:00-10:15 (308)**

**A Cross-Cultural Comparison of Science and Math Learning.** NANCY L. STEIN, *NORC/University of Chicago*, YUHTSUEN TZENG, *National Chung Cheng University, Chia-Yi, Taiwan*, MARC W. HERNANDEZ, *NORC-Chicago*—A series of studies was carried out on 4th graders in the U. S. and Taiwan, to determine beginning levels of mastery on core concepts in mathematics and physical science, and then to determine how well students learned when concepts were taught explicitly. The first study varied whether children saw explicit models of molecular movement and whether they saw a dynamic versus static presentation of beginning, middle and end shots. The second study varied whether concepts of measure were explicitly taught before science learning. Children in both countries performed well on physical science concepts thought to be difficult for elementary school children. Taiwanese children received far more rigorous training on measurement concepts than U.S. students, however. The amount of time Taiwanese children spent on math and science outside of school was also greater than U.S. children. Thus, even if the content and the strategies we use to teach are equated, the time children spend on learning, especially out of school, and the responsibility they take for learning still outdoes any U.S. effort.

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**10:20-10:35 (309)**

**Are Principles Good for You?** ELSA EIRIKSDOTTIR and RICHARD CATRAMBONE, *Georgia Institute of Technology* (Read by Richard Catrambone)—Electronics novices completed a training program with an electronic circuit simulation program. Participants could study materials on relevant electronics principles either before doing the training tasks, while doing the training tasks, or after completing the training tasks (the "before" and "after" groups also had to summarize the principles). After completing the training tasks (with a maximum allowed time of 2 hours), participants attempted test tasks that varied in transfer distance from the training tasks. Participants who studied and summarized principles before or after the training tasks scored higher on a declarative knowledge test compared to the use-during condition. However, when practice time is considered, the practice-time-per-correct-answer variable favored the use-during condition. Performance on transfer tasks did not differ. The practice and test results suggest that the use-during condition might be the most efficient training environment.

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**10:40-10:55 (310)**

**Optimized Keyboards for Locked-in Patients.** GREGORY FRANCIS, ELIZABETTE JOHNSON and KIALEE ANDERSON, *Purdue University*—Locked-in patients often communicate by typing with a virtual keyboard that requires selection of a moving cursor with a binary switch. Last year we showed how to build a model of human performance to allow us to simultaneously optimize the design of such a keyboard and the speed of the cursor in order to satisfy a speed-accuracy tradeoff. This year we describe improvements to the model that additionally allow us to consider variations in the path of the cursor. We can now predict performance for a variety of hierarchical cursor paths (e.g., selecting a row and then a column in a row to reach a target character). One surprising finding is that the optimal path is often flat (no hierarchical structure but cursor movement from one character to the next across the entire keyboard). A flat path is superior because each selection needed to guide the cursor toward a target character is an opportunity for making a mistake. A deeper hierarchical path structure tends to produce more errors or needs a much slower cursor speed. We show example keyboard designs that are optimized for different types of text entry and contrast them with keyboard designs that are currently used by locked-in patients.

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**11:00-11:15 (311)**

**Individual Differences in Working Memory Predict Second Language Learning Success.** JARED A. LINCK, SCOTT R. JACKSON, NOAH SILBERT, MEDHA TARE, ANITA R. BOWLES and MICHAEL F. BUNTING *University of Maryland Center for Advanced Study of Language*—Working memory (WM) is critical for language use (e.g., comprehension, production), and for native and second-language learning (SLL), including vocabulary and syntax acquisition. Less clear is the role of WM in SLL to advanced levels and across skill modalities. To examine these issues, we tested adult native English speakers at an intensive SLL school (N = 1,312). At enrollment, students completed a comprehensive test of personality, motivation, SLL experience, and cognitive abilities, including the running-memory WM test, and were tracked until graduation, up to 70 months later. WM – but not inhibitory control or task switching – significantly predicted reading, listening and speaking performance at graduation on a standardized proficiency test. This was true across 12 languages and controlling for other cognitive abilities (e.g., general intelligence, reading comprehension), non-cognitive traits (e.g., personality traits, motivation for learning), and prior SLL experience, supporting the role of WM in theories of adult SLL.

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**11:20-11:35 (312)**

**Eyewitness Identification Reform: Decisions and Trade-Offs.** STEVEN E. CLARK, *University of California, Riverside*—The link between false eyewitness identifications and false convictions is well-established. Several recommended procedures have been shown to reduce the risk of false identification, but these same procedures also reduce the correct identification rate, creating a trade-off between false identifications avoided and correct identifications lost. This trade-off, predicted by signal detection theories of memory, has been under-appreciated in the eyewitness identification literature. In light of this trade-off, how should policy decisions regarding eyewitness identification procedures be made? This question is addressed by considering the probative value of eyewitness identification evidence and the expected utility of various eyewitness identification procedures. Expected utility theory provides cost-benefit curves that describe procedural preferences as function of the guilty base rate and the cost ratio for correct and false identifications.

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## POSTER SESSION I

Thursday Evening

Convention Center Ballroom 6 ABC

Viewing 4:00 p.m.-7:30 p.m., Author Present 6:00 p.m.-7:30 p.m.

## ● VISION I ●

(1001)

**Cross Cultural Differences and Commonalities in Preference for Color Combination.** MICHIKO ASANO, *Keio University*, SHOKO KADOWAKI and KAZUHIKO YOKOSAWA, *The University of Tokyo*, KAREN B. SCHLOSS and STEPHEN E. PALMER, *University of California, Berkeley*—Although preferences for color combinations differ across cultures, the factors that influence those preferences may be the same across cultures. To test this hypothesis, we examined preferences for two-color-combinations (in a figure-ground arrangement) and their determinants for Japanese people. We compared the results to those for American people (Schloss & Palmer, 2011). Japanese color combination preferences differed from American preferences in that Japanese people prefer color combinations that contain light colors more than American people do. The influential factors and their relative importance were remarkably the same across the two cultures, however: most of the variance was explained by harmony ratings (i.e., how harmonious observers think the two colors are) and single-color preferences for the ground color (i.e., how much they like the ground color when it is viewed in isolation), and single-color preferences for the figural color.

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(1002)

**Aesthetic Judgment of Geometric Shape: The Role of Compactness.** JAY FRIEDENBERG, *Manhattan College*, TIMOTHY SPOONER, *University of Medicine and Dentistry New Jersey*, ELIZABETH RIVERA, ASHLEY WASILEWSKI and NICOLE MCBRIDE, *Manhattan College*—Several studies report that aesthetic judgments of rectangles are greatest for aspect ratios close to 1.618, the supposed “golden ratio” (Russell, 2000, Davis & Jahnke, 1991). We presented isosceles triangles at ten different ratios ranging from 1.0 to 2.5 and at one of four major orientations. Ratio was the length of the main symmetry axis relative to the length of the base. An analysis of variance (ANOVA) revealed significant main effects of rating for both ratio  $F(9, 490) = 196.7, p < 0.01$  and orientation  $F(3, 196) = 21.4, p < 0.01$ . Perceived attractiveness was a monotonic decreasing function of ratio with judgments highest for equilaterals. Judgments were also highest for triangles that pointed up. There was no golden ratio effect. Instead participants seemed to prefer triangles that were more compact, perhaps because they are perceptually “stable”. The preference for an upward pointing direction may be due to familiarity. However, upward pointing triangles are also the most perceptually stable. We discuss

what constitutes perceptual stability and how to separate this effect from shapes that are merely familiar.

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(1003)

**On the Concerns about LCD Displays for Laboratory Experiments: Much Ado About Nothing.** HAYLEY E P LAGROIX, MATTHEW R. YANKO, THOMAS M. SPALEK and J. DON READ, *Simon Fraser University*—Many cognitive and perceptual phenomena, such as iconic memory and temporal integration, require precisely timed brief displays. A critical requirement in these experiments is that the image should not remain visible after its offset. It is commonly believed that liquid-crystal displays (LCD) are unsuitable because of poor temporal response characteristics relative to cathode-ray-tube (CRT) screens. Remarkably, no psychophysical estimates of visible persistence are available to verify this belief. We obtained such estimates in dark-adapted viewing (CRT:  $>2s$ ; LCD:  $<2ms$ ) and light-adapted viewing (CRT:  $\sim 100ms$ ; LCD:  $<2ms$ ), thereby falsifying this belief. On the other hand, photometric measurements are available that seem to confirm the poor temporal characteristics of LCD screens; but those estimates were obtained before recent advances in LCD technology. Using a current LCD screen, we obtained photometric estimates of rise time far shorter (3-4ms) than earlier estimates (20-150ms), and approaching that of CRTs ( $<1ms$ ). We conclude that LCDs are preferable to CRTs when precisely-timed brief displays are required.

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(1004)

**Saccadic Adaptation To Random Error.** EMILY HIGGINS, *UCSD*, MARC POMPLUN, *UMass-Boston*, RANDY TRAN and KEITH RAYNER, *UCSD* (Sponsored by Simon Livsersedge)—Saccadic eye movements quickly adapt to consistent post-saccadic visual error, i.e., displacement between intended and actual saccade landing points. In the present study, we examined whether there is also oculomotor adaptation to inconsistent error, that is, noise in saccadic targeting. We artificially induced such error while subjects performed visual search. Subjects in an experimental group were presented with blocks of adaptation trials in which search arrays were shifted by a small, random vector during each saccade. These blocks were interleaved with test blocks presenting static displays. Subjects in a control group were presented with identical, but always static, stimuli. We compared eye movement behavior in the static blocks between these subject groups. In late blocks, subjects in the experimental group made more fixations per trial and displayed greater variability in



fixation duration than did controls. Our data therefore suggest that eye movements adapt to changes in saccadic targeting precision.

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(1005)

**Microgenesis and Neural Binding in the Competition for Consciousness.** SVEN PANIS and JOHAN WAGEMANS, *University of Leuven (K.U. Leuven)*—To study when and why common-onset masking by four dots happens, we measured accuracy and response times and recorded electromyographic (EMG) activity. We compared the masking effects of two trailing mask durations (TMDs; 85 and 169 ms), the attentional effect of a leading mask duration (LMD; 127 ms), and the effect of a baseline condition (TMD = LMD = 0 ms), on the time-dependent hazard probability of a correct response. Increasing the TMD resulted in a decline in overall accuracy but had no effect on mean RT. Survival analyses showed that both the effect of a TMD and an LMD interacted with the effect of the passage of time since target onset, and that the masking effect of a TMD of 85 ms developed later in time than that of a TMD of 169 ms. In trials without a response, spectral EMG analyses revealed subthreshold response competition, as well as an increased power due to attention and a decreased power due to masking, reflecting an increase and decrease, respectively, in the transmission of information between visual low- and high-level areas, decision centres, and motor neurons. Our results are consistent with an explanation of common-onset masking in terms of re-entrant processing.

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(1006)

**View-Invariant Object Recognition Is Learned by Pigeons Through Reward Prediction Error.** EDWARD A. WASSERMAN and FABIAN A. SOTO, *University of Iowa*—A model hypothesizing that different visual properties compete for control of performance in object categorization can account for a large body of animal and human data. The present study suggests that this model can also explain pigeons' learning to identify objects across changes in viewpoint. In Experiment 1, the conditions for view-invariance learning proposed by the model were reproduced by training pigeons with a single view of an object. Pigeons trained with affine transformations of this single image showed better recognition performance at novel views than pigeons trained without such transformations. In Experiment 2, pigeons were trained to recognize objects from multiple viewpoints, which usually leads to high performance at novel views of the trained objects. However, when the objects possessed a salient, informative metric property for solving the task, the pigeons did not show view-invariant recognition of the training objects, even after training with multiple views.

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## ● PERCEPTION I ●

(1007)

**Enumeration of Small and Large Numerosities: The Effect of Element Visibility.** MELANIE PALOMARES, PAUL R. SMITH and C. HOLLEY PITTS, *University of South Carolina*—Precise enumeration is associated with small numerosities (<4 items), while approximate enumeration is associated with large numerosities (>4 items). There is still debate on whether a single continuous process or dual independent processes mediate small and large enumeration. We evaluated a compromise between these two notions: that the precise representation of quantity is limited to small numerosities, but that the approximate representation of quantity spans across both small and large numerosities. We assessed the relationship between precise and approximate enumeration by looking at how luminance contrast affected enumeration of elements that differ by "ones" (1-8) or by "tens" (10-80). Enumeration functions of "ones" and "tens" have different characteristics, which is consistent with the presence of two number systems. However, simply decreasing element visibility changed the variability signatures of small numerosities to match those of large numerosities. Moreover, we found that enumeration by "ones" within the subitizing range (1-4 items) reliably correlated with the enumeration by "tens" (10-40 items), suggesting that small numerosities are mediated by both precise and approximate representations of quantity.

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(1008)

**A Symmetry-Breaking Theory of False Pop Out.** KIMBERLEY D. ORSTEN, *Rice University*, MARY C. PORTILLO, *U. of Houston - Downtown*, JAMES R. POMERANTZ, *Rice University*—False pop out (FPO) occurs when, in singleton displays (one disparate target in a field of homogeneous distractors), one of the distractors pops out, i.e., poses as the target. Imagine a flock where one of the white sheep pops out rather than the sole black sheep. FPO is rare and so would not arise with such flocks; instead, FPO occurs when the items in a display group into larger configurations, and the distractor that falsely pops out is the one that breaks the symmetry (or other, comparable emergent feature) of the display, whether or not it is a singleton. We demonstrate FPO with a variety of stimuli in a variety of array configurations. We relate FPO to illusions in which two identical items look different (Jastrow illusion; Leaning Tower illusion). Additionally, we compare different metrics for quantifying FPO, based on non-random distribution of error distributions across the distractors.

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(1009)

**Anger or disgust: Can you see the difference?** ANNIE ROY-CHARLAND, JESSICA BOULARD and MELANIE PERRON, *Laurentian University*—Adults are efficient at recognizing emotional facial expressions. However, research shows that some emotions are more often confused with others. A particular confusion is observed between anger and disgust. According to the perceptual hypothesis, emotions are more frequently confounded when they share facial activation. In this study, eye-movements were monitored to explore the use of action units to distinguish between anger and disgust. Results revealed the typical confusion with two prototypes of disgust being more frequently attributed to the emotion of anger. More importantly, the results revealed that participants spend more time in the mouth region for the two prototypes of disgust that include shared activation in this area. Furthermore, the time spent in this area is higher for inaccurate responses. These results support the perceptual processing hypothesis suggesting that when participants use shared versus unique cues, accuracy is impaired.

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(1010)

**The Additivity of Organizational Principles in the Segmentation of Auditory Necklaces.** MINHONG YU and MICHAEL KUBOVY, *University of Virginia*—We investigated the additivity of organizational principles in audition by using auditory necklaces (repeating rhythmic patterns) as stimuli. Imagine the following auditory necklace (AN), ...1110011011100110... where 1 represents a note and 0 represents a rest. It could be perceived either as a repeating 11100110 or as a repeating 11011100. In our experiments, as soon as an AN was played, a circular array of icons appeared on the screen. During each beat, the corresponding icon was highlighted. The participants' task was to click on the icon corresponding to the beat they perceived as the starting point. Probabilistic models of the data showed that parallel to results in visual perceptual organization (Kubovy & Van den Berg, 2008), three organizational principles run (a sequence of consecutive notes) length difference, gap (a sequence of consecutive rests) length difference and amplitude difference are additive.

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(1011)

**Separate Auditory Mechanisms Detect Personal Significance and Physical Deviance – Evidence from ERPs.** ANJA ROYE, *Rotman Research Institute*, THOMAS JACOBSEN, *Helmut Schmidt University*, ERICH SCHRÖGER, *University of Leipzig* (Sponsored by Frank Oppermann)—The auditory system is able to detect deviations from a regularity without attentional effort. These deviations may indicate the occurrence of potentially relevant sounds. However, sounds of personal significance appear to be detected with priority even in a highly variable

environment. This study investigated whether the detection of a personally significant sound occurs independent from the detection of an acoustic deviation. Therefore, participants were presented with a task-irrelevant sequence of acoustically variable sounds, one of these being a self-chosen sound associated with personal significance (the own SMS ring, Experiment 1) or a sound being assigned by the experimenter and trained to be of personal significance (Experiment 2). Event-related potentials revealed differential processing of personally significant and non-significant sounds at around 200 ms after stimulus onset. We argue that deviance detection and significance detection are two separate mechanisms in the service of identifying potentially relevant sounds outside the focus of attention.

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(1012)

**Is Loudness a Function of Musical Consonance / Dissonance?** LEE M. VILINSKY and RICHARD E. PASTORE, *Binghamton University*—Loudness is a subjective attribute of sound that, although most closely related to physical power, also varies across other physical properties (e.g. frequency, bandwidth). Does loudness also vary as a function of musical (thus subjective) consonance/dissonance? In Experiment 1, relative loudness was judged for pairs of 70 dB(C) stimuli that were either musical intervals or isolated higher notes from the intervals. With a common root note (G3 or B-flat3), consonance/dissonance for musical interval was defined by that higher note. For intervals, systematic differences were found as a function of consonance/dissonance that did not correspond to the component notes that differentiated the intervals. In Experiment 2, loudness ratio was evaluated for 10, 15, and 20 dB differences as a function of musical intervals compared. The ordering of power function exponents in Experiment 2 is consistent with the ordinal judgments from Experiment 1. Taken together, loudness is influenced by harmonic (musical) structure.

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(1013)

**Spatial Images Developed Through Extended Touch: Comparing Updating Performance Between Haptic and Visual Learning.** CHRISTOPHER R. BENNETT and NICHOLAS A. GIUDICE, *University of Maine*, ROBERTA L. KLATZKY, *Carnegie Mellon University*, JACK M. LOOMIS, *University of California*—This research compared the accuracy for updating spatial images in working memory built up from learning objects through extended touch (i.e., using a probe to extend the reach of the arm), with that found after learning the objects from normal haptic exploration or visual apprehension. Participants learned the location of individual objects from a fixed origin, then moved to a new position, and were tested with an updating task requiring walking (blindfolded) to the remembered target locations. Twenty-four total objects,

representing all combinations of two distances, two heights, and six azimuths, were learned through four separate conditions affording exploration with: (1) a one meter rod, (2) a two meter rod, (3) the hand, and (4) vision. Results showed similar patterns of updating performance between the four learning conditions. Taken together, the results suggest that spatial images in working memory are developed and accurately updated using an extension of the body.

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#### (1014)

**Grapheme-Color Synesthetic Tendency Test Without Color Presentation.** KAZUHIKO YOKOSAWA, *The University of Tokyo*, JUN-ICHI NAGAI, *University of the Sacred Heart*, MICHIO ASANO, *Keio University*—As individuals our visual experiences differ, so perhaps we are all synesthetes to some extent. First, we asked over seven thousand participants whether they had ever experienced grapheme-color synesthesia. Four percent responded positively, with the highest rate associated with young females. Second, we asked 123 young females, from a different pool, to associate 40 letters/characters (numerals, English alphabets, Hiragana, Katakana, and Kanji characters) with 11 basic color terms. This task was repeated twice, with sessions separated by a three week interval. Results indicated a broad distribution of color consistency across sessions. The average rate of color consistency was 42%, which was significantly above chance levels. Nine participants with high rates (above 70%) showed similar patterns in grapheme-color associations as nine confirmed grapheme-color synesthetes did. The grapheme-color association test is a simple and easy-to-use method for measuring synesthetic tendencies; it does not even need any real color presentation.

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### ● ACTION AND PERCEPTION I ●

#### (1015)

**Optimal Performance and the LBA Model.** STEPHANIE GOLDFARB, PATRICK SIMEN, CARLOS CAICEDO, PHILIP HOLMES, NAOMI E. LEONARD and JONATHAN D. COHEN, *Princeton University*—Recent work has compared the predictions of the linear ballistic accumulator (LBA) model and the drift diffusion model (DDM) for simple reaction time (RT) tasks but identified no important, qualitative differences between the predictions of the two models [1]. In this work, we compare the predictions of the LBA and DDM for simple RT tasks in which participants must trade off between speed and accuracy in order to maximize reward rates. We show that while the DDM predicts a single optimal performance curve [2], the optimal performance for the LBA varies significantly with changes in model parameters. We identify and investigate qualitative differences in the optimal performance curves resulting from these changes. We discuss implications for theories of optimal performance and

the extent to which data support these theories. [1] Donkin et al (2011). Diffusion versus linear ballistic accumulation: different models but the same conclusions about psychological processes? *PB&R*:18, 61-69. [2] Bogacz et al (2006). The physics of optimal decision making: a formal analysis of models of performance in two-alternative making: a formal analysis of models of performance in two-alternative forced choice tasks. *Psych Review*, 113, 700–765  
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#### (1016)

**Unilateral Blindsight in Complete Cortical Blindness.** SIMONA BUETTI, *University of Illinois at Urbana-Champaign*, NICOLAS BURRA and DIRK KERZEL, *University of Geneva*, BEATRICE DE GELDER, *Tilburg University*, ALAN PEGNA, *Geneva University Hospitals*—We studied patient TN, a patient with bilateral cortical blindness due to complete loss of his visual cortex. TN completed four tasks: (1) a present/absent judgment task with discrete responses to a lateralized flickering target; (2) a left-right localization task with discrete responses (in place, left-right button presses) with a flickering target; a left-right localization task with reaching responses (single-hand, left-right reaching response towards target location) with a flickering target (3) and with a non-flickering target (4). Surprisingly, TN performed above chance in all tasks for right-hemifield targets. TN showed below-chance localization performance when using discrete responses for left targets, and at-chance performance in the reaching task with static left targets. Overall, there was a clear left-hemifield processing deficit in all tasks, with lower detection, longer response times, and lower localization performance in reaching tasks. The data suggest that TN's blindsight for localization was restricted to one visual hemifield.

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#### (1017)

**Priming Hand Grip in the Dorsal Visual Processing Stream.** TODD A. KAHAN and SIMONE H. SCHRIGER, *Bates College*—Visually presented objects are processed in two pathways in the brain (dorsal and ventral). The ventral pathway is responsible for determining "what" was shown, while the dorsal pathway is better suited for determining "how" a person should interact with an object. Recently, a technique called continuous flash suppression (CFS) has been developed for presenting visual information. When stimuli are seen in CFS processing appears to be restricted to the dorsal (how) pathway and very little if any processing occurs via the ventral (what) pathway (Fang & He, 2005). This technique has since been used in priming experiments and the data support the claim that processing is restricted to the dorsal pathway. The current research was designed to further our understanding of the ways in which previewing objects in CFS will subsequently affect object recognition.

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(1018)

**Visuomotor Coordination Under Two Types of Reflections.** MOUNIA ZIAT, *Wilfrid Laurier University*, VINCENT HAYWARD, *2UPMC Univ Paris 06*, PHILIP SERVOS, *Wilfrid Laurier University*, MARC ERNST, *Bielefeld University*—Mirrors alter the mapping between motor behavior and visual information. A mirror introduces a reflection about a plane: each point viewed is the image of a point found by dropping a line perpendicularly to a plane (single mirror condition). A double orthogonal mirror introduces a reflection about a line: each point viewed is the image of a point found by dropping a line perpendicularly to the vertical edge (double mirror condition). We compared the CNS' ability to deal with these visual reflections. Participants performed a "connect-the-dots" 2D drawing task and a 3D block assembly task under each condition. With a single mirror, the 2D task was hard but the 3D task was relatively easy. With the double mirror, this trend was reversed. The learning time courses lead us to believe that, when exposed to reflected visuomotor mappings, the CNS solves these problems procedurally by "mental rotations" before learning the new mappings.  
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(1019)

**Fractal Fluctuations Support Perceptual Learning and Transfer.** DAMIAN G. STEPHEN, *Harvard University*, ALEN HAJNAL, *University of Southern Mississippi* (Sponsored by James A. Dixon)—Fractal temporal structure of fluctuations in wielding predicts detection of information for haptic judgments. Fluctuations reflect the flow of energy. The scaling exponent relating fluctuations to time scale indexes the rate of flow. Scaling exponents in the fractal range indicate similarly fast energy flow across all available scales (West & Grigolini, 2010). So, fractal fluctuations in wielding should predict efficient sampling of energy distributions underlying informational variables. We present evidence, first, that fractal fluctuations predict accuracy in haptic perceptual learning, irrespective of fluctuation size (i.e., mean and variance; Stephen, Arzamarski, & Michaels, 2010). Learning may depend upon the long-range temporal correlations entailed by fractal fluctuations: fractality may index the coordination of exploratory behavior over time. We present further evidence that fractality in wielding by trained limbs predicts how well training extends to untrained, anatomically disparate limbs. Fractality may provide a generic substrate for information detection throughout the organism.  
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(1020)

**Schizotypal Traits and Nonvisual Space Perception: Exploring the Role of Efference Copy.** NAOHIDE YAMAMOTO and EVELYN MUSCHTER, *Cleveland State University*—Efference copy has been considered as a component of nonvisual space perception, but empirical data

that support this notion have been sparse. The present study was designed to find evidence for the involvement of efference copy in space perception by capitalizing on the idea that dysfunctional efference copy underlies positive symptoms of schizophrenia. In two experiments, blindfolded participants who had varying degrees of premorbid schizophrenia (i.e., schizotypy) traits either walked along a linear path or were guided along it while sitting in a wheelchair. Subsequently, they verbally estimated the distance traveled. It was hypothesized that high-schizotypal participants would be less accurate in distance estimation than low-schizotypal participants when they walked, given that efference copies generated by walking presumably take a part in walked distance perception. By contrast, these two groups were predicted to perform similarly when they were in the wheelchair because no intentional actions (and thus no efference copies) were involved in this task. Results verified these predictions, suggesting that efference copy does play a role in space perception.

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## ● EMBODIED COGNITION ●

(1021)

**Feedback Rather Than Performance Influences Subsequent Perceptual Judgments.** KIMBERLY M. HALVORSON and ELIOT HAZELTINE, *University of Iowa*—Previous research suggests that acting on an object may affect subsequent perceptual judgments about that object (Witt and Proffitt, 2005; Witt et al., 2008). For example, Witt and Proffitt, 2005 found a correlation between players' batting averages and the perceived size of the ball. Players with higher batting averages reliably chose larger circles as matching the size of a softball. Similar results have been reported for other activities, including field goal kicking (Witt & Dorsch, 2009). We examined the role feedback plays on action effects as indicated by subsequent perceptual judgments. We used a computerized version of a throwing task, in which participants "launched" an item into a target by moving the mouse; participants' subsequent size estimates of the target were reliably larger only when they knew whether or not their "launch" was successful. This suggests that many of these effects may be driven by participants' knowledge of their performance.  
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(1022)

**A Bias to Detail: How Hand Position Modulates Visual Learning and Visual Memory.** CHRISTOPHER C. DAVOLI and JAMES R. BROCKMOLE, *University of Notre Dame*, ANNABELLE GOUJON, *University of Provence*—Despite enhancements in perception, attention, and visual short-term memory observed near the hands, it is not known how those enhancements influence higher-order cognitive functions such as learning and memory. To



examine that question, we employed the contextual cueing paradigm of visual learning. Participants searched for a target embedded within images of fractals and other complex geometrical patterns while either holding their hands near to or far from the stimuli. When visual features and structural patterns remained constant across to-be-learned images, no difference emerged between hand postures in rate of learning. However, when to-be-learned images maintained structural pattern information but changed in surface features (color), participants exhibited slower rates of learning when holding their hands near to the material. This finding shows that learning near the hands is impaired in situations in which common information must be abstracted from visually unique images, suggesting a bias toward detail-oriented processing near the hands.

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(1023)

**Integrating Mind and Body in a Response Selection Task: From Neural Decisions to Mouse Trajectories...and Back Again.** AARON T. BUSS and TIM WIFALL, *University of Iowa*, GREGOR SCHOENER, *Ruhr University--Bochum*, ELIOT HAZELTINE and JOHN P. SPENCER, *University of Iowa*—There has been a recent surge of research examining embodied cognition prompted, in part, by the innovative use of bodily movements to track--in real time--the state of cognitive dynamics. To date, however, the link between mind and body in these tasks has been largely conceptual in nature, despite innovations in the understanding of embodied neural dynamics. Here, we use Dynamic Field Theory (DFT) to couple a neural decision-making system to a simple motor system that generates mouse trajectories in space and time. We apply DFT to a response selection task where stimulus similarity and response similarity produced an overadditive effect on the curvature of mouse trajectories. DFT explains this effect by positing that response selection takes place in a metrical neural field that associates stimuli and responses. We show how the local dynamics within this field and interactions with the motor system account for mouse trajectories across conditions. This formal approach--which is broadly applicable to other tasks--demonstrates how mouse trajectories can serve as behavioral signatures of underlying neural mechanisms, revealing the mechanistic basis of decision-making.

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(1024)

**Exploring Potential Interference Effects Between Motor Simulation and Language Processing.** MARK A. CASTEEL, *Pennsylvania State University, York*—Researchers studying embodied cognition have shown that readers often mentally simulate described actions. Little is understood, however, about the nature of the influence of motor activation on reading comprehension. Previous data I collected found that participants slowed when they read an action similar to one they were planning to perform. I interpreted this pattern within the context of common coding

theory. The present research attempted to replicate and expand this finding using an ongoing action rather than one held in memory. Participants engaged in an action that was either congruent or incongruent with an action in an upcoming text. As they engaged in the action, they simultaneously read the text line by line. Reading times to the critical lines (particularly the verbs) was measured to see whether motor activation interfered with reading about a complementary action. The results help to delineate the influence of motor activation on language comprehension.

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(1025)

**A Test of Embodied Perception with Aurally Perceived Distances.** KYLE T. GAGNON, MICHAEL N. GEUSS, JOSHUA RUECKERT and JEANINE K. STEFANUCCI, *University of Utah*—When an observer's reach is extended by holding a tool, objects formerly out of reach are perceived to be within reach, suggesting the visual system incorporates changes to the body. Our work extends this finding to audition. Participants were asked to judge whether they could reach to a sound-emitting object, while holding and not holding a baton. However, some participants did this task with vision, while others used only audition. With vision, participants judged that they could reach to objects farther away when holding the baton. With only audition, participants judged they could reach farther, but not to the same extent as the vision condition. These initial results suggest that extending one's reach may be incorporated in perceived action capabilities, although moderated by the modality used. An additional study tested whether a different change to the body (increased effort) was similarly incorporated by the auditory and visual systems.

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(1026)

**Motor Dynamics in Numerical Representations: Evidence from Mouse-Tracking.** THOMAS J. FAULKENBERRY, *Texas A&M University - Commerce*—Current models of numerical representation share the view that interference between numerical magnitude and spatial position (e.g., the SNARC effect) occurs in the response selection stage, after which a motor response is initiated, typically as a button press. However, these models assume no differences in the execution of the response stage, indicating that such interference effects are pre-motor in nature. In two experiments (a parity task and a numerical comparison task), participants' streaming mouse movements were recorded as they chose between task-relevant response alternatives for single-digit Arabic numerals. Before settling onto correct choices, the processing of numerals where the response location was inconsistent with numerical size (e.g., left-side responses with large numbers) led hand trajectories to deviate toward the incorrect response. Distributional analyses of these trajectories indicated that spatial/numerical interference resulted from dynamic competition between parallel and partially-active representations. Furthermore,



this competition was carried through to the motor stage, giving rise to the possibility that numerical representations are more tied to bodily affordances than previously thought.

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(1027)

**The Effect of Action-sentence Compatibility on Memory.**

KAREN D. I. SCHUIL, LEONORA C. COPPENS and ROLF A. ZWAAN, *Erasmus University*—Action sentence comprehension may involve motor resonance. For instance, a number of studies have demonstrated the action compatibility effect (ACE), wherein sentences with an implied direction (e.g., “Open the drawer”) facilitated a congruent response movement (e.g., a button press towards the body). This ace effect has mainly been demonstrated in response latencies and reading times. The current experiment investigated the ACE with a cued recall task. The experiment consisted of three phases. First, participants learned sentences with an implied direction (up or down) and viewed pictures of the objects mentioned in the sentence. Second, participants moved the pictures in a congruent or incongruent direction (up or down) with the computer mouse and restudied the sentences. Third, participants performed a cued recall test on the sentences. Whether congruent actions facilitate memory is discussed, along with theoretical implications for embodied theories of cognition.

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(1028)

**Embodied Memory: Embodied Retrieval Cues Enhance Recall.**

ALTHEA BAUERNSCHMIDT and J. ERIC T. TAYLOR, *Purdue University*, JEFFREY D. KARPICKE, *Purdue University* (Sponsored by David Pisoni)—Theories of human memory have traditionally focused on the importance of semantic or meaning-based processing. Theories of embodied cognition, however, emphasize that mental processes are grounded in sensorimotor mechanisms. This view implies that when people process words, they not only encode semantic attributes of words but also automatically encode sensorimotor attributes of words. Consequently, retrieval cues that reinstate sensorimotor information should be effective for recall. In a series of experiments, subjects studied lists of concrete nouns (e.g., chair) under standard intentional learning instructions. They took cued-recall tests with extralist cues that were strong semantic associates (table), weak semantic associates (glue), or weak semantic associates that reinstated sensorimotor attributes of the targets (sit). Strong cues produced better recall than weak cues, but embodied weak cues outperformed non-embodied weak cues, even though the cues were matched on associative strength to the targets. Embodied retrieval cues that reinstate sensorimotor processing can enhance recall.

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● SPATIAL COGNITION I ●

(1029)

**Orientation Representation and Non-incremental Transformations in Mental Rotation.**

DAVID ROTHLEIN, THITAPORN CHAISILPRUNGRAUNG and MICHAEL MCCLOSKEY, *Johns Hopkins University* (Sponsored by Brenda Rapp)—Mental rotation is typically assumed to involve mental processes that are (somehow) analogous to the physical rotation of the object in question. This interpretation implies, for example, that the processes underlying 90° and 180° mental rotations are qualitatively the same, differing only quantitatively. In the present study participants reported the orientation that would result from rotating a stimulus picture 0°, 90°clockwise, 90°counterclockwise, or 180°. Analyses of participants' errors revealed differences in the distribution of error types between the 90° and 180° conditions, and suggested that mental rotation processes are qualitatively different for 90° and 180° rotations. Specifically, we suggest that the 180° rotations (unlike the 90° rotations) are accomplished via two discrete changes to parameters of a non-pictorial object orientation representation, whereas 90° rotations may involve incremental updating of a different parameter. Our findings highlight the importance of explicit assumptions about object orientation representations in the study of mental rotation.

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(1030)

**Boundary Extension: Color Doesn't Matter, Perceived Restorativeness Might.**

MARGARET P. MUNGER, DANIEL M. KELLER and KATHERINE T. NESS, *Davidson College*—When instructed to remember the entire scene, including the edges, participants accept wider-angle shots as the same; this is called boundary extension (BE, e.g. Dickinson & Intraub, 2008). Color can influence memory for scenes, with better memory for color scenes that are diagnostic (e.g., forests and deserts) compared to grayscale versions (Nijboer et al , 2008). We examined BE for color diagnostic nature scenes (deserts & forests) and color nondiagnostic man-made scenes (cities & markets), expecting that gist would be more readily available in diagnostic color scenes, and lead to larger BE. We found BE for both scene types, but color did not matter in diagnostic nature scenes. In fact, grayscale nondiagnostic man-made scenes had more BE than color versions. Additional item analysis revealed that all pictures leading to BE had lower perceived restorativeness (Berto, 2005); better memory for the edges of scenes occurred for scenes higher in perceived restorativeness.

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(1031)

**Do Virtual and Real Environments Influence Spatial Cognition Similarly?** BERNHARD E. RIECKE and LONNIE B. HASTINGS, *Simon Fraser University*—Given the increasing use of virtual environments in both research and industry, it is important to understand whether virtual reality actually affords spatial perception, cognition, and behavior similar to the real world. Using a judgment of relative direction (JRD) task, Riecke and McNamara (Psychonomics 2007) demonstrated orientation-specific interference between participant's physical orientation in an empty test room and their to-be-imagined orientation in a previously learned room of similar geometry. To investigate whether the same interference can be observed in VR, we replicated the previous procedure but added a "virtual" test condition in which participant's performed the same JRD task, but in a photorealistic virtual replica of the real test room displayed using an immersive custom-built Wheatstone stereoscope (2560x1600 pixel/eye). While some participants showed the expected effect in the real but not virtual environment, unexpectedly we also observed the reverse. We are currently running control studies to investigate potential underlying factors.  
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(1032)

**How Do Humans Detect Landmark Instability During Navigation?** MINTAO ZHAO and WILLIAM H. WARREN, *Brown University*—We investigate a paradox in human navigation: since path integration is imprecise, we rely on stable landmarks – but then how do we detect landmark instability? Participants performed a triangle completion task in an ambulatory virtual environment. Landmark stability was manipulated by covertly shifting local landmarks prior to the home-bound leg by an angle randomly sampled from a Gaussian distribution with a SD of 1, 2, or 3 times the SD of path integration. Participants followed the landmarks in the high and medium stability conditions, but not in the low stability condition. Thus, path integration is a very coarse reference system that can only detect highly unstable landmarks, whereas global orientation cues may be more sensitive to landmark stability. We are currently testing whether fixed global orientation cues (virtual mountains 800 m away) improve the detection of landmark instability.  
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(1033)

**Translational Spatial Updating of Multiple Targets Under Normal and Severely Degraded Vision.** MARGARET R. TARAMPI, SARAH H. CREEM-REGEHR, JONATHAN Z. BAKDASH and WILLIAM B. THOMPSON, *University of Utah*—Previously we demonstrated that observers under degraded vision conditions are able to spatially update a single target through walking without vision. However such single-target conditions may not generalize to environments with multiple

targets. In a translational updating task, participants viewed a one- and six-target array. Participants were asked to verbally judge the quadrant location and pointing direction of a specified target. The judgments were made either from their initial position or a new position in the space, walked to while blindfolded. Under degraded vision, participants showed greater absolute pointing error than under normal vision. In both viewing conditions, absolute pointing error was greater for the six-target array and increased with the distance of self-translation. Furthermore, updating objects in back compared to in front, with respect to the observer, showed increased error and more variability. Results are considered with respect to mechanisms of spatial updating and implications for low vision navigation.

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(1034)

**Action-Compatibility when Verifying Spatial Information Learned from Navigation and Maps.** QI WANG and HOLLY A. TAYLOR, *Tufts University*, GEORGE L. WOLFORD, *Dartmouth College*, TAD T. BRUNYÉ, *Tufts University & US Army NSRDEC*—Four studies explored action-compatibility effects (ACE) when retrieving spatial knowledge acquired from real environments or maps. Participants with high or low environment familiarity verified descriptions relating relative spatial locations by moving the mouse to a YES or NO button. The correct mouse movement direction was congruent or incongruent with the actual spatial relationship. Results demonstrated that ACEs differed as a function of spatial information source (navigation vs. map), directional terms (right/left vs. east/west) and environment familiarity. Learning from navigation and processing egocentric terms more likely activated perceptuo-motor representations of spatial information, especially with less-developed representations. Well-developed map representations allowed participants to change retrieval strategies in different situations. These participants demonstrated ACEs when shifting between egocentric and cardinal descriptions, but did not if only responding to cardinal descriptions. These findings challenge the viewpoint of single, image-like spatial representation and lend support to perceptuo-motor integration in learning spatial environments.  
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(1035)

**What's the Difference Between Active and Passive Spatial Learning?** ELIZABETH CHRASTIL and WILLIAM H. WARREN, *Brown University*—We test three potential contributions to active spatial learning: (1) motor/proprioceptive information, (2) vestibular information, and (3) cognitive decision-making. Twelve groups of participants learned the locations of 8 objects in an ambulatory virtual maze environment presented in an HMD. In six learning conditions, Free and Guided exploration were

crossed with Walking, Wheelchair, and Stationary modes of travel. In the Survey test, participants walked novel shortcuts directly from A to B. Results suggest that walking during exploration reduces the constant and variable error in shortcuts. In the Route test, they walked from A to B within the maze corridors. Results show that the Free Walking group performed the best, while the Free Wheelchair group had the worst performance. Individual and sex differences were also found. The results imply that motor/proprioception may contribute to learning survey knowledge, while the combination of motor/proprioception and decision-making is important for route learning.

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(1036)

**The Effect of Disorientation on Subjective Straight-Ahead.** BENJAMIN A. KRAMER, JOHN W. PHILBECK and STEPHEN C. DOPKINS, *The George Washington University*, JESSE SARGENT, *Washington University*—Past work has suggested that disorientation with respect to the environment degrades the precision of inter-object relationships in spatial memory. Here, we tested the hypothesis that at least some of this effect is due to an effect of disorientation on the precision of the egocentric reference frame. Participants were disoriented by undergoing a series of whole-body rotations while blindfolded, and then manipulated a pointer without vision to indicate the direction they felt was “straight ahead”. After disorientation, participants exhibited significantly greater variability in their straight-ahead judgments than similar judgments performed while oriented. These findings suggest that at least part of the effects of disorientation found in past work could stem from decreased precision in the egocentric reference frame against which directional judgments are based, perhaps in addition to effects of disorientation on spatial memory per se.

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(1037)

**Object-centered Reference Systems and Human Spatial Memory.** XIAOLI CHEN and TIMOTHY P. MCNAMARA, *Vanderbilt University*—The present study investigated the role of object-centered reference systems in memories of objects' location. Participants committed to memory the locations and orientations of either 11 human avatars or 11 animal models displayed in a desktop virtual environment, and then completed judgments of relative directions, in which they pointed to objects from imagined vantage points corresponding to the locations of the objects. Results showed that, with avatars, performance was better when the imagined heading was congruent with the facing direction of the avatar located at the imagined vantage point. With animal models, no such facilitation was found. For both types of stimuli, performance was better for the learning view than a novel view. Results demonstrate that memories of the locations of objects are affected by object-centered reference systems, and are consistent with

conjectures that spatial memories are hierarchies of spatial reference systems, with higher levels corresponding to larger scales of space.

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(1038)

**The Effects of Visual Impairment in Representing Space.** TOMASO VECCHI, *University of Pavia, Italy*, LOTFI MERABET, *Harvard Medical School*, MAURA MONEGATO, *University of Pavia, Italy*, ALFREDO PECE, *Melegnano Hospital, Italy*, ZAIRA CATTANEO, *University of Milano-Bicocca, Italy* (Sponsored by Claus-Christian Carbon)—Congenitally blind individuals perform similarly to sighted individuals in certain spatial tasks but not in others. For instance, blind individuals show pseudoneglect in bisecting horizontal rods, similarly to normally sighted individuals, and this is likely to reflect a right hemisphere dominance in space representation. However, congenitally blind individuals differ from sighted individuals in the way they make use of certain spatial organizational principles, such as mirror symmetry. In this study, individuals affected by a partial deficit of the visual system (e.g., amblyopia, strabismus, and monocular blindness) were tested on a series of spatial tasks in order to investigate which specific aspects of visual perception lead to the different performance observed in blind individuals. Our data indicate that an imbalance between the two eyes may have a different impact on the development of attentional spatial mechanisms and on the quality of spatial mental representations compared to complete blindness.

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## ● COGNITIVE SKILL ACQUISITION I ●

(1039)

**Facilitation of Prior Memory Procedures in Visual Category Comparisons and Arithmetic Equation Comparisons.** CHRISTOPHER A. WAS, *Kent State University*—Recent evidence suggests that some long-term semantic priming effects may be in part due to the facilitation of content specific, but item-general memory procedures (e.g., Was, 2010). Previous investigations have relied on tasks that required participants to perform a simple cognitive task of classifying exemplars of two categories presented either aurally or as text. Facilitation of this procedure was then operationalized by subsequent improvements in the speed of item-general classification. Two experiments were conducted to determine if these effects were specific to verbal category identification or if similar effects could be demonstrated using other memory procedures. In Experiment 1, graphically presented exemplars were used in the item-general classification task. Experiment 2 required participants to process and compare simple arithmetic equations. In both experiments, facilitation

of item-general memory procedures was demonstrated. The results support the hypothesis that some long-term semantic priming may be the result of persistent memory for prior cognitive operations.

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#### (1040)

**Transfer Effects after Ten Days of Intensive Cognitive Training.** JEFFREY S. PHILLIPS, EMILY M. BRAUN, BRETT WORKMAN, LUCAS HORAN, CHRISTIAN D. SCHUNN and WALTER W. SCHNEIDER, *University of Pittsburgh*—Intensive cognitive training regimens have generated widespread interest, due to their potential applications to education and clinical rehabilitation. In this experiment, we examine the efficacy and specificity of training in two paradigms: complex working memory (CWM) and serial reaction time (SRT) tasks. Fifty participants (25 per group) were trained for 10 days in 30-40 minute sessions. Before and after training, they completed a battery of near- and far-transfer assessments, including working memory, reaction time, Stroop, logical inferences, and non-verbal reasoning tasks. CWM trainees improved from a starting verbal span of 4.9 (1.3) to 8.8 (2.5) items, and from a spatial span of 3.1 (0.7) to 6.4 (1.3) items. Likewise, SRT trainees demonstrated robust sequence learning, relative to randomized responses (mean  $z=3.4$ ). In transfer assessments, the CWM group improved on digit span and spatial working memory tasks, while the SRT group improved on a simple reaction time task. These results suggest that short periods of intensive cognitive training can affect performance on closely-related cognitive tasks.

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#### (1041)

**Moderate Amounts of Attentional Control Training Can Improve Performance on a Variety of Untrained Working Memory Tasks.** HILLARY SCHWARB, *Georgia Institute of Technology*, ANDY MCKINLEY, *Air Force Research Laboratory*, JAYDE NAIL, ZAIN SULTAN and ERIC H. SCHUMACHER, *Georgia Institute of Technology*—Learning and training have been topics of interest for over a century; however, findings in the training literature are often inconsistent and frequently counterintuitive. Arguably, the most important feature of a training program is the ability of the trained skill to transfer to new situations. Recently, researchers have taken a particular interest in training cognitive skills. In fact, several studies have demonstrated successful transfer across a variety of cognitive skills (e.g., Chein & Morrison, 2010; Dahlin et al., 2008; Green & Bavelier, 2006; Jaeggi et al., 2008). The current study extends these findings by investigating the influence of attentional control training on a variety of untrained working memory, fluid intelligence, and information processing tasks. Results indicate that generalized improvements resulting from attentional control training are process specific. Specifically, these data suggest that training related improvements occur on measures of

verbal working memory as well as visual working memory resolution.

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#### (1042)

**An fMRI Study of Arithmetic Training: Different Activation Patterns of Basal Ganglia Due to Differences in Training Procedures.** ARAVA Y. KALLAI, CHRISTIAN D. SCHUNN and JULIE A. FIEZ, *University of Pittsburgh*—A within-subject fMRI study tested the components of an arithmetic training program designed to engage procedural learning mechanisms, by manipulating parameters considered essential for procedural learning: contingent feedback, incentive value of positive results, and uncertainty about outcomes. Fifteen participants solved double-digits addition problems in five conditions. In the Base condition, participants received trial-by-trial feedback and monetary rewards for correct answers. The No-feedback and No-reward conditions lacked one of these parameters. A higher-certainty condition included easier problems, and in a lower-certainty condition the feedback was occasionally false. While correct solutions led to similar activation in number-related regions across conditions, errors in the manipulation conditions led to a reduced activation compared with Base. Basal ganglia activation was reduced in the No-feedback condition, compared with Base. The patterns of activation across conditions provide insights into how neural learning mechanisms, as well as domain-specific regions, are differentially engaged by training features.

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#### (1043)

**Negotiation Strategy Training Using a Modified Analogical Encoding Technique.** IRIS I. RATTLEY, *The University of New South Wales*—The present research investigated the effectiveness of a modified analogical encoding technique for the training and transfer of negotiation strategies using short scenarios. Traditional analogical encoding involves comparison of two examples of the same strategy at training. The modified technique of diverse training involves comparison of two scenarios that each exemplifies a different strategy at training. Four strategies were included in the experiments: logrolling, forming a contingent contract, inclusion of time preferences, and addition of an extra issue. In Experiment 1, both traditional analogical encoding and the modified method yielded positive transfer in the application of an appropriate strategy in a test scenario, relative to a rest control condition. Experiment 2 indicated that for the modified method, the scenarios illustrating different strategies do not need to be superficially different, as is believed essential for traditional analogical encoding. Experiment 3 indicated that the specificity of transfer varies by strategy; scenarios illustrating the contingent contract produced the most specific transfer. Implications for alternative theories will be discussed.

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(1044)

**Do Lag Effects on Loss of Memory-Based Automaticity Reflect Decay or Interference?** NICOLAS J. WILKINS and KATHERINE A. RAWSON, *Kent State University*—According to memory-based processing theories of automaticity (Logan, 1988; Palmeri, 1997; Rickard, 1997), improvements in response speed with practice reflect a shift from algorithmic processing to retrieval of prior interpretations. How does lag affect gains and loss of memory-based automaticity? Rickard, Lau, and Pashler (2008) found that retrieval use during practice was greater with short versus long lags between trials, but the effect reversed after a delay. Does this differential loss of retrieval use reflect decay or interference? In the current study, participants repeatedly verified alphabet arithmetic problems with short or long lags between practice trials. Replicating Rickard et al., retrieval use in a delayed test session was lower for items that had been practiced with short versus long lags. More important, the same pattern obtained during an immediate test session, implicating differential susceptibility to interference rather than different rates of decay for short versus long lag items.

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(1045)

**Processing Ordinality and Quantity: The Case of Developmental Dyscalculia.** ORLY RUBINSTEN, *University of Haifa* (Sponsored by Avishai Henik)—In contrast to quantity processing, up to date, the nature of ordinality has received little attention from researchers despite the fact that both quantity and ordinality are embodied in numerical information. We report two novel experiments of ordinal processing that explored the relation between ordinal and numerical information processing in typically developing adults and those with developmental dyscalculia (DD). Participants made “ordered” or “non-ordered” judgments about 3 groups of dots (non-symbolic numerical stimuli) or 3 numbers (symbolic task). In contrast to previous findings and arguments about quantity deficit in DD participants, when quantity and ordinality are dissociated (as in the current tasks), DD participants exhibited the normal ratio effect. Also, DD participants showed the ordinality effect, only in the descending direction. These findings suggest that there might be two separate cognitive representations of ordinal and quantity information and that linguistic knowledge may facilitate estimation of ordinal information.

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(1046)

**On the Relationship Between Mechanical Abilities and Cognitive Representation: An Investigation of Hands-on Ability.** NATASHA J. HAGADONE, *Michigan Technological University*, ANNA PEREIRA, *University of California at Berkeley*, MICHELE H. MILLER and EDWARD T. COKELY, *Michigan Technological University*—Research suggests that hands-on ability is an important part of engineering achievement and success. Historically, hands-on ability has been investigated via

psychometric methods with relatively little concern for underlying cognitive mechanisms. We conducted a series of surveys and experiments involving industry representatives, university professors, and students (graduate and undergraduate). Results indicated that specific experiences and cognitive representations may play key roles in hand-on ability. Cognitive representations also tend to be central to most conceptual definitions used by experts and professionals. Moreover, results indicated that hands-on ability tends to be an important factor in hiring decisions, similar to communication skills and teaming ability. Discussion focuses on the assessment of key cognitive processes (e.g., estimating the diversity and complexity of available exemplars) and potential implications for skill acquisition and training.

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(1047)

**Working Memory Training and Transfer to Gf – Evidence for Domain Specificity.** SUSANNE M. JAEGGI, MARTIN BUSCHKUEHL and JOHN JONIDES, *The University of Michigan*—We trained young adults on an adaptive N-back task for the duration of a month. One group trained on a dual n-back task (visuospatial and verbal material), whereas another group trained on a single n-back task (verbal material only). Before and after training, we assessed participants’ fluid intelligence (Gf) by means of a battery of established measures which we combined into two latent factors (visual and verbal Gf). We compared the two experimental groups’ gain in Gf with the gain of an active control group which trained on an intervention focusing on improving skills related to crystallized intelligence. Whereas there were no differential group effects in the verbal domain as a function of training, both N-back training groups outperformed the active control group in improving visual Gf, regardless of the N-back version they trained on (dual or verbal), providing evidence that transfer after N-back training occurs primarily in the visual domain.

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(1048)

**Calibrating Adults' Estimates in Dot Enumeration.** ALEX M. MOORE, NATHAN O. RUDIG and MARK H. ASHCRAFT, *University of Nevada Las Vegas*—We investigated how adults estimate numerosity in a dot enumeration task, showing them displays of 30 to 1000 dots. Without calibration to the range of stimuli being tested, participants responded in a way best described as showing scalar variability. When we calibrated them to the endpoint of the continuum, by showing a labeled display of 1000 dots, their responses followed a logarithmic pattern. Adult and developmental number line estimation studies have shown that integration of midpoint knowledge is an important aspect of linear responding, and this aspect was provided to adults in a second set of experiments to explore its influence on the pattern of estimation.

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## ● EXPLICIT MEMORY I ●

(1049)

**Influence of a Perpetrator's Distinctive Facial Feature on Eyewitness Identification.** CURT A. CARLSON, *Texas A&M University - Commerce*—This study addressed the effect of a target's distinctive facial feature on eyewitness identification. It also tested for an interaction between a distinctive feature and a holistically distinctive face, from target-present and target-absent lineups. Finally, simultaneous and sequential lineups were compared to assess the likelihood of the sequential lineup advantage, in light of recent research indicating that target distinctiveness is an important factor. Faces rated as distinctive yielded higher accuracy compared to those rated as nondistinctive. Adding a distinctive feature to a holistically nondistinctive target did not change correct identification rate. Interestingly, adding a distinctive feature to a holistically distinctive target decreased correct identification rate, but only for simultaneous lineups. Out of four simultaneous-sequential comparisons, there was one sequential lineup advantage in false identification rate: after encoding a holistically nondistinctive target with a distinctive feature. This translated into a sequential advantage in terms of probative value.

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(1050)

**Don't I Know You? Exploring How Context Affects the Perceived Familiarity of Strangers.** SAMANTHA A. DEFFLER and ELIZABETH J. MARSH, *Duke University*, ALAN S. BROWN, *Southern Methodist University*—Paralleling the real-world situation of encountering a stranger in a familiar place, we asked if the rated familiarity of an unfamiliar person would change if it was judged in the context of a famous landmark, such as the Eiffel Tower, versus an unfamiliar landscape or a colored background. Participants viewed yearbook photographs of unfamiliar people overlaid on variable backgrounds, and rated each person for pre-experimental familiarity on a 1 (very unfamiliar) to 6 (very familiar) scale. Strangers were rated as more familiar if they appeared in the context of famous scenes, as opposed to novel scenes or colored backgrounds. Familiarity is not judged in isolation; participants were unable to assess the familiarity of the strangers independently of the backgrounds.

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(1051)

**A Dual Process Approach to the Description-Identification Relationship Using Conjunction Faces.** DAWN R. WEATHERFORD and CURT A. CARLSON, *Texas A&M University - Commerce* (Sponsored by Scott Gronlund)—In two experiments, we tested three theories of verbal overshadowing/facilitation for face recognition: the Semantic Processing, Criterion Shift, and Transfer Appropriate Processing account. Using conjunction faces

and Remember/Know judgments, we also examined how featural or holistic description contributed to recollection versus familiarity. In Experiment 1, we found increased hit rate and conjunction false alarm rate for both featural and holistic verbalizers. In Experiment 2, we tested memory for three different conjunction types (intact interior, disrupted interior, and disrupted interior with novel features) and warned participants to avoid making conjunction errors. Both types of verbalizers demonstrated increased hit rate, decreased false alarm rate, but no difference in conjunction false alarm rate. Overall, these results, strengthened with signal detection analysis, support the Semantic Processing account of verbal facilitation and are discussed in terms of the influence of verbalization on recollection and familiarity.

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(1052)

**Covert Retrieval Practice Benefits Retention as Much as Overt Retrieval Practice.** MEGAN A. SMITH, *Purdue University*, HENRY L. ROEDIGER, *Washington University in St. Louis* (Sponsored by David G Elmes)—Research dating back a century shows that testing benefits retention; however, most testing research has employed tests requiring overt responses. Does covert retrieval during testing—thinking of but not producing responses—produce the same benefit? Tulving (1983) hypothesized that overt and covert retrieval should result in comparable retention benefits, yet production effect research shows that producing an overt response during encoding aids retention. If the same principle operates during testing, overt responding may lead to enhanced retention relative to covert retrieval. We report three experiments comparing free recall and cued recall performance of categorized word lists after overt and covert retrieval on a first test. The results generally confirm Tulving's hypothesis: overt and covert retrieval result in comparable retention benefits on a later test. Students can learn as much from testing themselves while studying using covert responding as they would from overt responding.

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(1053)

**Memory for Emotional Simulations: Remembering a Rosy Future.** KARL K. SZPUNAR, *Harvard University*, DONNA ROSE ADDIS, *The University of Auckland*, DANIEL L. SCHACTER, *Harvard University*—Mental simulations of future experiences are often concerned with emotionally arousing events. Although it is widely believed that mental simulations enhance future behavior, virtually nothing is known about the mnemonic fate of these simulations over time or whether emotional simulations are especially well-remembered. We used a novel paradigm, combining recently developed methods for generating future event simulations and well-established memory testing procedures, to examine the retention of positive, negative, and neutral simulations over multiple delays. We found that with increasing delay, details associated with negative

simulations become more difficult to remember than details associated with positive and neutral simulations. We suggest that these delay-by-emotion interactions reflect the mnemonic influence of fading affect bias, where negative reactions fade more quickly than positive ones, resulting in a tendency to remember a rosy simulated future. We also discuss implications for affective disorders such as depression and anxiety.

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(1054)

**Identifying Superior Eyewitnesses: Handedness Predicts Eyewitness Memory Accuracy.** KEITH B. LYLE and AMANDA B. COLE, *University of Louisville*—Some people very consistently use one hand over the other for manual activities while other people are more inconsistent. In prior research, inconsistently-handed individuals have exhibited superior memory on a variety of tests. We examined whether this superiority extends to cued recall of visually complex, forensically relevant scenes. Subjects viewed such scenes in two experiments. Inconsistently-handed subjects recalled more correct details from the scenes than did consistently-handed subjects, provided the details were not contradicted by post-viewing misinformation. Inconsistent and consistent subjects were equally susceptible to misinformation, and equally confident about their answers. Inconsistent subjects' greater correct recall suggests that assessing consistency of handedness may help identify superior eyewitnesses.

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(1055)

**Compound Cueing in Free Recall.** LYNN J. LOHNAS and MICHAEL J. KAHANA, *University of Pennsylvania* (Sponsored by Saul Sternberg)—Most memory models assume that the most recently retrieved item influences retrieval of the next item. However, results from the serial learning literature suggest that participants use an amalgam of multiple previous items as a compound cue (e.g. Posnansky 1972, Kahana & Caplan 2002). These results may overestimate endogenous compound cueing, as participants show stronger temporal organization in serial tasks. For this reason, we investigated compound cueing in free recall. In a meta-analysis of free recall studies, we show that the conditional response probability and inter-response time of a recall transition vary as a function of its preceding transition. This result is also predicted by the context maintenance and retrieval model, demonstrating that compound cueing is consistent with context-based memory models.

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(1056)

**Gist Binding in Phantom Recollection.** KETHERA FOGLER and DONNA J. LAVOIE, *Saint Louis University*—False memory is argued to arise from familiarity processing; however, false memories can be rich in episodic detail (phantom recollection; PR), which cannot be explained by familiarity processing alone. Some research (e.g., Lampinen et al., 2005) suggests that decision-making processes supplement familiarity during retrieval to produce PR, while other research (e.g., LaVoie et al., 2009) indicates that PR is a result of binding processes at encoding. This study examines our hypothesis that episodic and semantic gist representations are bound at encoding to produce PR. We measured response times in a remember/know recognition test (Exp. 1), predicting fast RTs to false remember judgments as a result of binding of gist representations at encoding. In Exp. 2 we examined the effect of sleep consolidation on PR, predicting greater PR after sleep relative to a no-sleep delay. Results from both experiments suggest that PR is the product of binding processes occurring during encoding.

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## ● WORKING MEMORY I ●

(1057)

**Behavioural Consequences of Retrieval-induced Forgetting.** MARCELLE L. FERNANDES and JO SAUNDERS, *Swansea University*—The current two experiments examined the impact of retrieval-induced forgetting on behavioural tests. Participants first studied either neutral and positive or neutral and negative traits about a target and then either recalled all the traits before being asked to take a seat outside the laboratory (Experiment 1) or they were asked to take a seat outside the laboratory before recalling all the traits (Experiment 2). When the recall phase occurred before the seating task a rebound effect was found on the seating task. When the recall phase occurred after the seating task a retrieval-induced forgetting effect was found on the seating task. The findings indicate the presence of a rebound effect (Experiment 1) and retrieval-induced forgetting effect (Experiment 2) on behavioural tests.

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(1058)

**Investigating the Distinctions of Memory for Changed and Unchanged Objects.** JOHN F. MAGNOTTI and JEFFREY S. KATZ, *Auburn University*—Recent research has shown that method of assessment impacts memory sensitivity in the change detection task. Further, change detection studies have found strikingly different visual working memory (VWM) capacities for detection of changing vs. unchanging objects. A typical change detection

task involves the presentation of a sample array (e.g., colored squares), a brief retention interval, and then the presentation of a choice array. We compared the Yes/No and Forced-Choice procedures using a “detect the change” condition and a “detect the same” condition across several memory loads and comparison difficulties. Results suggest that all four tasks tap into common underlying processes, with differences related to their relative degree of comparison difficulty and decision noise. The data suggest common storage for visual objects and a separate interference resolution mechanism.

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(1059)

**Verbal Versus Visual Working Memory Skills in Action Video Game Players.** ASHLEY F. ANDERSON, RACHEL KLUDT and DAPHNE BAVELIER, *Brain and Cognitive Sciences, University of Rochester*—Action video games have been reported to have widespread effects on attention. To understand if these effects are also seen in other aspects of cognition, we explored the domains of visuo-spatial and verbal working memory. We did not find any differences due to gaming experience in 2 tests of verbal working memory - letter span and an n-back task. However, using a change detection task and a filtering task to probe visual working memory, action video game players exhibited a greater memory capacity and were better at filtering out distractors than those who did not play action video games. These results indicate that action video game players do not show improvements on all cognitive tasks, and that most differences between action gamers and non-gamers are likely to be in visuo-spatial and non-verbal domains.

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(1060)

**The Representation of Position in Verbal and Nonverbal Short-Term Memory.** SIMON FISCHER-BAUM, *Beckman Institute, University of Illinois Urbana-Champaign*, MICHAEL MCCLOSKEY, *Department of Cognitive Science, Johns Hopkins University*—This study addressed two questions: How are the positions of items within a sequence represented?; and, Is the scheme for representing position constant across sequence types? We used perseveration errors in serial recall tasks to probe position representation for sequences of familiar words in verbal short-term memory (Experiments 1 & 2), and for sequences of spatial locations (Experiments 3 & 4) and oriented objects (Experiment 5) in non-verbal short-term memory. For the familiar words and oriented objects the results indicated that item position was represented relative to both the beginning and the end of the sequence (both-edges position representation). For the spatial locations, however, position was represented only with respect to the beginning of the sequence. These results are difficult to reconcile with proposals positing modality independent order processing (e.g., Depoorter & Vandierendonck, 2009),

and also with proposals that assume a sharp verbal/non-verbal processing divide (e.g. Baddeley, 1992).

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(1061)

**Forgetting from Working Memory Feature by Feature.** TIMOTHY J. RICKER, *University of Missouri*, NELSON COWAN, *University of Missouri*, KAREN R. HEBERT, *University of Missouri*—Working memory is the system that keeps information available for use in cognitive tasks. Zhang and Luck (2009) found that the passage of time caused single-feature items to be lost completely in a sudden-loss of memory, rather than forgotten through a gradual loss of memory precision. Because item and feature information were confounded, we wished to explore this important finding further. On each trial we asked participants to remember a single item composed of multiple features. We found that items were not forgotten suddenly with the passage of time but instead suffered a gradual death through multiple cuts. Individual feature of were forgotten at different rates and participants used the remaining partial information to make their responses when some features were forgotten. Forgetting from working memory is not as simple as attention to all-or-nothing object representations, but instead involves a more complex process of individual feature decay.

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(1062)

**Unobtrusive Monitoring of Cognitive Health in Older Adults: Modeling a Memory Game.** KRYSTAL A. KLEIN and MISHA PAVEL, *Oregon Health and Science University*—Mild cognitive impairment, a syndrome typically preceding Alzheimer’s dementia, is typically diagnosed with the aid of neuropsychological testing that is plagued by problems such as insufficiently frequent and prohibitively expensive testing, low retest reliability of some measures, and performance variability. Here we present a memory game that older adults played recreationally in their homes on personal computers over a one-year period. Although our initial subject pool did not experience cognitive decline, we were able to use a buffer-based cognitive model to decompose their scores into a parameter space and demonstrate high correlation between players’ buffer size and their average performance on a ubiquitous neuropsychological test, the Trail Making Test, which was administered four times over the course of the study. Future studies will use unobtrusive monitoring of gameplay, and using such cognitive models with subjects serving as their own controls, will be able to detect cognitive decline over months or years.

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(1063)

**The Mixed List Paradox: An ERP Investigation.** JOEL D. DICKINSON, *Laurentian University*, CAROLINE MORIN, *Cranfield University*, MARIE POIRIER, *City University*—Typically, in immediate serial recall, words that appear in the language at a higher frequency are better recalled than words that appear with a lower frequency. However, using lists with alternating low and high frequency words reduces or abolishes the impact that frequency has on recall. There are 2 types of explanations for the findings 1) encoding differences that occur in mixed versus pure frequency lists or 2) strategic differences guided by the participant. The current study evaluated the cerebral activity (more specifically, the event related potentials) differences associated high and low frequency words within pure versus mixed lists. Word frequency and List Type (pure or alternating) were manipulated. Event related potentials (ERPs) were computed during the encoding of each word. Comparisons of the N400 for word type between lists type were analyzed. Results are discussed in terms of the differing views of the mixed list effect.

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(1064)

**Is Measuring Short-Term Memory as Easy as Reducing Test-Expectancy?** MATTHEW J. HAYS, *University of Southern California*, ADRIEL BOALS, *University of North Texas*—Learners intuitively understand that they must rely on long-term memory processes in order to recall information after an intervening distractor (e.g., Watkins & Watkins, 1974). Several researchers (e.g., Muter, 1980) have supposed that reducing the expectation of a test after a distractor reduces long-term memory involvement, permitting a “pure” measure of forgetting from short-term memory. We report an experiment that contradicts this notion by revealing substantial proactive interference in a low-test-expectancy Brown-Peterson paradigm. Because proactive interference indicates that long-term memory is involved (e.g., Craik & Birtwistle, 1971), these results suggest that reducing test-expectancy alone is not sufficient to reduce long-term memory involvement.

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(1065)

**Autobiographical Memory Specificity, Negative Mood State and Executive Control.** BILLY J. RUTHERFORD, *Huntington VA Medical Center / Marshall University*, STEVEN P. MEWALDT, *Marshall University*—Reduced autobiographical memory specificity may commonly be observed in individuals with clinical depression; however, evidence is inconclusive as to whether this impairment represents a trait-like quality of depression or is the result of current mood state. The present study employed a mood induction procedure and a digit-recall task designed to interfere with working memory to test the role of current mood and executive functioning in the autobiographical memory of non-depressed college students. Non-depressed

subjects recalled significantly fewer specific memories on an autobiographical memory test following an induced, negative mood state and also when completing a concurrent digit-recall task. Results suggest that reduced autobiographical memory specificity is related to current mood state and involves central executive processes.

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(1066)

**Orthographic Distinctiveness and Memory for Order.** GINA A. GLANC, *Texas A & M University Corpus Christi*, ROBERT L. GREENE, *Case Western Reserve University*—Orthographic distinctiveness (as measured by neighborhood size) may have complex effects on memory. Previous research has found that words with small orthographic neighborhoods show an advantage in item recognition, while words with large neighborhoods show an advantage in associative recognition. The effects of neighborhood size on immediate memory for order may be similarly complex. Immediate reconstruction of six-word lists drawn from a large stimulus pool shows an advantage for small-neighborhood words. However, when memory for order is tested through immediate serial recall, the reverse is found, with large-neighborhood words showing an advantage.

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(1067)

**Influences of Syntax On Serial Recall: Bias vs facilitation.** TIM JONES, SIMON FARRELL and STEPHAN LEWANDOWSKY, *University of Western Australia*—Immediate serial recall of sentences and lists containing syntactic chunks is more accurate than for non-syntactic orderings of the same words. This could be explained by a boost in recall for groupings of words that conform to the syntax, or an overall biasing effect towards more sentence-like sequences. The current study investigated immediate serial recall for sequences of seven words that could be re-ordered into syntactic structures varying on a 7-point scale of syntactic validity. Increasing syntactic validity led to greater accuracy. Responses tended to have greater syntactic validity than would be expected if syntax had no impact on recall. The results distinguished between two computational models of the influence of syntactic validity on recall, based on Dennis (2009): a 'binding' mechanism in which items within syntactic chunks were bound together more strongly; and a 'biasing' mechanism whereby recall was based on a weighted combination of memory for the presented sequence and memory for commonly-encountered syntactic patterns.

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(1068)

**Permitting Metacognitive Control During a Complex Span Task Diminishes the Relationship Between Working Memory and Fluid Intelligence.** VANESSA M. LOAIZA, CASSIDY HURFORD, DAVID P. MCCABE and MATTHEW G. RHODES, *Colorado State University* (Sponsored by Carol Seger)—Metacognitive control may influence working memory performance and subsequent relationships with measures of higher order cognition, such as fluid intelligence. In the present study, participants completed an experimenter-paced operation span task (i.e., paced according to their responses to the arithmetic problems), which included five randomly presented trial lengths of 2 to 6 to-be-remembered words. Half of the participants were informed regarding the number of to-be-remembered words in a trial and half were not. Participants also completed Raven's Advanced Progressive Matrices, a common fluid intelligence test. Although the informed group slowed their responses to the arithmetic problem with increasing list length, response times did not vary for the uninformed group. Recall was superior for the informed compared to the uninformed group, but only the uninformed group's recall performance was related to fluid intelligence. The results suggest that opportunities for metacognitive control may moderate the relationship between working memory and fluid intelligence.

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#### ● METAMEMORY/METACOGNITION I ●

(1069)

**Metacognitive Control of Spacing and Testing During Learning: Are They Related?** MELISSA H. LAVAN, MATTHEW J. PAGANO and THOMAS C. TOPPINO, *Villanova University*—Metacognitive knowledge of learning processes is reflected in the choices people make while learning. Previous research examined separately how learners choose to space practice and what type of practice they prefer (restudy vs. a practice test). However, decisions about these practice dimensions seem unlikely to be independent of one another. We investigated the relationship between spacing practice, type of practice, and perceived item difficulty [reflected by judgments of learning (JOLs)] in the context of metacognitive control over learning common-word pairs. For each pair, participants made a JOL, followed by a decision regarding further practice. In Experiment 1, we investigated decisions about the type of practice (restudy vs. practice test) as a function of JOL, expected spacing, and whether feedback was expected following a practice test. In Experiment 2, we investigated decisions about spacing as a function of JOL and type of practice (restudy, test with feedback, or test without feedback).

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(1070)

**Judgments of Learning are Influenced by Multiple Cues in Addition to Memory for Past Test.** JARROD C. HINES and CHRISTOPHER HERTZOG, *Georgia Institute of Technology*, DAYNA R. TOURON, *University of North Carolina Greensboro*—Finn and Metcalfe (2007, 2008) showed that judgments of learning (JOLs) in multi-trial learning experiments are influenced by an individual's memory of prior test outcomes (i.e., a memory for past test, or MPT, heuristic). We used 2-Phase associative recognition tasks to identify additional possible cues used for second-trial JOLs in two experiments. Multilevel regression models with Phase 2 JOL as the dependent variable revealed the simultaneous independent influences of multiple predictors. Variables contributing to the regression equation included prior recognition accuracy (representing the MPT effect) and RT (objective factors), but also participant-reported recognition confidence judgments and perceived recognition RT (metacognitive factors). Phase 1 JOLs and Phase 2 study time allocation also predicted Phase 2 JOLs independent of MPT. Although MPT is a powerful influence on subsequent JOLs, other factors, including proximal experiences emerging at Trial 2 encoding, predict JOLs independent of prior test performance.

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(1071)

**Retrieval Insulates Memorial and Metamemorial Performance from Interference.** MEEYEON LEE and AYANNA K. THOMAS, *Tufts University*, JOHN B. BULEVICH, *Stockton College*—Research suggests that taking a test before learning new information will improve learning relative to a situation in which no intervening test occurs between the two learning episodes. However, enhanced learning of subsequent material through testing also has resulted in impaired retrieval of initial information (retrieval enhanced suggestibility, RES). The previous research demonstrated RES with conceptually integrated material. In the present study we examined RES in the context of conceptual unrelated material. In a task where initial (A – B) and subsequent (A – D) learning were unrelated paired associates, participants who received a test between initial and subsequent learning were more likely to learn A – D pairs, demonstrated better memory for A – B pairs, and showed improved metacognitive accuracy, as compared to those who did not receive an intervening test. These results demonstrated that receiving the intervening test reduced interference effects in contrast to the RES findings.

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(1072)

**Fluency and Organization in Categorical Knowledge of Deaf and Hearing College Students.** M. DIANE CLARK, CANDACE MYERS and JESSICA LINK, *Gallaudet University*—Marschark, Convertino, McIvor and Masteller (2004) studied the organization of the mental lexicon of deaf and hearing college students by examining their category and taxonomic knowledge and differences where found in how they organized their semantic knowledge bases. Deaf students tend to demonstrate limited vocabulary knowledge (Marschark 1993; Paul 1998) and in general have lower levels in their reading skills (Allen, 1986). The research question was; do deaf and hearing college students differ in the fluency for category instances (i.e., number listed) or do they differ in the frequency with which they report instances. This project asked both deaf and hearing college students to list as many exemplars as they could for four natural categories—animals, colors, fruits, and vegetables. The fluency (number of items) was not found to be different when compared across the two groups but the organizational structures of the categories were different.

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(1073)

**High-Order Cognition in Dreaming: Not an Oxymoron.** TRACEY L. KAHAN, *Santa Clara University*—Dreaming is often described as deficient in high-order cognition. However, recent research indicates that dreaming experiences are not uniformly deficient in executive functions when compared with comparably sampled waking experiences. The present study replicates and extends the latter work. Narrative reports of participants' (N = 182; 120 females) dreaming and waking experiences were obtained using an experience-sampling protocol. Participants also rated the metacognitive, cognitive, sensory, and affective characteristics of these experiences. Results replicated previous findings of metacognition in dreaming. Further, stepwise linear regression revealed that the strongest predictor of metacognitive skills in dreaming (self-regulation, self-monitoring) were reports of the same metacognitive skill in waking. Notably, the intensity of negative affect was a reliable predictor of self-regulation in dreaming, but not in waking. These findings reinforce claims of strong continuities in cognition across dreaming and waking and suggest that dreaming may play an important role in emotion-regulation.

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(1074)

**Metacognitive Beliefs about Aging and Emotion: the 'Worse-than-Average' Effect with Judgments of Learning.** S. K. UMA TAUBER and JOHN DUNLOSKY, *Kent State University*—Healthy aging and the emotionality of to-be-remembered material can influence performance on subsequent memory tests. In a series of experiments we tested participants' metacognitive beliefs about aging and emotion via judgments of learning (JOLs) made for oneself,

a peer, or an older adult. In particular, participants studied negative and neutral words, and then made standard JOLs predicting self memory performance, JOLs predicting memory performance for an average young adult (aged 18-21), or JOLs predicting memory performance for an average older adult (aged 65+). Memory was evaluated with free recall and was followed by retrospective global judgments. JOLs discriminated between age groups and emotionality of items, but retrospective global judgments were influenced more by emotional valence. A worse-than-average effect was also evident with JOLs and retrospective global estimates. Participants believed that memory may work differently for someone else and in general indicated that their memory is "worse than average".

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(1075)

**Metacognitive Judgments May Influence Source Memory, But Metacognitive Beliefs May Not.** GABRIEL I. COOK, *Claremont McKenna College*, PAUL S. MERRITT, KEITH B. LYLE, *University of Louisville*—Stimulus characteristics often influence both metacognitive judgments as well as source memory, however, the relationship between metamemory and source memory is not well understood. We examined whether metacognitive beliefs about stimulus differences at encoding and the type of metamemory judgment made on those stimuli translate into source-memory differences at test. Participants made frequency judgments on some words and read other words silently (or they studied words presented in either a small or large font size) and then made a metamemory judgment for item memory (JOL) or a judgment of source memory (JOSL). Although differences in metacognitive beliefs about the sources may not predict source memory reliably, the type of metacognitive judgment does influence overall source accuracy.

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(1076)

**Effect of Recollection on Episodic Feeling-of-Knowing Accuracy in Young and Older Adults.** MICHEL L. ISINGRINI and AUDREY PERROTIN, *University of Tours*, CELINE SOUCHAY, *University of Leeds*, LAURENCE TACONNAT and BADIAA BOUAZZAOUI, *University of Tours*—In feeling of knowing (FOK) studies, participants predict subsequent recognition memory performance on items initially encoded but that cannot be recalled. This study examined the hypothesis that FOK accuracy may be influenced by the recollection of contextual information related to the unrecalled target by asking participants to indicate whether the information on which they based their prediction of future recognition was related or not to the contextual episode of learning. Such procedure enabled to distinguish two type of episodic FOK accuracy, associated to the recollection of the context information (R-FOK) or not (NR-FOK). In addition, we tested whether the episodic FOK accuracy deficit demonstrated by older adults

could be reduced in R-FOK. Results confirmed that R-FOK accuracy was significantly higher than NR-FOK accuracy confirming that the recollection of contextual information enhanced episodic FOK. However, this was not the case for older adults indicating that, contrary to the younger adults, they do not benefit from this recollection effect. This suggests a lack in older adults in the quality of contextual details retrieved pertaining to the unrecalled target that are required to make accurate FOK judgments.

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(1077)

**Does Feedback Processing Interact with Feedback Timing?** DANIELLE M. SITZMAN and MATTHEW G. RHODES, *Colorado State University*—Previous research has demonstrated that, when given feedback, participants are more likely to correct confidently-held errors compared with errors held with lower levels of confidence, a finding termed the hypercorrection effect (Butterfield & Metcalfe, 2001). This appears to be due, in part, to increased feedback processing after high-confidence errors compared with low-confidence errors (Butterfield & Metcalfe, 2006; Fazio & Marsh, 2009). The current experiments examined how the timing of feedback may interact with the processing of feedback. Participants answered sets of general knowledge questions and were given either immediate feedback or delayed feedback. For both immediate and delayed feedback, participant's confidence in their response influenced how they processed feedback. Practical and theoretical implications of these data are discussed.

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(1078)

**Delaying Predictions of Memory Performance: A Comparison of JORKs and JOLs.** NICHOLAS C. SODERSTROM and DAVID P. MCCABE, *Colorado State University* (Sponsored by Matthew Rhodes)—Delaying judgments of learning (JOLs) substantially increases their predictive accuracy, a finding termed the delayed-JOL effect. This presumably occurs because, in contrast to immediate JOLs, delayed JOLs rely more on retrieval processes that are diagnostic of future memory performance. The current study investigated whether judgments of remembering and knowing (JORKs; McCabe & Soderstrom, in press) are also improved when made at a delay. Participants studied unrelated word-pairs, making item-by-item JORKs or JOLs either immediately after study or following a delay. If immediate JORKs are based more on retrieval processes than immediate JOLs then the benefits of delaying judgment should be markedly reduced with JORKs. Indeed, although delaying judgments improved predictive accuracy for both JOLs and JORKs, this effect was significantly attenuated when JORKs were elicited, suggesting that immediate JORKs rely on retrieval processes to a greater extent than immediate JOLs. Theoretical and practical implications are discussed.

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## ● HUMAN LEARNING AND INSTRUCTION I ●

(1079)

**Spatial Abilities and Learning Procedural Motor Tasks from Instructional Media.** T. B. GARLAND and CHRISTOPHER A. SANCHEZ, *Arizona State University*—Findings regarding the effectiveness of using dynamic visualizations (i.e., animations) to improve instruction are mixed. Are these learning disparities connected to individuals' inherent visuospatial aptitude, which suggests that different visualizations are more or less useful for different individuals? In this study, participants who varied in visuospatial ability were asked to learn 3 complex procedural tasks from either a dynamic video presentation, or instead static screenshots drawn from the video. The perspective of these visualizations was also manipulated to either increase or decrease visuospatial processing load. Results indicated that while dynamic video was superior to static visualizations, this was primarily for low visuospatial individuals only. Further, higher visuospatial abilities increased the number of steps learned, and decreased the time to reach solution in higher visuospatial load conditions. This suggests that dynamic media does indeed interact with visuospatial abilities, and that the utility of this media is dependent on learner characteristics.

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(1080)

**Evidence for a Spatial Processing Deficit in Math Anxiety.** ERIN A. MALONEY, STEPHANIE WAECHTER and SHERIF SOLIMAN, *University of Waterloo*, EVAN F. RISKO, *Arizona State University*, JONATHAN A. FUGELSANG, *University of Waterloo*—'Math anxiety' is a condition in which individuals experience negative affect when performing tasks involving numerical and mathematical skills. Math anxiety shows a strong negative relation to math enjoyment and achievement. To date, it has been argued that math anxiety is "math specific", meaning that its effects are only associated with math and numerical tasks (e.g., complex addition and counting objects). Here we show that math anxiety is associated with spatial processing ability, in particular, mental rotation ability. These data provide the first evidence of an association between math anxiety and performance on a non-numerical or mathematical task. These data also provide insight into a potential antecedent to math anxiety. Specifically, researchers have argued that poor spatial processing ability acts as an obstacle to achievement in mathematics. Thus, children with poor spatial processing ability may encounter negative experiences with math and may develop math anxiety as a result.

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(1081)

**Manipulations That Enhance Integration Do Not Reduce Retrieval-Induced Forgetting.** LINDSEY CLEMENT, DANIELLE ATKINS, EMILY MANN, KRISTA BOND, JODI PRICE and JEFFREY S. NEUSCHATZ *University of Alabama in Huntsville*—Retrieval-induced forgetting (RIF) describes a memory phenomenon wherein practicing recalling some of the items (e.g., Orange) from a category (e.g., FRUIT) hinders the recall of other semantically related, but unpracticed items (e.g., Banana). We investigated whether manipulations designed to facilitate integration, or the formation of meaningful relationships between all words and their category cue, would serve to reduce RIF. Participants were either explicitly told to integrate items, rank order how well items represented category cues, assign items to category cues, or assign and then rank order items. Participants completed these condition-specific tasks before completing the RIF paradigm in which the same category cue-exemplar word pairs were used. We found that these manipulations increased overall recall of the items, but they also served to increase RIF effects.

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(1082)

**Transfer of Interleaving Benefits in the Inductive Learning of Categories.** MONICA S. BIRNBAUM, ROBERT A. BJORK and ELIZABETH LIGON BJORK, *UCLA*—DeWinstanley and Bjork (2004) found that the benefits of certain encoding strategies (generating vs. reading) can transfer to the processing of future materials. Additionally, Shea and Morgan (1979) demonstrated that benefits of interleaving practice (vs. blocking) for learning motor skills can transfer to learning new motor skills. We investigated whether benefits of interleaving for inductive learning (as demonstrated by Kornell & Bjork, 2008, for artistic styles) might similarly transfer to inductive learning of new materials. Participants studied a set of butterfly species in either a blocked or interleaved manner and then categorized novel images of butterflies as belonging to one of those species; they then studied a different set of butterfly species (blocked or interleaved) and were similarly tested. Our question was whether the benefits of interleaving for learning the first set would transfer to the learning of the second set, regardless of the practice schedule given to the second set. Results indicate that interleaving not only benefited inductive learning of the first set but also affected inductive learning of the subsequent set.

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(1083)

**The Persistence of Memory: Directed Forgetting Does Not Hinder Category Induction.** COLIN T. CLARK, ELIZABETH L. BJORK, and ROBERT A. BJORK, *University of California, Los Angeles* (Sponsored by Nate Kornell)—In an induction task one must classify an unfamiliar stimulus into established categories. But to what

extent is induction performance based on direct comparisons to other exemplars? Directed forgetting (DF) studies find differential effects on memory in direct tests, such as free recall, on which to-be-forgotten items tend to be more poorly recalled than are corresponding to-be-remembered items, but no such differences are apparent on more indirect tests, such as word-fragment-completion. The DF paradigm, therefore, provides a good test of the directness of memory access in a given task. In the current study, participants studied paintings by different artists paired with the artists' names in two lists, and they were instructed to either remember or forget the first list. We found typical DF results in the recall of artists' names, but not in subsequent induction performance, suggesting that the induction task does not rely on direct comparisons.

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(1084)

**Delaying Feedback is Beneficial, But Only if You Want to Know the Answer.** KELLIE M. OLSON and SHANA K. CARPENTER, *Iowa State University*—When students are tested, research has found that delaying feedback by a few seconds is more beneficial than providing it immediately (e.g., Carpenter & Vul, 2011). However, little is known about the theoretical nature of this effect. The current study investigated one potential reason for the delay-of-feedback benefit. Participants learned the answers to a list of obscure trivia questions by receiving feedback either immediately after each item, or after a four-second delay. Immediately after answering each question, but before receiving feedback, participants were asked to indicate how curious they were to know the answer. On a final test given five minutes later, recall of the answers was best for items learned from delayed feedback, but this only occurred for items that received a high-curiosity rating. These results suggest that a brief delay before feedback may be beneficial because it serves to maintain or increase participants' curiosity to know the answer.

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(1085)

**Inferring Facts From Fiction: Reading Correct and Incorrect Information Affects Memory for Related Information.** ANDREW C. BUTLER, *Duke University*, NANCY A. DENNIS, *Pennsylvania State University*, ELIZABETH J. MARSH, *Duke University*—Fictional stories represent a source from which people can acquire both true and false knowledge about the world. The present study explored whether the benefits and costs of learning from fictional stories extend beyond memory for directly stated pieces of information. Of interest was whether readers would use correct and incorrect information to make deductive inferences about related information in the story, and then later remember those inferences. Subjects read fictional stories that contained pairs of facts about the world. The framing of one of the two facts was manipulated so that it contained correct information, incorrect information, or a

general reference to the information. Later, subjects answered general knowledge questions that tested deductive inferences that could be made by combining the pairs of facts. The results showed that subjects generated and retained the deductive inferences regardless of whether the critical sentence contained correct or incorrect information and irrespective of whether the sentences were placed consecutively in the text or separated by many sentences.

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(1086)

**Interference Dynamics and Spacing Effects, or the Lack Thereof: Support for an Accessibility Principle.**

COURTNEY M. CLARK and ROBERT A. BJORK, *University of California, Los Angeles*—Recommendations to space rather than mass practice of to-be-learned information are offered widely, usually without qualification, and certain explanations of the spacing effect predict that spacing is always desirable for long-term retention. We show, however, consistent with Bjork, Kornell, and Cheung's (2009) findings, that when spacing and accessibility are disentangled via a spontaneous-recovery paradigm, it is accessibility, not spacing per se, that provides the better basis for predicting outcomes. More specifically, reduced accessibility—which is usually, but not always, associated with spacing—enhances relearning. We demonstrate that, owing to interference dynamics, even different materials within one learning session can profit differentially from spaced versus massed practice. Our results provide a potentially more sophisticated basis for deciding when to-be-learned material should be revisited in order to obtain maximum benefits of a second study episode. Email: Robert A. Bjork, [rbjork@psych.ucla.edu](mailto:rbjork@psych.ucla.edu)

(1087)

**The Positive Effects of Testing in Lifelong Learning.**

ASHLEY ND MEYER, *Baylor College of Medicine*, JESSICA M. LOGAN, *Rice University*—Formal learning can be a lifelong pursuit, so methods for improving learning should be considered in relation to both younger and older learners in order to better assess the methods' usefulness in education. A technique found to be effective for improving learning and memory in younger students is testing. Testing improves performance more than additional exposure to material (restudying) does. Older learners, however, may show decreased benefits from testing because of poorer episodic memory and decreased benefits accrued from retrieval practice. This study examined the benefits of testing for learning in 60 younger university students aged 18-25, 60 younger community adults aged 18-25, and 60 older community adults aged 55-65 over two retention intervals (5 minutes or 2 days). Positive testing effects were similar for all groups, but were larger after two days. These findings show that testing can be a beneficial learning tool for both younger and older learners.

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(1088)

**Retrieval Practice Over the Long-Term: Should Spacing Be Expanding Or Equal Interval?**

SEAN H.K. KANG, *University of California, San Diego*, ROBERT LINDSEY and MICHAEL C. MOZER, *University of Colorado, Boulder*, HAL PASHLER, *University of California, San Diego*—If there are multiple opportunities to review to-be-learned material, is it better for retrieval practice to be attempted soon after initial study, followed by progressively expanding intervals between successive retrieval attempts, or should the retrieval attempts be spaced apart at equal intervals? Although Landauer and Bjork (1978) argued for the superiority of expanding retrieval, more recent research has not generally confirmed this. Prior research, however, has focused exclusively on optimizing performance on a single final test and has usually examined training spread over just a single session. We argue that a more practically relevant issue is average performance arising over a considerable period of training. We will present results from a multi-session web-based experiment on learning of foreign vocabulary.

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● SELECTIVE ATTENTION I ●

(1089)

**Effects of Emotional Arousal on Difficult Visual Search.**

TAE-HO LEE and MARA MATHER, *University of Southern California*—Previous research (Navalpakkam & Itti, 2007) proposed an optimal-gain model to describe how attentional gain should be deployed when performing a difficult discrimination task. According to the model, gains should be applied to neurons tuned exaggeratedly away from the target to optimize the salience of the target relative to the distractors (i.e. signal-to-noise ratio). We conducted a series of experiments to investigate how arousal influences representation of a target's visual features, in a difficult visual search task with distractors similar to the target. As hypothesized, it was found that neuronal tuning was not exaggerated as a function of arousal. However, the overall ability to discriminate the target was impaired. These results suggest that arousal prevented the optimal gain in perceptual processing of the target by unbiasing the tuning curve. Simultaneously, arousal induced loss of processing specificity for the target by widening the variance in the tuning curve.

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(1090)

**Motion and Geometry in Gaze Discrimination.**

NICOLA C. ANDERSON, *University of British Columbia*, EVAN F. RISKIO, *Arizona State University*, WALTER F. BISCHOF, *University of Alberta*, ALAN F. KINGSTONE, *University of British Columbia*—It is typically thought that the discrimination of gaze direction relies on the use of the ratio of iris to sclera in the visible part of the eye. However, when



people move their eyes, their change in eye direction also carries a motion signal. Here, we directly compared the relative contribution of motion vs. geometrical cues in the perception of another's gaze. Participants were shown two images: a person looking straight ahead and then looking to the left or right 3 different distances from centre. This resulted in the apparent motion of the eyes to the left or right. To eliminate the motion signal, participants received the final eye position only. Geometrical cues were manipulated with contrast polarity. Participants judged the direction of the perceived eye movement. Results suggest that both motion cues and geometrical cues systematically influence the perception of gaze.

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(1091)

**How Do Task Instructions Alter the Spatial Reference Frame of Scene-Based Processing?** MARK MILLS, *University of Nebraska - Lincoln*, STEFAN VAN DER STIGCHEL, *Utrecht University*, ANDREW HOLLINGWORTH, *University of Iowa*, MICHAEL D. DODD, *University of Nebraska - Lincoln* (Sponsored by John Flowers)—Previous work indicates that task instruction influences scanpaths and inhibition of return (IOR) when viewing static scenes. During visual search, individuals are both slower and less likely to refixate previously viewed locations relative to novel locations. When task instructions emphasize memorization, pleasantness rating, or free-viewing, however, the opposite pattern is observed, with individuals faster to return to previously viewed locations, suggesting that the influence of memory on eye movements is task dependent. It has not been determined, however, how task set and memory influence scanpaths and IOR in tasks more akin to real world scene viewing. We provide evidence that various dynamic scene manipulations—when the scene expands (Experiment 1), changes locations (Experiment 2), or is disrupted (Experiment 3)—interact with task set in a manner that alters the influence of memory and the likelihood of observing IOR, with implications for understanding the spatial reference frame of scene-based IOR.

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(1092)

**Neural Correlates of Conscious and Non-conscious Visual Processing.** MICHAEL A. PITTS, *Reed College*, ANTIGONA MARTINEZ and STEVEN A. HILLYARD, *UCSD*—An inattention paradigm along with EEG was employed to isolate neural correlates of conscious perception from non-conscious and post-perceptual processes. In the first phase of the experiment, subjects performed a distracter task while task-irrelevant line segments formed shape patterns or random configurations. During this phase, half of the subjects failed to notice the shapes when queried and were considered inattentionally blind. In the second phase, the task was the same, but now

all subjects reported seeing the shapes. Occipital ERPs (180ms) differed for shape-present versus shape-absent stimuli regardless of whether subjects noticed the shapes. At subsequent latencies (300ms), however, ERPs differed only when subjects were aware of the shapes. In a third phase, the task was altered such that the shapes were made task-relevant. Here, the same two ERP components were followed by additional more wide-spread activity. Single-trial analyses of the EEG revealed gamma oscillations for shape-present stimuli, but only in phase 3, when the shapes were task-relevant. Follow-up experiments confirmed that only the mid-latency (300ms) occipital-parietal ERP component was consistently linked with conscious perception.

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(1093)

**Behavioral Distraction by Oddball Vibro-Tactile and Auditory Deviants: Functional Similarities.** FABRICE B. R. PARMENTIER, *University of the Balearic Islands, Spain*, JESSICA K. LJUNGBERG, *Umea University, Sweden*—Unexpected changes in a stream of auditory distracters capture attention in an ineluctable manner and delay responses in an ongoing visual categorization task (behavioral novelty distraction). Here we extended the study of this phenomenon by reporting the first within-participant comparison of such distraction in the tactile and auditory modalities using vibrotactile-visual and auditory-visual cross-modal oddball tasks. The results showed a number of functional similarities between the tactile and auditory modalities: a negative impact of distracter novelty on performance in the ongoing visual task (novelty distraction), distraction on the subsequent trial (post-novelty distraction), and a similar decrease of these effects across blocks. The findings suggest that behavioral distraction by oddball stimuli might obey general principles transcending sensory boundaries.

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(1094)

**Distraction by Auditory Deviants: Not Knowing When Is More Distracting Than Not Knowing If.** JESSICA K. LJUNGBERG, *Umea University, Sweden*, FABRICE B. R. PARMENTIER, *University of the Balearic Islands, Spain*—Studies have shown that distraction occurs when an auditory stimulus (deviant) differ from an otherwise repeated baseline sound (standard). Traditional views consider such distraction as the consequence of the deviant sounds' low probability of occurrence relative to that of the standard. Parmentier, Elsley and Ljungberg (2010) questioned this view, showing that behavioral distraction is not obligatory and only occurs when sounds (standards and deviants) act as useful warning cues by providing information as to whether and when a target stimulus is to be presented. This study disentangled the roles of a target's probability of occurrence (PO) and the target's time of occurrence (TO). Comparing



performance in a cross-modal oddball task where standard and deviant sounds provided information about PO, TO, both or none, we found distraction by deviants only when sounds conveyed PO. We conclude that deviants yield distraction to the extent that standards and deviants carry relevant goal-directed information.

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(1095)

**Involuntary Spatial Attention Influences Auditory Processing: Evidence from Human Electrophysiology.**

JENNIFER A. SCHNEIDER, *Simon Fraser University*, DANIEL J. WEEKS, *University of Lethbridge*, STEVEN A. HILLYARD, *University of California San Diego*, JOHN J. MCDONALD, *Simon Fraser University*—The appearance of a salient but spatially nonpredictive auditory cue can attract attention momentarily, facilitating responses to nearby targets when the cue-target interval is short (100-300 ms) and delaying responses (i.e., producing IOR) to nearby targets when the interval is longer. The similarities between this pattern of results and those observed in peripheral visual-cueing studies have prompted consideration of a shared (supramodal) attention-control system, but still little is known about the neurophysiological operations associated with peripheral auditory cue effects. Here, we used event-related potentials (ERPs) to investigate the consequences of involuntary spatial attention on the neural processing of auditory targets in a spatial go-no-go task. At short cue-target intervals, ERPs to validly and invalidly cued targets began to diverge within 200 ms of target onset over anterior as well as posterior scalp regions. The scalp topography of this effect was similar to one reported previously when peripheral auditory cues preceded visual rather than auditory targets. These findings indicate that involuntary orienting of attention to sound can modulate processing of subsequent auditory and visual targets in similar ways.

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(1096)

**The Functional Role of Gaze When Viewing Dynamic Faces.**

MELISSA L.—H. VO, *Harvard Medical School, Brigham & Women's Hospital*, TIM J. SMITH, *Birkbeck, University of London*, JOHN M. HENDERSON, *University of South Carolina*—What is the purpose of gaze allocation during dynamic face perception? We monitored participants' eye movements while they watched videos, with or without sound, featuring close-ups of pedestrians engaged in interviews. Contrary to previous findings using static displays, we observed no general preference to fixate eyes. Instead, gaze tended to target the center of faces. When a depicted face was speaking, participants increased gaze toward the mouth. When the sound was eliminated, gaze toward the eyes increased, while fixations to the mouth decreased. These results argue against pure low-level visual attraction and for a more functional use of gaze, e.g., aiding comprehension of verbal information exchanged during

social interactions. Interestingly, viewers followed speakers' gaze regardless of sound conditions, suggesting that observed gaze shifts are strong social cues with or without dialogue. These findings provide evidence that the moment-to-moment adjustments of gaze function to optimize comprehension when viewing dynamic faces.

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(1097)

**Visual Search in a Three-dimensional "Real World" Stimulus Display.**

THOMAS G. GHIRARDELLI, TAYLOR MARCUS, ANNIE COSGROVE-DAVIES, KATHERINE LAWSON and KELLEN MATTHEWS, *Goucher College*—In a typical visual search task, participants view a two-dimensional display of items on a computer screen and are asked to report if a target is presented among nontarget items (distractors). The purpose of this study was to determine if specific predictions made from these typical visual search tasks apply to tasks that require manual interaction with stimuli in a three-dimensional stimulus display. Participants were asked to search for and retrieve a predefined target item among a set of real items (e.g., Lego-brand building blocks) randomly distributed on a tabletop. We measured response time to retrieve the target item as a function of set size (i.e., the number of items presented) under standard search conditions (e.g., feature and conjunction search). We found near-zero slopes for color feature search and slopes of 34 ms/item for conjunctions of size and color, consistent with accounts of visual search based on typical 2D visual search tasks.

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(1098)

**Actions Modulate Attentional Capture by Motion Onset.**

DAVOOD G. GOZLI and JAY PRATT, *University of Toronto*—The onset of new motion is a robust cause of attentional capture. The present study, motivated by the common-coding account of action and perception, examined whether attentional capture by motion onset can be modulated by the observer's mode of action. Specifically, the common-coding account predicts that planning an action will render features of that action less available for unrelated visual processes. Consistent with this hypothesis, Experiment 1 showed that the magnitude of attentional capture caused by a single motion onset was reduced when this motion was compatible to the observer's response (i.e., along the same vertical or horizontal axis). Similarly, Experiment 2 showed attentional capture for a response-different motion onset but not for a simultaneous response-similar motion onset. Since both types of motion were present in every trial, this indicates that response-similarity affected visual-attentional processes and not motor processes. Overall, these results show that the attentional prioritization caused by motion onset can be modulated by the observer's concurrent action.

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(1099)

**Sensory and Motor Mechanisms of Oculomotor Inhibition of Return.** ZHIGUO WANG, *Chinese Academy of Sciences*, JASON SATEL and RAYMOND M. KLEIN, *Dalhousie University*—We propose and simulate, with a dynamic neural field model, two mechanisms underlying inhibition of return (IOR) in the oculomotor system: sensory and motor. Reflecting sensory adaptation (or habituation) repeated visual stimulation results in a reduction of visual input to the superior colliculus (SC); consequently, saccades to targets which appear at previously stimulated locations will have longer latencies than those which appear at unstimulated locations. In contrast, the execution of a saccade results in asymmetric activation in the SC; consequently, saccades which reverse vectors will have longer latencies than those which repeat vectors. In the IOR literature, these two mechanisms correspond to IOR effects observed following covert exogenous orienting and overt orienting in the absence of peripheral stimulation, respectively. We predict that these two independent mechanisms will have additive effects; a prediction that is confirmed in a behavioral experiment.

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(1100)

**Cueing the SNARC Effect.** PETER DIXON, *University of Alberta*—When people make parity judgements, a compatibility effect is commonly observed in which responses to small digits are faster with the left hand and responses to large digits are faster with the right hand – the so-called SNARC effect. When a cue indicating the stimulus-response mapping is provided on each trial, this effect is found when the cue is presented briefly but not when the cue remains on the screen. The difference between these two conditions is that with a brief presentation, the stimulus-response mapping must be encoded and retrieved from memory; with a long-duration cue, the response can be found in the stimulus display. Thus, the SNARC effect may be due to occasional interference in retrieving the appropriate response for a given stimulus from memory.

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(1101)

**It's Still MAD: Why Don't Luminance Onsets Capture Attention?** MELINA A. KUNAR and DERRICK G. WATSON, *The University of Warwick* (Sponsored by Zachary Estes)—Previous work suggests that visual search for items exhibiting a luminance onset is efficient. Recently, however, we found that in a more complex Multi-element Asynchronous Dynamic (MAD) search, involving static, luminance onset ('blinking') and moving stimuli, there was no search benefit for targets that showed gradual luminance onsets. In this current series of experiments, we found that there remained no search benefit even when targets showed abrupt rather than gradual luminance onsets. Furthermore, giving participants time and top-down knowledge to process these transients did not make search for blinking items more

efficient. In contrast, search for the target was efficient when it was the only blinking item in the display. However, similar to other work using MAD stimuli, search for a moving target was less efficient than search for a static one. The results support theories which propose visual priority for unique events.

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(1102)

**I Forgot What I Was Looking For: Interference Affects Targets, But Not Distractors.** KARLA B. ANTONELLI and CARRICK C. WILLIAMS, *Mississippi State University*—Retroactive interference has been found for conceptually-related visual memories, but interference was attenuated for conceptually distinct objects (Konkle, Brady, Alvarez, & Oliva, 2010). This finding was taken as evidence that conceptual information was necessary for high-fidelity visual memories. In the current study, we tested for retroactive interference following incidental encoding from a conjunction visual search. In two experiments, we found significant visual memory for both targets and distractors from a visual search. More importantly, we found significant interference for search target objects, but not for distractor objects. Thus, differences in the level of processing during encoding emphasizing conceptual information (e.g., finding a named target object) can lead to additional enhancement of visual memory that is susceptible to interference. Visual memories may be constructed of a non-categorical dependent component and an additional conceptual component that enhances memory that is dependent on a decision being made about the object.

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## ● COGNITIVE CONTROL I ●

(1103)

**Backwards Inhibition in Task Switching With Repetition of Multiple Components of A Task.** ALEXANDRA HALL-RUIZ and DALE DAGENBACH, *Wake Forest University*—Backward inhibition is theorized to suppress residual activation of abandoned task sets during task switching. This inhibition is manifested in slower responding to lag 2 repetitions of the abandoned task set. Most studies of this repeat one aspect of a task set. The present experiments addressed what happens when multiple components of task set can vary. Experiments 1 and 2 sought to replicate the established inhibition effect for perceptual dimensions and action rules separately. Consistent with expectations, inhibition operated on the abstract level of the task set. Experiments 3 and 4 combined the two tasks into one task set where one or both aspects could repeat, but varied whether the two aspects were learned simultaneously or sequentially during practice. Significant inhibition was found for singular and simultaneous repetitions of the two components contingent on the task set formation. Implications regarding the nature of task sets and inhibition are discussed.

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(1104)

**Predicting Individual Differences in Multitasking Ability Using General Cognitive Ability Measures.** WINSTON JONES, HAO BAI, JARROD MOSS and STEPHANIE DOANE, *Mississippi State University*—The purpose of this study was to identify general cognitive abilities that are related to individual differences in multitasking ability. Participants performed a battery of cognitive ability tasks that reliably measure fluid intelligence, perceptual speed, feature integration, and visual tracking. Multitasking ability was measured using a task shown to be predictive of real-world multitasking performance, the Abstract Decision Making (ADM) task (Joslyn & Hunt, 1998). The ADM is a multitasking task that involves sorting objects with task interruptions and time pressure. ADM performance provided several ability measures, including: strategy consistency, interruption recovery tendencies, and a speed/accuracy score, the latter of which was used as the primary multitasking ability metric. Each multitasking metric was compared to the general cognitive ability measures. The results indicate that all of the cognitive abilities measured except for visual tracking were predictive of the primary multitasking ability metric.

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(1105)

**Cognitive Interventions and Variability in Older Adults: Relationships with Training Success and Neural Network Metrics.** ANDREA L. WORSHAM, JANINE M. JENNINGS and DALE DAGENBACH, *Wake Forest University*—Previous research has found a relationship between increased cognitive variability in older adults and dementia of the Alzheimer's type (Duchek et al., 2009; Holtzer et al., 2008). However, little is known about the effect of cognitive or physical activity interventions on variability, or the association between variability and other cognitive/neural variables. The current study, which was part of the Seniors Health and Activity Research Program-Pilot, explored the following: 1) the independent and combined effects of repetition-lag memory training and aerobic exercise training on cognitive variability, 2) whether training success predicts the amount of cognitive variability seen post-training and 3) the relationship between cognitive variability and neural network metrics data obtained from MRI post-training. The results suggest that cognitive variability may be improved by physical activity with an additive benefit from cognitive training. Moreover, slower progress through training and less efficient neural networks appear to be associated with higher intra-individual variability.

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(1106)

**Explicit Monitoring of Implicit Details Disrupts Skilled Typewriting.** KRISTY M. TAPP and GORDON D. LOGAN, *Vanderbilt University*—Although the cognitive system constantly monitors expert performance, monitoring the details of skilled behaviors is often disruptive. We asked whether this paradoxical disruption results from monitoring to make implicit details explicit or from monitoring implicit details to adjust behavior. In one experiment, skilled typists were asked to report the sequence of hands they used to type a target word. This increased inter-keystroke intervals (IKSIs) by 69%. In another experiment, skilled typists were instructed to type only the letters of target words that are typed with one hand while inhibiting letters typed with the other hand. This increased IKSIs by 71%. The findings support a nested, two-loop theory of skilled typewriting. The theory suggests that an outer, explicit processing loop is unaware of hand-to-letter assignments, which are controlled by an inner, implicit processing loop, so disruption occurs when the outer loop must gain access to the details of inner-loop processing.

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(1107)

**Forgetting in the Face of Rehearsal: Are Actively Rehearsed Items Susceptible to Retrieval-Induced Forgetting?** JOHN F. NESTOJKO, *UCLA*, CHRISTOPHER J. SCHILLING and BENJAMIN C. STORM, *University of Illinois at Chicago*—Retrieval-induced forgetting is the finding that items that are not the target of a retrieval attempt but that interfere with retrieval become less recallable later than they would have been otherwise (Anderson, Bjork, & Bjork, 1994). The present research examined whether non-target items actively rehearsed during retrieval are susceptible to retrieval-induced forgetting. Using a modified version of the retrieval-practice paradigm, half of the participants were instructed to rehearse non-target items during retrieval practice, whereas the other half were not. Results across two experiments suggest that actively rehearsed non-target items are susceptible to retrieval-induced forgetting, but that the size of the effect is diminished owing to the facilitative effects of rehearsal. Implications for theoretical accounts of retrieval-induced forgetting are discussed.

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(1108)

**The Impact of Retrieval Difficulty on Retrieval-Induced Forgetting.** JOHN F. NESTOJKO, ELIZABETH L. BJORK and ROBERT A. BJORK, *University of California, Los Angeles*—When retrieval cues are linked to multiple responses, response competition impedes retrieval. Ample evidence indicates that response competition is resolved via a reduction in access to non-target responses of the retrieval cue, commonly labeled retrieval-induced forgetting (Anderson, Bjork, & Bjork, 1994). The present research was

designed to examine the retrieval-difficulty hypothesis of retrieval-induced forgetting—that retrieval-induced forgetting increases with increased retrieval difficulty—which we tested in three experiments using variations of cue support (e.g., FRUIT: \_\_NGE; WEAPONS: SW\_\_; DRINKS: WHISK\_\_) during the retrieval-practice phase. Results across these experiments indicate that retrieval difficulty plays an ancillary role in retrieval-induced forgetting.

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(1109)

**Decay of Response Rule Representation during Task Switching.** JONATHAN G. HAKUN and SUSAN M. RAVIZZA, *Michigan State University*—A reliable effect in serial task performance is the slowing of response times for repeated tasks as a function of an increase in the time between trials. Typically, this loss of facilitation has been characterized as a loss of repetition priming as the response-cue-interval (RCI) increases. This view was recently challenged (Horoufchin, et al, 2010) in a study demonstrating that this effect could be accounted for by an alternative cue-based retrieval mechanism (“episodic retrieval”). The goal of the current study was to determine if the episodic retrieval effect is generalizable to other task contexts, particularly a paradigm that isolated response rule switching. The current results indicated that the episodic retrieval effect is not generalizable to response rule switching; rather, the loss of repeat facilitation appeared to be related to a loss of response rule priming. Critical differences in task structure were explored through a series of experiments.

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(1110)

**The Effect of Working Memory Capacity on Conflict Monitoring.** REBECCA B. WELDON and MYEONG-HO SOHN, *George Washington University*—There is an ongoing debate as to whether sequential effects in the Simon task can be attributed to feature integration (stimulus-response bindings) or conflict adaptation (adjustment of control in the presence of conflict). We present evidence suggesting that working memory capacity (WMC) contributes to effective conflict adaptation. Subjects completed a Simon task with blocks of varying proportions of congruent trials. In Experiment 1, 50% of trials were congruent. Experiment 2 consisted of one block of 80% congruent trials and one block of 20% congruent trials. When complete repetitions and complete alterations were removed, conflict adaptation effects were observed only in high WMC subjects. Following incongruent trials, the Simon effect significantly reduces (50%, 80% blocks) or disappears (20% block) in high WMC subjects. However, the Simon effect increases following incongruent trials in low WMC subjects. WMC may be a strong determinant of whether conflict adaptation will be observed in interference tasks.

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## ● SPEECH PERCEPTION ●

(1111)

### **Predicting Comprehension of Accelerated Speech.**

CHRISTINA V. WASYLYSHYN, *Naval Research Laboratory*—This experiment seeks to examine the relationship of listening comprehension in accelerated speech conditions with other measures of cognition in order to determine predictors of listening performance. Comprehension of short auditory narratives was examined at seven accelerated speech rates (ranging in 15% increments from 50% to 140% faster-than-normal). Participants were asked to evaluate statements about ideas represented or not represented in the narratives. Participants also completed measures of working memory, long-term memory, executive control functioning, and processing speed. Results indicated that comprehension performance for true statements at slower speeds (mean of speech rates 50% and 65%) was predicted by long-term memory scores, and comprehension for true statements at faster speeds (mean of speech rates 80-140%) was predicted by working memory scores. No measures predicted performance for false statements at slower or faster speech rates. The results will be discussed in terms of accelerated speech research and theories of memory.

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(1112)

### **Perceptual Learning of Non-Adjacent Coarticulation in Speech.**

SARAH T. OLSEN and CYNTHIA M. CONNINE, *Binghamton University*—In production of a Vowel1-Consonant-Vowel2 sequence, the acoustic properties of V1 anticipate V2. Experiment 1 replicated earlier findings showing that listeners are sensitive to this anticipatory coarticulation; cross-spliced V1CV2 sequences in which V1 correctly (match) or incorrectly (mismatch) anticipated V2, showed faster vowel identification of V2 for match sequences (mismatch effect). Listeners were exposed to mismatching (Experiment 2) or matching (Experiment 3) sequences in a learning phase, followed by the vowel identification task. Exposure to mismatching stimuli neutralized the mismatch effect and exposure to match stimuli perceptually enhanced weaker acoustic articulatory cues. The experiments demonstrate that adult listeners can acquire new patterns of non-adjacent anticipatory coarticulation, and adjust to naturally occurring less salient patterns.

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(1113)

**Speech with a Smile: Influences of Affect On Audiovisual Speech Perception.** MICHAEL S. GORDON and JOHANNA ANCHETA, *William Paterson University*—Recent research has demonstrated that happily-expressed audiovisual speech improved detection relative to speech expressed with neutral and sad emotions. However, it is unclear whether this advantage is due to improved articulation clarity by the talker, affective influences on approach motivation by the perceiver, or related interacting processes. To address these issues, audiovisual utterances produced with natural happy and sad expressions were visually distorted to exaggerate the affect of the mouth. In addition, faces were manipulated by pairing them with affectively expressive eyes that conflicted with the expression of the mouths (e.g., sad-eyes with happy-mouths vs. happy-eyes with happy-mouths). Results from this research suggest the powerful influence of affect on speech detection. Positive expressions, even with moderate visual distortion, tended to improve speech detection relative to negative expressions. Implications from this research are discussed with respect to the interactive processes of face, affect, and speech perception.  
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(1114)

**Information for Speech Perception: What the Irrelevant Speech Effect Tells Us.** NAVIN VISWANATHAN, JOSH DORSI and STEPHANIE GEORGE, *State University of New York at New Paltz*—The Irrelevant Speech Effect (ISE) is the finding that serial recall is more impaired by the presence of background speech compared to background noise (Colle & Welsh, 1976). In our study, we sought to determine what information in the speech signal is essential to producing ISE. Our study consisted of two standard (natural speech, white noise) and two additional background conditions: a three formant sinewave speech background (see also Tremblay et al., 2000), and a selectively reversed sinewave background which was created by selectively reversing the first two formants of the sinewave background. This permitted us to examine the effect of altering the information carried by the signal while maintaining complexity. Our results indicated that natural speech produced more disruption compared to white noise replicating the ISE. More interestingly, sinewave speech produced significantly greater disruption of serial recall than selectively reversed sinewave speech. This finding suggests that dynamic information carried by the formants is critical for ISE. We discuss implications of this finding for accounts of ISE and speech perception.  
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(1115)

**Sublexical Representation of Indexical Information in Spoken Word Recognition.** CYNTHIA R. HUNTER and PAUL A. LUCE, *University at Buffalo, The State University of New York*—Many models of speech recognition posit

abstract lexical and sublexical units, yet much research has demonstrated that specific episodic information about spoken words (e.g., regarding talker identity and speaking rate) is encoded in memory. Long-term indexical priming studies examining the role of episodic information in spoken language perception have used lexical stimuli but have not explicitly examined the effects of variation in rate or talker on processing of segmental levels of representation. Thus, whether indexical information is stored with sublexical representations is unclear. We examined talker and speech rate priming for CVC words, in which the CVC or -VC rhymes were repeated. Repetition of rhymes (-VCs) facilitated processing only when indexical information overlapped between prime and target. Lexical (CVC) priming was equivalent regardless of overlapping indexical information. These results suggest a sublexical locus for form-based indexical priming.

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(1116)

**Phoneme Perception and the Structure of Lexical Neighborhoods.** MARY M. FLAHERTY and JAMES R. SAWUSCH, *University at Buffalo*—The organization of the mental lexicon influences phoneme and word perception. For example, the neighborhood of a target (the set of similar sounding words) alters both word recognition and phoneme perception. Another factor is the relationship among the neighbors. The clustering coefficient represents the proportion of neighbors that are also neighbors of one another. Chan & Vitevich (2009) demonstrated that the cluster coefficient can influence word recognition. The current study used nonword CVC syllables to investigate whether the cluster coefficient can also influence phoneme identification. Pairs of nonword series were created in which the voiced end of one series had a higher clustering coefficient, whereas the reverse was true for the other series. Listeners identified ambiguous items as belonging to the end of the series with the higher clustering coefficient. These results suggest that the organization of lexical neighborhoods is important for processing speech sounds.  
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(1117)

**Flipping the Word Upside Down: Top-Down Effects During Word Learning.** KEITH S. APFELBAUM and BOB MCMURRAY, *University of Iowa* (Sponsored by Eliot Hazeltine)—Word learning is presupposed to involve decomposing new words into their constituent phonemes, then storing word-forms based on these abstract forms. However, categorization in other domains shows that representations vary based on the task and training stimuli. We ask whether adult word learning shows similar top-down effects despite the protracted period of exposure to language's phonetic categories. Adult participants (n=40) learned 12 novel words; half learned words with little phonological overlap, while the others learned six



overlapping words and six non-overlapping words. After learning, participants' lexical representations were gauged by measuring sensitivity to mispronunciations of these items, with greater sensitivity indicating more precise representations. Participants learning overlapping words showed greater sensitivity to mispronunciations, indicating improved lexical representations. Additionally, we investigated whether word learning affects perceptual phonological categories. Participants who learned overlapping words showed steeper categorization functions of vowel continua, indicating improved phonological categorization. Thus adult word learning incorporates top-down mechanisms.

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(1118)

**Neighbors of Neighbors in Spoken Word Recognition: The Enemy of My Enemy is My Friend.** MICAH GEER and PAUL A. LUCE, *State University of New York at Buffalo*—Substantial evidence suggests that performance in spoken word recognition declines as the number of words highly similar to a target (neighborhood density) increases. Less attention has been given to the processing consequences of broader lexical neighborhoods of spoken words. We varied the mean neighborhood density of the neighbors of target words, while controlling indices of the immediate neighborhoods of the targets (density and clustering coefficient (Chan & Vitevitch, 2009)). "Distant" neighbors of neighbors are more similar phonologically to the immediate neighbors of a target than to the target itself -- that is, their relationship to the target is relatively weak and mediated by the immediate neighbors of the target. Performance in lexical decision and naming tasks favored targets with a greater number of these distant, mediated neighbors -- a reverse density effect. The results are discussed in terms of the topology of lexical representations. Email: Micah Geer, [micahgeer@gmail.com](mailto:micahgeer@gmail.com)

## ● PSYCHOLINGUISTICS I ●

(1119)

**Made You Look: Linguistic Information Can Cause (Forbidden) Eye Movements to Irrelevant Objects.** EILING YEE, *Basque Center on Cognition, Brain and Language*, GARY LUPYAN, *University of Wisconsin*, SHARON L. THOMPSON-SCHILL, *University of Pennsylvania*—Hearing task-irrelevant words (i.e., the name of a displayed object) can delay responses in a visual detection task (Salverda & Altmann, 2011). But can linguistic information engender an eye movement to an object when both object and heard word are task-irrelevant, and when making a saccade would be counter-productive? Participants saw displays containing a fixation dot and a single object and were asked to fixate the dot and judge a size change. 500ms before the size change, participants heard a word that either matched or mismatched the displayed object. Despite being instructed to fixate and to

ignore the words and objects, participants made occasional saccades to the objects. Fixation was broken most often when the word matched an object on the right side of fixation. Hence, task-irrelevant linguistic information influenced visual attention enough to produce overt eye movements, suggesting that the influence of language on vision is difficult to inhibit.

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(1120)

**A Probabilistic Perspective on Incremental Learning of Center-Embedded (CE) Structures.** JUN LAI and FENNA H. POLETIEK, *Leiden University, The Netherlands*—Hierarchical center-embedded structures, such as AnBn, cause difficulties for language learners due to their complexity (Bach, Brown & Marslen-Wilson, 1986; Chomsky, 1957; Corballis, 2007). Recent artificial grammar learning (AGL) studies demonstrated a starting small (SS) effect. In particular, sufficient exposure to zero-level-of-embedding exemplars and a staged-input were the critical conditions in learning AnBn structures (Lai & Poletiek, 2011). The present 2 AGL experiments aim to replicate the SS effect and test another possible facilitating effect of the input, i.e. the frequency distribution of the input stimuli. Participants were exposed to a set of non-words consisting of CV syllables generated by a hierarchical recursive grammar, and were required to give grammaticality judgments over novel items. We propose that learning is facilitated most when SS works under other conditional cues, such as a skewed frequency distribution with simple stimuli being more numerous than complex ones (Poletiek & Chater, 2006)

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(1121)

**The Role of Time in Spoken Word Recognition: Evidence Against Temporal Order in Lexical Representations.** JOSEPH C. TOSCANO, *University of Iowa*, NATHANIEL D. ANDERSON, *University of Illinois*, BOB MCMURRAY, *University of Iowa* (Sponsored by Gary Dell)—A challenging problem in spoken word recognition is time: speech unfolds over time, and temporal order appears crucial for distinguishing words (cat vs. tack). Current models assume that phoneme order is explicitly represented but have struggled to satisfactorily implement this. However, work in visual word recognition (the transposed letter effect) suggests that order is coarsely encoded, if at all. We examined whether this is true in spoken word recognition by measuring activation for phonological anadromes, words with the same phonemes in the opposite order. Participants performed a visual world task with displays containing a target (cat), anadrome (tack), cohort (cash), and unrelated item (mill). We found more fixations to anadromes than both unrelated words

( $p < 0.0001$ ) and words with an overlapping vowel (tap;  $p = 0.011$ ). This challenges existing models, suggesting that temporal order may not be explicitly encoded. We discuss how fine-grained acoustic detail may allow accurate recognition without such temporal codes.

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#### (1122)

**The Multi-regional US Homograph Database.** KRISTIN M. WEINGARTNER, BRIANNA M. EITER and VINCENT R. BROWN, *Hofstra University*, DAVID S. GORFEIN, *University of Texas, Dallas*—The Multi-regional US Homograph norms include word association information for 600 homographs collected from 12 different schools across the United States. The continuous word association technique (Bilodeau & Howell, 1965) was used, whereby each participant provided four associates for every homograph. We describe an on-line database that includes the following information from the norms: (1) meaning dominance measures, (2) comparisons of meaning dominance measures across regions, and (3) measures of stability for each associate – or the likelihood that across the four responses, a given participant's associate would shift from one meaning (bank: monetary institution) to another (bank: the side of a river). To examine shifts in meaning dominance over time, we also report comparisons between the dominance measures from the current norms and those from older norms.

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#### (1123)

**Dissociating Effects of Parafoveal Lexical Processing from Effects of the Sentence Context.** BERNHARD ANGELE, *University of California San Diego*, TIMOTHY J. SLATTERY, *University of South Alabama*, TARA L. CHALOUKIAN, ELIZABETH R. SCHOTTER and KEITH RAYNER, *University of California San Diego*—Recent research (Kennedy, 1998) claims the existence of parafoveal-on-foveal effects, that is, effects of the properties of the next-to-be fixated word on fixation times on the current word. We performed an experiment to investigate whether these effects actually have a parafoveal source. In order to do this, we used a variation of the moving mask paradigm (Rayner & Bertera, 1979) to mask a) the first word to the right of fixation, b) only the second word to the right of fixation, c) both the first and the second words or d) none of the words (no mask). We found significant parafoveal-on-foveal effects even when the upcoming word was masked. As a consequence these effects must be caused by factors unrelated to parafoveal processing. We discuss potential causes of these effects, such as syntactic and semantic properties of the upcoming word, transitional probabilities and word predictability.

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#### (1124)

**Syllable and Tone Processing During Lexical Retrieval in Chinese-English Bilinguals.** CHUCHU LI, CANDISE Y. LIN and NAN JIANG, *University of Maryland, College Park*—18 proficient Mandarin-English bilinguals were asked to name the ink color of Chinese characters in two blocks. The response language was Mandarin in one block and English in the other. There were six conditions: congruent color characters (the character is its ink color), congruent S+T+ (the character and its ink color share same syllable and tone), congruent S+T- (the character and its ink color share same syllable but different tone), congruent S-T+, neutral and incongruent color characters. In the within language block, the participants showed significant facilitation in all of the congruent conditions and significant interference in the incongruent condition compared to the neutral condition. This suggested that syllable segments and tones were processed separately and both play important roles during lexical access in L1 Chinese. In the between-language block, participants only showed significant facilitation in the congruent color character condition and significant inhibition in the incongruent condition compared to the neutral condition. This suggested that the presence of Stroop effects on S+T+, S+T- and S-T+ conditions in the within-language block may occur at the articulation stage.

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#### (1125)

**Prime Relevance Is a Critical Factor for Lexical Contribution To Letter Level Processing.** MICHELE SCALTRITTI and FRANCESCA PERESSOTTI, *DPSS, University of Padova* (Sponsored by Roberto Dell'Acqua)—When nonwords are intermixed with words in reading aloud, stimulus quality (SQ) and frequency exert additive effects. This pattern suggests that interactive activation between the letter level and the orthographic lexicon is strategically prevented to avoid lexical capture (O'Malley & Besner, 2008). However, when a semantic priming paradigm is applied in lexical decision, frequency interacts with SQ for unrelated trials (Borowsky & Besner 1993). The aim of the present research is to assess the role of prime relevance in this effect. In Experiment 1, frequency, SQ and prime relatedness (repeated vs. unrelated) were manipulated in a reading task with words and nonwords. Interactive effects of frequency and SQ were observed. In Experiment 2 only unrelated primes were used, and additive effects of frequency and SQ were found. These results suggest that the presence of related primes plays a critical role in the regulation of activation dynamics in target processing.

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(1126)

**Effects of Length and Orthography on Initial Landing Positions During Reading.** PATRICK PLUMMER and KEITH RAYNER, *UCSD* (Sponsored by Rebecca Johnson)—A study of eye-movements during reading examined the affect of parafoveal word length and orthographic regularity on targeting saccades into upcoming words. Long (8-9 letters) and short (4-5 letters) target words, which were matched on lexical frequency and initial letter trigram identity, were paired and embedded into identical sentence frames. The gaze-contingent boundary paradigm (Rayner, 1975) was used to manipulate parafoveal information available to the reader before direct fixation of the target word. The parafoveal preview was either identical to the target word or a visually similar nonword. The nonword previews contained initial letters exhibiting orthographic regularity or orthographic irregularity. Results showed that orthographic preprocessing of the word to the right of fixation affected eye-movement targeting processes without systematic changes across different word lengths. Furthermore, these data suggest that lexical status of an upcoming saccade target in the parafovea does not significantly influence eye-movement targeting.  
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(1127)

**The Mental Representation of Plurals.** NIKOLE D. PATSON, *Ohio State-Marion*, GERRET E. GEORGE and TESSA WARREN, *University of Pittsburgh*—We investigated comprehenders' mental representations of plural noun phrases. Participants read a sentence that ended with either a singular or a plural noun phrase (e.g., "The farmer picked the apple/apples") and then saw a picture of an item or items (e.g. apple(s)) that matched or mismatched the number of the noun phrase. Participants judged whether the pictured item(s) were mentioned in the sentence. Judgment times showed an interaction between noun phrase type and match such that for plural noun phrases, participants were numerically, but not reliably, faster to respond "yes" to a number mismatching picture. However, when the noun phrase was singular, participants were reliably faster to respond "yes" to a singular picture compared to a plural picture. These results suggest that comprehenders might process mental images for plurals differently than for singulars. In the case of plural noun phrases, comprehenders may be computing and mentally representing logical entailment relationships.  
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## ● CONCEPTS AND CATEGORIES I ●

(1128)

**A Rational Framework for Inferring Feature Representations from Context.** JOSEPH L. AUSTERWEIL and THOMAS L. GRIFFITHS, *University of California, Berkeley*—Objects can be represented differently depending on the context in which they appear,

implying that their features are inferred from their context. We focus on a special case of this problem: How do people infer the feature representation of an object when its context is the other objects presented with it? We present a rational analysis of the problem of inferring a feature representation, construing the problem as one of accurately encoding a set of objects using as few features as possible (a simplicity bias). This account predicts that people will represent the same object using different features depending on how its parts are distributed in the context. We confirm this prediction through experiments using 2-D and 3-D objects. Additionally, we extend the model to the case where the observable properties of objects are transformed between presentations (e.g., when my eyes saccade, my retinal image translates). We compare how transforming the observed properties of an object in its context affects the features inferred by people and by our model.

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(1129)

**Representing Implicit Categories: Are Labels Symbols or Stimuli?** ETIENNE DUMESNIL and DENIS COUSINEAU, *University of Montreal* (Sponsored by Serge Larochelle)—Categorization theories were mainly developed through classification-learning paradigms. However, researchers recently began exploring other means of category acquisition more systematically. Chin-Parker and Ross (2004) observed that in the context of explicit categories, classification-learners integrate more diagnostic dimensions than inference-learners, while inference-learners integrate more typical dimensions than classification-learners. The study presented here was designed to verify if these results could be extended to a context of implicit categories. Results show that for implicit categories: (1) classification-learners associate more diagnostic dimensions to category labels than inference-learners; (2) classification-learners integrate as much typical information as inference-learners. These results support the hypothesis that implicit categories are not created by picking up information that is invariant with regards to category labels but by associating category labels to groupings of invariant perceptual information. Moreover, taken together with those of Chin-Parker and Ross (2004), these results support the existence of both an explicit and an implicit system.

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(1130)

**Enhancing Men's Processing of Women's Sexual-Interest Cues.** TERESA A. TREAT, *University of Iowa*, RICHARD J. VIKEN, *University of Indiana*, COREEN A. FARRIS, *University of Pittsburgh*, JODI R. SMITH, *University of Iowa*—Men at risk of exhibiting sexual aggression display impoverished processing of women's nonverbal affective cues. The present study evaluates whether feedback on sexual-interest (SI) judgments enhances men's reliance on SI when making such judgments and when predicting a woman's response to a sexual advance. 97 undergraduate

males viewed 232 images of women who varied in SI, provocativeness-of-dress (POD), and attractiveness (ATT). Participants rated SI, and half viewed trial-by-trial expert ratings. Next, all participants judged whether 110 women would respond favorably to a sexual advance and completed a measure of rape-supportive attitudes. Provision of feedback increased SI utilization and decreased POD utilization when making SI ratings and increased SI utilization when judging sexual advance responsiveness. Endorsement of rape-supportive attitudes was associated with decreased SI reliance and increased POD reliance when judging women's responsiveness; risk status did not moderate the magnitude of training effects. Future research will evaluate the impact of enhanced training strategies and instructional manipulations on the magnitude and transfer of effects.

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(1131)

**A Metacognitive Illusion in Category Learning.** JONATHAN G. TULLIS, AARON S. BENJAMIN and BRIAN H. ROSS, *University of Illinois at Urbana-Champaign*—In order for learners to effectively control their self-guided study, metacognitive judgments must be accurate. Yet learners' judgments about future performance often rely on cues related to the current ease of acquisition. Here we investigate people's ability to assess learning of real-world categories (birds). We held constant the total number of tokens studied while varying the number of different types studied across categories. Classification performance during learning was poorer for categories with more unique types, but later classification of new members was better for those categories. Learners' judgments about their ability to classify new members of categories reflected performance during acquisition, and thus inversely predicted classification of new category members. These results demonstrate that metacognitive illusions based on ease of acquisition occur even during high-level learning tasks, like classification. Because self-assessments guide control of ongoing learning, such metacognitive failures can adversely affect self-directed learning of categories.

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(1132)

**Comparing Comparisons in Category Learning.** ERIN J. HIGGINS and BRIAN H. ROSS, *University of Illinois*—When learning about new categories, learners frequently engage in comparisons across the various exemplars they have encountered. The goal of this project is to understand the learning effects of different types of comparisons, specifically within-category and between-category comparisons. Within-category comparisons may highlight the common features and relational structure of each category, whereas the between-category comparisons may highlight the differences between the categories. We present a series of experiments, which use a wide variety of real-world and artificial categories, and we find that the effect of

comparison type depends on the type of category to be learned. Although further studies will address possible explanations, our initial speculation is that between-category comparisons are more effective when the category structure is closely tied to the surface features of the category exemplars and within-category comparisons are more effective when the category structure requires abstraction away from the surface features of the exemplars.

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(1133)

**Intent To Learn Is a Necessity: A Challenge for Implicit Category Learning.** GYSLAIN GIGUERE and BRADLEY C. LOVE, *The University of Texas at Austin*—The Serial Reaction Time (SRT) task has been extensively used to study implicit sequence learning. We applied it to categorization, seeking to determine whether predictive contingencies between background images (i.e., category members) and category labels could be learned either intentionally or incidentally. When instructed to learn the contingencies between images and labels, participants showed slower RTs for the SRT trials where the image and label mismatched rather than matched; the difference in RTs between trial types was significantly correlated with the high generalization performance obtained in an explicit categorization transfer task. Participants who were told that the images shown during the SRT task were random did not show a mismatch effect. Also, their learning and generalization were marginal and strikingly reduced when compared to the intentional learning group, except in cases where participants reported being aware of the relationship. These results underline the crucial character of intent in learning categories.

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(1134)

**The Impact of Manipulating the Meaning of Category Labels on Supervised Classification and Inference Learning.** GUY L. LACROIX and GLEN HOWELL, *Carleton University*—Some category-learning researchers assumed that category labels are psychologically equivalent to features (Anderson, 1991). However, studies have since shown that manipulating instructions such that a verbal label reflects a stimulus feature as opposed to category membership affects participants' inductive inference decisions (Yamauchi & Markman, 2000; Yamauchi, Kohn, & Yu, 2007; Yamauchi & Yu, 2008). In these studies, participants were provided reference stimuli to use to make classification and inference decisions. The present work, in contrast, examines how the instructional manipulation impacts supervised classification and inference learning, in which memory must be used to make decisions. Preliminary results suggest that the manipulation affects only the time course of inference learning. However, at transfer, inference and classification learners show performance decrements when the label denotes a feature instead of category



membership. These results imply that category labels must play a qualitatively different role than features in models of classification and inference learning.

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(1135)

**Comparing Comparisons for Category Learning.** ERIN J. HIGGINS and BRIAN H. ROSS, *University of Illinois*—When learning about new categories, learners frequently engage in comparisons across the various exemplars they have encountered. The goal of this project is to understand the learning effects of different types of comparisons, specifically within-category and between-category comparisons. Within-category comparisons may highlight the common features and relational structure of each category, whereas the between-category comparisons may highlight the differences between the categories. We present a series of experiments, which use a wide variety of real-world and artificial categories, and we find that the effect of comparison type depends on the type of category to be learned. Although further studies will address possible explanations, our initial speculation is that between-category comparisons are more effective when the category structure is closely tied to the surface features of the category exemplars and within-category comparisons are more effective when the category structure requires abstraction away from the surface features of the exemplars.

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(1136)

**Comparison Between Successively Presented Stimuli During Blocked and Interleaved Presentations in Category Learning.** PAULO F. CARVALHO and ROBERT L. GOLDSTONE, *Indiana University*—The order in which stimuli are presented during category learning has been shown to influence category acquisition. For example, interleaving exemplars of two categories can result in better performance than presenting several exemplars clustered by category (blocking). One possible reason for this effect is the different opportunities the two schedules offer for comparisons and the nature of those comparisons (Goldstone, 1996). The work presented here compared the effect of interleaved over blocked learning of two categories. We presented participants with a matrix of face morphs (Steyvers, 1999) divided into two arbitrary categories with either an interleaved (75% alternation) or blocked schedule (25% alternation). Critically, in the blocked condition, successive stimuli from the same category were either similar or dissimilar. Interleaved practice resulted in better learning during category acquisition, but only when compared to blocking of dissimilar stimuli. We propose that when successive items from the same category were similar, this helped participants to be able to hone in on the category relevant features, elevating performance to that of interleaved presentations.

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(1137)

**Hierarchical Category Structures Facilitate Acquisition of Probabilistic Relational Categories.** WOOKYOUNG JUNG and JOHN E. HUMMEL, *University of Illinois*—Kittur et al. (2004, 2006) and Jung & Hummel (2009, 2011) showed that people have great difficulty learning categories defined by the relations among exemplars' parts when those categories have a probabilistic (aka family resemblance) structure, in which no single relation is shared by all members of a category. Yet acquisition of such categories is not strictly impossible: In all these studies, roughly half the subjects eventually reached criterion. What are these subjects doing that the other half are not? We hypothesized that successful subjects were those who divided the nominal categories into two or more sub-categories, each of which individually has a deterministic structure. We report an experiment testing and supporting this hypothesis: Explicitly presenting subjects with hierarchical (category and sub-category) structures facilitated the acquisition of otherwise probabilistic relational categories.

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## ● LETTER AND WORD PROCESSING I ●

(1138)

**Imageability and Body-Object Interaction Effects in Multisyllabic Word Recognition.** STEPHEN D. R. BENNETT, *University of Northern British Columbia*, A. NICOLE BURNETT, *University of Calgary*, PAUL D. SIAKALUK, *University of Northern British Columbia*, PENNY M. PEXMAN, *University of Calgary*—Previous research has shown that imageability and body-object interaction (BOI) exerted independent facilitatory effects in visual word recognition using monosyllabic words (Tillotson, Siakaluk, & Pexman, 2008). We extended this avenue of research by examining the effects of imageability and BOI in picture naming, word naming, lexical decision, and semantic categorization using multisyllabic words. Results from hierarchical multiple regression analyses showed that imageability and BOI separately accounted for unique latency variability in each task, even with several other predictor variables (e.g., print frequency, number of syllables, age of acquisition) entered first in the analyses. The effects of these two variables were facilitatory, such that words rated higher in imageability and words rated higher in BOI were responded to more quickly. Thus, our findings demonstrate that facilitatory imageability and BOI effects extend to multisyllabic words. We interpret our findings within perceptual symbol systems theory (Barsalou, 1999) and a semantic feedback account of lexical processing.

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(1139)

**Highly Clustered Phonological Neighborhoods Inhibit Visual Word Recognition.** MARK YATES, *University of South Alabama*—Studies have shown that phonological neighbors facilitate visual word recognition. However, all previous studies have been concerned with the overlap between the target word and its neighbors. The research reported here evaluated how the overlap among neighbors influences processing of the target word. To measure neighbor overlap, the clustering coefficient was used. The clustering coefficient is defined as the ratio of links between a word's neighbors and the possible number of links that could exist between a word's neighbors. The results show that words with neighbors that are highly clustered (i.e., are closely related in terms of sound) are processed more slowly than are words having neighbors that are less clustered. This result is surprising given the facilitative nature of phonological neighbors reported in previous studies. The results are explained in terms of current models of visual word recognition.

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(1140)

**Parafoveal Information Can Facilitate Word Identification in Reading.** BERNHARD ANGELE, RANDY TRAN and KEITH RAYNER, *University of California San Diego*—To what extent parafoveal information influences ongoing foveal processing has been the subject of considerable debate. In particular, the presence of a parafoveal word which is similar to the foveal word has been shown to facilitate processing of the foveal word (Inhoff, Radach, Starr, and Greenberg, 2000). We used the gaze-contingent boundary paradigm (Rayner, 1975) to manipulate the parafoveal information that subjects received while fixating a target word (e.g. "news") within a sentence. Specifically, a reader's parafovea could contain a repetition of the target ("news"), a correct preview of the post-target ("once"), an unrelated word ("warm"), random letters ("cxmr"), a nonword neighbor of the target ("niws"), a semantically related word ("tale"), or a nonword neighbor of that word ("tule"). Target fixation times were significantly lower in the parafoveal repetition condition than in all other conditions, suggesting that foveal processing can be facilitated by parafoveal repetition.

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(1141)

**The Effect of Positional Constituent Family Size on Compound Word Processing.** UN SO PARK-DIENER, *University of Kansas*, GREG B. SIMPSON, *Illinois State University*—Gagne and Spalding (2009) found that recognition of a compound word is facilitated when preceded by another compound with a similar relation between the constituents. Positional constituent family size and frequency also had effects on priming magnitude. The present study directly investigated the effect of positional constituent family size on compound words processing. Four

types of compound words defined by the family sizes of their two constituents (high-high; high-low; low-high; low-low) were used in a masked priming lexical decision task and in a sentence reading task with eye-tracking. We predicted that constituents with higher positional family size would be primed more strongly, and have shorter reading time, than constituents with lower family size. Initial data from the masked priming experiment shows priming across all conditions.

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(1142)

**The Effect of Phonological Similarity On Novel Word Learning Depends On Type of Similarity.** LIBO ZHAO and PRAHLAD GUPTA, *University of Iowa*—Learners commonly need to concurrently learn labels for similar sounding words. This study addressed how phonological similarity might influence such concurrent word learning and whether different types of phonological similarity might have different effects. Participants learned novel word labels for drawings of referents in four word form similarity conditions: alliterative similarity, rhyme similarity, canonical similarity, and dissimilar control. Word targets in the alliterative condition shared the two initial phonemes, those in the rhyme condition shared the last two phonemes, and every pair of targets in the canonical condition shared two phonemes in varying positions. The naming test revealed lower performance in the alliterative and canonical similarity conditions compared to the control condition, but no reliable decrement in the rhyme condition. These results suggest that the effect of phonological similarity in word learning is dependent on the type of similarity. Theoretical implications of this finding and future directions will be discussed.

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(1143)

**How Does Reading Experience Shape Letter Processing? Behavioral and Electrophysiological Evidence.** MARIA DIMITROPOULOU, MANUEL CARREIRAS and JON ANDONI DUÑABEITIA, *Basque Center on Cognition, Brain and Language, BCBL*—The present study used behavioral and electrophysiological measures to examine whether letter recognition is modified by exposure to print during the initial phases of reading acquisition. In two experiments, preschoolers, with knowledge of the letters, and first-graders, performed same/different judgments on letter-pairs. Behavioral results showed that both preschoolers and first-graders tended to judge as identical letter-pairs differing by one similar-looking same-case letter (za-ze) as well as pairs only differing by an upper and a lowercase version of the same letter (za-zA). However, the cost for the latter pairs was significantly greater for first-graders than for preschoolers, suggesting that letter identities become automatically activated as a function of increased exposure. ERPs closely mimicked the pattern of behavioral

effects, showing larger waveform differences for first-graders than for preschoolers with the latter pairs. These findings support a cognitive shift in letter processing induced by reading experience at the earliest stages of reading acquisition.

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(1144)

**In One's Right (or Left) Mind: What Lexicality Reveals About Hemispheric Processing Asymmetries.** MICHAEL J. TAT and TAMIKO AZUMA, *Arizona State University*—The cerebral sub-systems theory states that the right hemisphere (RH) specializes in visual word form processing, while the left hemisphere (LH) processes word forms in an abstract manner (Marsolek, 2004). The current experiment investigated the processing of word form information within and between these sub-systems. Using a repetition priming paradigm, words were initially seen in the left or right visual field, and participants judged words as correctly spelled or not. In a second block, words were repeated in the same visual field, or the opposite field. Participants saw three word forms: words with a deleted letter (e.g., brdge), words with a substituted letter (e.g., brldge), and words with letters transposed (e.g., brigde). Priming assessed through response times indicated the RH processes unfamiliar forms more efficiently. Further, current results suggest that the RH can transfer form information to the LH, while the LH does not transfer form information to the RH.

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(1145)

**Basic Processes in Reading: Towards a Better Understanding of the Role of Spatial Attention.** DEREK RAUWERDA, *University of Waterloo*, SERJE ROBIDOUX, *CCD, Macquarie University*, DEREK BESNER, *University of Waterloo*, COLTHEART MAX, *CCD, Macquarie University*—Examinations of the role of spatial attention in reading have often relied on variants of the Stroop task (e.g., Lachter, Ruthruff, Lien, & McCann, 2008). Conclusions that reading requires spatial attention rely on the assumption that spatial attention is equally important to both reading and colour identification. The results from our experiment demonstrate that this is not the case. Colour naming relies less on spatial attention than does reading aloud. Thus, evidence from Stroop tasks that word reading does not rely on spatial attention may reflect the low attentional demands of the primary colour naming task and not the attentional demands of reading per se.

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(1146)

**What Drives Group Differences in Brain Activity between Children with and without Reading Difficulty?**

AMY S. DESROCHES, EDUARDO EUROPA, CHRIS MCNORGAN, JENNIFER E. MINAS and JAMES R. BOOTH, *Northwestern University*—We used functional magnetic resonance imaging [fMRI] to evaluate the neural basis of reading difficulty. Brain activity was recorded from 19 children with reading difficulty [RD] and 33 typical readers [TD] during visual word and pseudoword rhyming. Greater activation was observed for TD versus RD children in the left fusiform gyrus [FG], insula, inferior parietal lobule [IPL] for words, and in the left inferior frontal gyrus [IFG] for pseudowords. Interestingly, regardless of lexicality, activity in the FG, IFG and insula was correlated with reading ability; however, group effects differed by region. For both groups, higher reading scores were related to greater recruitment of the FG (i.e., greater visual-orthographic processing). Alternatively, for RD children only, poorer reading skill was associated with reduced activation in the left insula and IFG (i.e., reduced articulatory-phonological processing and phonological recoding). The results have implications for interpreting group differences in brain activity in learning disability.

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(1147)

**Do Part-Whole Relations Produce Facilitation in The Picture-Word Interference Task?**

PATRICIA J. BROOKS, *College of Staten Island and the Graduate Center, CUNY*, KEVIN SAILOR, *Lehman College, CUNY*—Three picture-word interference experiments varied both the degree of association and the presence of a part-whole relation between the distractor and the target picture to be named. Across the three experiments, part-terms associated with their targets (e.g., helium paired with a picture of a balloon) produced facilitation at an early SOA (-300 ms), which replicated the time course of associative facilitation observed previously (e.g., Sailor et al., 2009). In contrast, unassociated part-terms (e.g., rubber paired with a balloon) never produced facilitation, undermining the claims of Costa et al. (2005) that semantically-related distractors produce facilitation if they are not candidate picture names. Rather, across experiments, unassociated part-terms tended to produce a semantic interference effect (SIE). The size of the interference effect from part-terms tended to be weaker than the standard SIE with coordinates reported in many other studies, and its time course varied across experiments. We interpret our findings as consistent with lexical competition accounts of the SIE but difficult to explain in terms of the plausibility of the distractor as a response to the target picture.

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(1148)

**IDK If You Really H8IT Unless You Spell It Out.** MARY L. STILL, *Missouri Western State University*, ALISON L. MORRIS, *Iowa State University*, KIMBERLY JONES, *Missouri Western State University*—With the recent increase in text messaging, many people have incorporated new abbreviations into their vocabularies. It is important to know if those abbreviations are interpreted in the same way as the words they represent. While evidence suggests that abbreviations convey meaning, it is unclear whether or not they adequately convey emotional information. It is possible that, because they are learned later in life, abbreviations are processed like words from a second language – which have been shown to elicit attenuated emotional responses. In two experiments using an emotional Stroop task, interference was readily obtained for emotional words and phrases (e.g., I hate it), but no effect was found for emotional abbreviations (e.g., IH8IT). This was true even for frequent texters. These results suggest that emotional text-messaging abbreviations do not readily elicit emotional responses, and may be functionally similar to words learned later in life from a second language.

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(1150-1154)

**Grant Funding Agencies.** Information about various grant funding agencies is available. Representatives will be available throughout the conference.

## POSTER SESSION II

Friday Noon

Convention Center Ballroom 6 ABC

Viewing 10:00 a.m.-1:30 p.m., Author Present 12:00-1:30 p.m.

## ● PERCEPTION II ●

(2001)

**Numerical Magnitude and the Kappa Effect.** DOUG ALARDS-TOMALIN, JASON P. LEOBOE and LAUNA C. LEOBOE-MCGOWAN, *University of Manitoba*—In the following study, the imputed-velocity hypothesis was tested for duration judgments for inter-stimulus intervals (ISIs) separating numbers of varying magnitude. Previous research has shown that when two discrete stimulus events are presented sequentially, varying in distance (e.g., visual space, auditory frequency); the ISI duration will be inferred as a function of the perceived distance. The current study tested whether this finding applies to an abstract, continuous stimulus dimension, that of numerical magnitude. Centrally presented three digit sequences were displayed employing an AXB paradigm. The first and last digits were always 1 and 9, while the middle occurring stimulus could take on 6 possible values (2, 3, 4, 6, 7, and 8); the durations of the two ISIs delineating the stimuli were manipulated. This procedure was then replicated where the numbers were presented in an auditory format. The results demonstrated that ISI duration judgments are influenced by numerical distance.

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(2002)

**Detection of Haptic Contours: Background and Contour Density.** KRISTA E. OVERVLIET, JOHAN WAGEMANS and RALF T. KRAMPE, *University of Leuven, Belgium*—We investigated the influence of element density on haptic contour detection. Participants explored haptic random dot displays in which a contour was present in 50% of the trials. The contour was defined by a higher density of elements (dots), as compared to the background. The task for the participants was to judge whether the contour was present or not. Density of the contour elements as well as the average density of background elements was varied. We chose the different densities with reference to the spatial resolving capacities of the four different classes of mechanoreceptors in the human finger pad. Results showed similar detection times for stimulus displays with equivalent density ratios between contour and background. In contrast, detection times increased systematically with increasing ratios of contour / background densities. We explain our results based on the spatial resolving capacities of the mechanoreceptors with small receptive fields (SAI and FAI afferents).

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(2003)

**Implicit Feedback and Recalibration of Perception.** DREW H. ABNEY and JEFFREY B. WAGMAN, *Illinois State University*—Calibration is the process of scaling perception to environmental properties. Studies have shown that perception of a given property becomes recalibrated when feedback provides explicit information about that property. For example, perception of length of wielded objects becomes recalibrated when feedback about this property is provided during training. However, recent studies have also shown that perception of a given property becomes recalibrated when feedback provides only implicit information about that property. For example, perception of the entire length of a wielded object becomes recalibrated when feedback about partial length is provided during training. Two experiments further investigated this phenomenon. Experiment 1 found that perceiving one property of a wielded object recalibrated perception of different property of that object. However, Experiment 2 found that perceiving a property of a wielded object from one grasp position did not serve to recalibrate perception of that same property from a different grasp position.

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(2004)

**Temporal Summation is Independent of Frequency in the Pacinian (P) Tactile Channel.** MUSTAFA Z. YILDIZ, MURAT ÖZSALTIK and BURAK GÜÇLÜ, *Bogazici University*—Classical temporal summation model states that for stimuli with longer durations, more neural impulses are integrated, which results in lower psychophysical detection thresholds. Similar improvement would also be expected if the frequency of a vibrotactile stimulus is increased at constant duration. In psychophysical experiments on 6 subjects, sinusoidal mechanical vibrations were applied on the fingertip (contactor radius: 2 mm) at different frequencies (150, 250, 350, 500 Hz) and durations (10, 1000 ms) specifically targeting the Pacinian (P) tactile channel. The thresholds followed the typical U-shaped sensitivity curve of the P channel, and were significantly elevated for the 10-ms stimuli as compared to the 1000-ms stimuli. This duration-based difference (~ 6.6 dB) was almost constant as a function of frequency, but significantly lower than the model-predicted difference of 13.1 dB. Furthermore, the model predicted continuously decreasing thresholds as a function of frequency and did not produce the U-curve. The results support the classical model for the duration-based threshold differences as being independent of frequency, but the model may be incompatible with the general frequency dependence of the thresholds.

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(2005)

**Auditory Driving in Cinematic Art.** MARILYN G. BOLTZ, *Haverford College*—Although the visual modality often dominates the auditory one, one exception occurs in the presence of tempo discrepancies between the two perceptual systems: variations in auditory rate typically have a greater influence on perceived visual rate than vice versa. This phenomenon, termed “auditory driving”, is investigated here through certain techniques used in cinematic art. Experiments 1 and 2 relied on montages (slideshows) of still photos accompanied by musical selections in which the perceived rate of one modality was assessed while the other was systematically varied. A similar methodological strategy was used in Experiments 3 and 4 in which film excerpts of various moving objects (e.g. car, horse, train) were accompanied by the sounds typically produced by these objects. In both cases, auditory dominance was observed and found to be dependent on visual motion perspective. These findings, in turn, have both theoretical and practical implications.

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(2006)

**A Thermal Illusion Induced by Visual Objects on the Rubber Hand.** SHOKO KANAYA, YUKA MATSUSHIMA and KAZUHIKO YOKOSAWA, *The University of Tokyo*—Visual touches to a rubbery fake hand in front of a participant synchronized with touches to his/her hidden real hand elicit a strange perception: The fake hand is experienced as belonging to the participant. This is the Rubber Hand Illusion (RHI). Effects of RHI on subjective hand ownership or on perceived position of the real hand have been intensively demonstrated, but it remains unclear whether RHI on the real hand includes attributes of the external stimuli. Here, following induction of RHI by synchronized touches, two objects with different temperatures (plastic/ice cube) were presented successively to the fake hand; when applied to the real hand these stimuli did not differ thermally. Participants reported illusory thermal shifts in their real hand that increased or decreased in experienced temperature with corresponding thermal changes in objects applied to the fake hand. Results indicate that visual stimuli during RHI can affect thermal sensation.

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(2007)

**Synaesthesia: Links To Other Unusual-Connectivity Syndromes.** MARGARET WILSON and AKALKA BARATH, *University of California Santa Cruz*—In synaesthesia, experienced by ~4% of the population, a stimulus in one sensory modality elicits perception in another modality. Most common is Grapheme-Color synaesthesia, in which letters and numbers subjectively have colors. In this newly emerging area of research, links to autism spectrum have been proposed; and, separately, mappings of abstract domains onto concrete ones, such as imagining time spatially, have been labelled “synaesthesia.”

The present study addressed both these issues by administering a battery of questionnaires to a large sample of undergraduates. Results showed no relationship between synaesthesia and autism spectrum, leading us to provisionally conclude that these two syndromes are unrelated. Results did show, however, that synaesthesia correlates with time-space “synaesthesia,” suggesting that the two syndromes share an underlying causality.

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## ● SPATIAL COGNITION II ●

(2008)

**Localizing the Onset Position of Moving Stimuli in Different Trial Contexts.** JOCHEN MÜSSELER and JENS TIGGELBECK, *Work and Cognitive Psychology, RWTH Aachen University*—It is long known that observers make localization errors in the direction of motion when asked to point to the perceived onset position of a moving target (Fröhlich effect). However, recent studies revealed a strong effect of trial context: When the stimuli did not appear at predictable positions but at unpredictable positions, localization errors in direction of motion were at least drastically reduced. In the present experiments we examine different accounts addressing this effect of trial context.

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(2009)

**Directional Bias in Human Facial Profile Drawing: A Meta-Analysis.** SUMEYRA TOSUN and JYOTSNA VAID, *Texas A&M University*—Directional bias in object facing in line drawings has been studied since the 1930s and attributed variously to cerebral hemispheric asymmetries in spatial attention, biomechanical factors in ease of inward vs. outward directed limb movement, and/or to directional scanning biases arising from reading/writing experience. Data from 23 published and unpublished studies of over 13,000 predominantly right handed individuals’ drawings of profiles were entered into a series of meta-analyses. The analyses showed that handedness and script directionality each exerted an influence on profile orientation. Specifically, a tendency for leftward facing of profiles was associated with left-to-right reading/writing experience and right hand use, whereas no preference or a rightward facing bias was associated with reading/writing from right to left and with left hand use. Although these variables contributed a sizeable portion of the variance, there was still unexplained variance remaining, suggesting that other variables also affect performance on this task.

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(2010)

**Use of Geometric Properties for Reorientation: Object Arrays and Extended Surfaces.** WEIMIN MOU, JEAN-FRANÇOIS NANKOO and MARCIA L. SPETCH, *University of Alberta*—Previous studies reported that children rely on extended surfaces (e.g., room) but not object arrays to locate an object after disorientation whereas human adults could use both (Gouteux & Spelke, 2001). This project investigated how human adults use object arrays and rooms in the immediate environment to orient to invisible "cities". In virtual environments, participants learned the directions of seven words representing novel cities in a variety of directions with the presentations of object arrays and room surrounding them. Then participants pointed to cities after disorientation with the presentations of either object arrays or room. Participants' orientation was estimated by the mean of the pointing error across cities. The results showed that participants regained their orientation with the presentation of the room but not with the presentation of the object array. The ongoing experiments are examining the roles of connection among object arrays and distance of the object arrays to the viewer. The preliminary results showed the combination of both connection and distance was essential in reorientation. These results indicated that human adults also rely more on extended surfaces than on object arrays in reorientation.

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(2011)

**Item Types, Cognitive Strategies, and Gender Differences in Mental Rotation.** RANDI A. DOYLE and DANIEL VOYER, *University of New Brunswick*—The aim of the current study was to replicate previous findings in which the magnitude of the male advantage in mental rotation abilities increased when participants mentally rotated occluded versus non-occluded items, and decreased when participants mentally rotated human figures versus blocks. Mainly, the study aimed to address methodological issues noted on previous human figure mental rotations tests. Our results did not support previous research on embodied cognition as mental rotation performance decreased among both men and women when mentally rotating human figures compared to block items. However, for women, the effect of occlusion was decreased when mentally rotating human figures. Results are discussed in terms of task difficulty and gender differences in confidence and guessing behavior.

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(2012)

**Body Anchoring in Imaginal Perspective Switches.** KRISTINA SCHMITZ and MARK MAY, *Helmut-Schmidt-University Hamburg, Germany*—Experiments on spatial judgment performance after imaginal rotations have shown that response time and pointing errors increase as a function of rotation angle between imagined and body-defined perspective. Accounts ascribe additional processing

requirements after imaginal as compared to locomotor rotations to cognitive spatial transformations in an early processing phase and sensorimotor response conflicts in a later phase. A first experiment examined whether relief from sensorimotor interferences facilitates spatial judgments after imaginal rotations as would be predicted by a sensorimotor interference account. Costs related to imaginal perspective taking were significantly reduced by disorienting participants. A second experiment demonstrated that costs re-emerged after participants were cognitively reanchored by self-generating a hypothesis about their head direction. The results of these experiments show that body anchoring and resulting spatial response interferences need to be considered in theoretical conceptions of imaginal repositioning.

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(2013)

**Neither by Global nor Local Cues Alone: Evidence for a Unified Orientation Process.** BRADLEY R. STURZ and CAROLINE K. EASTMAN, *Armstrong Atlantic State University*, KENT D. BODILY, *Georgia Southern University*—A substantial amount of empirical and theoretical debate remains concerning the extent to which an ability to orient with respect to the environment is determined by global (i.e., principal axis), local (i.e., wall lengths, angles), and/or view-based (i.e., stored representation) accounts. We developed an orientation task that allowed the manipulation of the reliability of the principal axis of space between groups while maintaining goal distance from the principal axis, local cues specifying the goal location, and visual aspects of the goal location consistent across groups. Control and test trials revealed that participants trained with a reliable principal axis of space utilized both global and local geometric cues whereas those trained with an unreliable principal axis of space utilized only local geometric cues. Results suggest that both global and local geometric cues are utilized for reorientation and that the reliability of the principal axis of an enclosure differentially influences the use of geometric cues. Such results have implications for theoretical accounts of geometry learning and provide evidence for a unified orientation process.

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(2014)

**Handling Mental Rotation: Behavioral and Physiological Evidence for Gender Differences in Strategies.** DAWN G. BLASKO, *Pennsylvania State University at Erie*, JAMES J. HODGE, *The University of Vermont*—Mental rotation is the one area of spatial cognition where gender differences favoring men are most prominent, yet in many samples significant differences are not found. In the current work, we examine some of the potential reasons for the variability in spatial performance. One possible contributor to women's poor performance is stereotype threat, and the data suggest that the form of the mental rotation task that is given seems to influence the susceptibility of women to performance

decrements. Women reported being more likely to use a block counting or pattern recognition strategy than men who reported more attempts to mentally rotate the whole object. Event-related brain potentials (ERPs) were recorded while men and women completed a mental rotation task and evidence for strategy differences were seen based on gender and on performance level.

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## ● COGNITIVE SKILL ACQUISITION II ●

(2015)

**Are Correlated Streams of Information at the Core of Incidental Sequence Learning? A Theoretical Framework and Empirical Evidence.** BEAT MEIER, *University of Bern*—According to a “correlated streams account” of implicit learning the presence of correlated streams of information is necessary for implicit learning of sequenced events. Using several different sequence learning paradigms, we present empirical evidence in support of this account. We propose that, on a neuro-anatomical level, the interplay of fronto-striatal loops is at the core of this kind of learning. This hypothesis is tested with different patient groups with brain lesions/dysfunctions in areas assumed to affect different fronto-striatal loops. The results are consistent with our proposal. Thus, the correlated streams account is supported by experimental and neuropsychological work. Moreover, it can accommodate many previous accounts that were put forward to explain the emergence of implicit sequence learning.

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(2016)

**Learning Specificity in Time and Distance Estimation: Implications for Improved Training.** LINDSAY S. ANDERSON, ALICE F. HEALY and VIVIAN I. SCHNEIDER, *University of Colorado Boulder*, IMMANUEL BARSHI, *NASA Ames Research Center*—Learning is often specific to the conditions of training, making it important to identify which aspects of the testing environment are crucial to be matched in the training environment. Previous work on focus of attention (FOA) has demonstrated performance differences due to whether individuals focus their attention internally or externally. The present study examined how transfer between learning and testing might be affected by two tasks that differ only in where they require participants to focus their attention. Instead of comparing internal and external FOAs, in this case, FOA was either on time or distance estimation. When all conditions were equal aside from FOA instructions, Experiment 1 showed transfer between tasks, suggesting that training might not be specific to FOA. When distance cues were removed from time estimation, Experiment 2 showed no transfer between time and distance estimation, suggesting that external task cues influence task representation and transfer between tasks.

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(2017)

**Transfer of Training in Following Different Types of Navigation Instructions.** VIVIAN I. SCHNEIDER and ALICE F. HEALY, *University of Colorado Boulder*, IMMANUEL BARSHI, *NASA Ames Research Center*—This study investigated whether learning to follow navigation instructions is specific to the type of instructions provided. College students followed navigation instructions for movement in grids on a computer screen simulating a 3-dimensional space by mouse clicking on the grids. They were trained, given a distractor task, and then tested. Three types of instructions were compared, differing in the presence of landmarks, which were colored letters in the cells of the grids, and/or the commands (e.g., up two, red E). Performance was better overall when landmarks were shown at training. Significant transfer of training from one instruction type to another was found only for testing with no landmarks. Thus, training with landmarks aided subsequent testing, even when the landmarks were not mentioned in the commands. These results imply that representations used to retain navigation instructions depend on both the commands given and the presence of landmarks in the displays.

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(2018)

**Genetic Modulation of Training and Transfer in Older Adults: BDNF Val66Met Polymorphism is Associated with Wider Useful Field of View.** LORENZA S. COLZATO, GUIDO P.H. BAND and BERNHARD HOMMEL, *Leiden University*—Western society has an increasing proportion of older adults. Increasing age is associated with a general decrease in the control over task-relevant mental processes. In the present study we investigated the possibility that successful transfer to untrained tasks in elderly people is modulated by preexisting neuro-developmental factors as genetic variability related to levels of the brain-derived neurotrophic factor (BDNF), an important neuromodulator underlying cognitive processes. We trained participants, genotyped for the BDNF Val66Met polymorphism, on cognitive tasks developed to improve dynamic attention. Pre-training (baseline) and post-training measures of attentional processes (divided and selective attention) were acquired by means of the Useful Field of View (UFOV) task. As expected, Val/Val homozygous individuals showed larger beneficial transfer effects than Met/-carriers. Our findings support the idea that genetic predisposition modulates transfer effects.

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(2019)

**Cognitive Training of Speech-in-Noise Perception in Older Adults.** ERIN M. INGVALSON and PATRICK C.M. WONG, *Northwestern University*—Older adults struggle to perceive speech in noisy environments, often outside of any peripheral hearing disorder. Older adults also show declines in cognitive abilities such as attention and working memory capacity as a function of normal aging. Given that speech perception in noise is also cognitively demanding, it is possible that at least some of the difficulties older adults face perceiving speech in noise may be a result of their diminished cognitive abilities. Furthermore, cognitive training may improve speech perception in noise functions. In this study, participants were trained on either auditory attention or auditory working memory. Speech-in-noise perception abilities were assessed both pre- and post-test. Older adults improved on both the cognitive training measures and in their speech-and-noise perception abilities, indicating there is a cognitive component to speech-in-noise perception and that cognitive training can be an efficacious means of improving this skill for older adults.

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## ● EYEWITNESS MEMORY ●

(2020)

**Eyewitness Memory: Examining the Impact of Lineup Race On Lineup Format.** DAVID DOBOLYI and CHAD S. DODSON, *University of Virginia*—Research investigating eyewitness lineup format has generally endorsed sequential lineups, in which faces are shown one at a time, as superior to simultaneous lineups, in which faces are all shown together. Sequential lineups have been found to offer a reduction in mistaken identifications in lineups in which the perpetrator is absent, a finding sometimes referred to as the sequential advantage. However, sequential lineups have also been found to offer a reduction in correct identifications in lineups in which the perpetrator is present, suggesting consistently reduced choosing. We investigated the robustness of these findings when lineup race is taken into consideration. Past research has shown that individuals are better able to discriminate same race faces versus other race faces, the latter of which are deemed more similar. While identification performance in corresponding race lineups was consistent with past research, performance in cross race trials did not clearly indicate a sequential advantage.

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(2021)

**Effects of Repeated Photo Refreshing On Eyewitness Identification.** TRENT TERRELL, *University of Mary Hardin-Baylor*—The efficacy of photo refreshing as a tool for “jogging” eyewitness memories continues to be an important topic for both criminal and civil law. Previous work from our lab has demonstrated that multiple refreshing

episodes can hinder rather than benefit identifications in product identification scenarios. The present research extends this paradigm to a more typical focus of eyewitness memory research—identifying a suspect following a simulated carjacking. Subjects viewed photos both ten minutes and one week after the initial exposure. As previously demonstrated, an initial round of target absent refreshing reduced the likelihood of a correct identification following subsequent target present refreshing—even when witnesses correctly identified the first array as target absent. This demonstrates that target absent refreshing can reduce the efficacy of eventual target present refreshing.

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(2022)

**What Does Signal-Detection Theory Say About Eyewitness Memory?** LAURA MICKES, VIVIAN HWE, TRAVIS M. CARLISLE, JOHANNA C. MCELFRISH and JOHN T. WIXTED, *UC San Diego*—In the eyewitness memory literature, it has been suggested the relationship between confidence and accuracy in lineup identification is weak (e.g., based on a low gamma correlation). However, recent work using a calibration approach has shown that the confidence-accuracy (CA) relation is often strong (despite the low correlation coefficient). The strong CA relationship is consistent with signal-detection theory, but a simple signal-detection account of lineup identification is lacking. To investigate this, we conducted lineup experiments in which half of the lineups contained an image of a previously seen target (Target Present) and half did not (Target Absent). While the CA relationship was strong for Target Present trials, it was weaker for Target Absent trials. This finding replicates an asymmetry sometimes observed in field studies. Moreover, the asymmetry is consistent with a simple lineup version of the unequal-variance signal-detection model that has long served to guide thinking about old/new recognition.

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(2023)

**Recognition of Details Never Experienced: The Effect of Speculation.** ROBYN E. HOLLIDAY and JOYCE E. HUMPHRIES, *University of Leicester UK*—A 3-stage misinformation paradigm was used to investigate the effects of an encoding manipulation (speculate versus read) on 5, 7, 10, and 13-year-old children's false memories. Children watched a 5-mins film clip about a birthday party; the next day they were given a post-event summary which contained two types of false information – 1. read to them and 2. self-generated in response to a request to speculate about what else can be done with the target detail. Our question was whether asking children to speculate about objects and actions that were not part of the original stimulus event would produce misinformation effects similar to those reported by Holliday and colleagues using semantic and linguistic cues to elicit self-generated details. Results showed that speculating details increased false recognition

in comparison to read details in the 5 and 7-year-olds. False alarms to speculated details increased with age from 5 to 7 years, then declined between 7 and 13 years. These findings are consistent with a verbatim based account of the misinformation effect (e.g., fuzzy-trace theory).

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(2024)

**Pilgrims Sailing the Titanic: Plausibility Effects on Memory for Misinformation.** DANIEL G. SLATEN, SCOTT R. HINZE, WILLIAM S. HORTON and DAVID N. RAPP, *Northwestern University*—Readers appear to rely on information from fictional stories even when it is obviously inaccurate (e.g., Marsh, Meade, & Roediger, 2003). We investigated whether inaccurate ideas are necessarily encoded in this way, or whether any tendency towards encoding inaccuracies might be influenced by plausibility. In Experiment 1, stories were set in implausible, fantastical settings; we expected these settings would reduce reliance on story information. But participants still used both the accurate and inaccurate information presented in the stories to answer later test questions. In Experiment 2, with mundane story settings, we presented information in implausible and inaccurate (e.g., The pilgrims' boat was the Titanic), plausible but inaccurate (e.g., ...the Godspeed), or accurate forms (e.g., ...the Mayflower). Participants were significantly less reliant on implausible information than plausible inaccuracies and accurate information. These findings constrain previous accounts of encoding effects, as considered with respect to the activation of concepts in semantic memory.

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(2025)

**Using Eye Movements To Examine The Timecourse of Witnesses' Decision Strategies.** MATTHEW P. GERRIE, THOMAS A. HUTHWAITE, STASIA HAIGH and JOEL MAJER, *Victoria University of Wellington* (Sponsored by Todd Jones)—Eyewitness identification has been highlighted as a leading cause of wrongful conviction. Psychological science has pointed to witnesses' decision strategies as a cause of these identification errors. It is hypothesized that witnesses who rely on a process of elimination to choose a face from the lineup—known as a relative judgment—are more likely to be incorrect. Conversely, witnesses who rely on a recognition acceptance process—known as an absolute judgment—are more likely to be correct. However, few researchers have provided a measure of decision strategies in real-time. One method to achieve this goal is with witnesses' eye movements. In a series of experiments, we found that eye movements provide a proxy measure of relative judgment behavior. Further, our data show that these eye movement patterns differ across the timecourse of identifications from offender-absent and offender-present lineups. These data have important implications for our understanding of witness decision strategies.

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(2026)

**Knowledge Updating in Jurors Under Differing Cognitive Loads.** KARENNA F. PARRA and CHARLES A. WEAVER III, *Baylor University*—We investigated jurors' use of exculpatory evidence in rendering verdicts. Mock jurors read a trial summary describing an armed robbery of a convenience store in which the suspect appears guilty, then rendered a verdict. Half of the jurors then viewed a videotape of the robbery in which the perpetrator did not match the description provided in the trial summary; the remaining jurors completed an unrelated task. All jurors then voted again. Those who watched the video were significantly less likely to vote guilty at Time 2. In Experiment 2, we manipulated cognitive load during summary reading and videotape viewing. Those who read under conditions of high cognitive load were less likely to vote guilty initially, and those who watched the video under high cognitive load were less likely to modify their verdict after viewing exculpatory evidence. These results are consistent with a knowledge updating view of juror decision making.

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(2027)

**A Healthy Skepticism? Intended and Unintended Consequences of Warnings About Misinformation.** KRISTINE KOHLHEPP and DAVID N. RAPP, *Northwestern University*—People fail to carefully evaluate what they read, relying on text content even when it is clearly incorrect (e.g., Marsh & Fazio, 2006). Instructions to remain vigilant for misinformation have proven ineffective at eliminating these tendencies. We examined whether informing participants about relevant research findings prior to reading might decrease reliance on false information. Participants read a text containing true and false information and afterwards judged the validity of facts, with critical items derived from the information in the text. Experiment 1 replicated previous work, with participants exhibiting poor accuracy on the judgment task after having read false as compared to true information in the story. In Experiments 2 and 3, after learning about research findings, participants were less likely to rely on misinformation from the text. But this enhanced skepticism had an unintended consequence: Participants were now also less likely to rely on correct information from the text.

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(2029)

**The Good, the Bad, and the Neutral: The Role of Outcome Type in the Susceptibility to Suggestion for Post-Event Causal Information.** QUIN M. CHROBAK and CHRISTOPHER L. GROVES, *University of Wisconsin-Oshkosh* (Sponsored by William Merriman)—Eyewitnesses to forensically relevant events are frequently called upon to provide testimony regarding the cause of some known outcome (e.g., describing the events that led to a physical altercation). However, recent research has demonstrated that participant-witnesses who do not observe such causal information during an event may be particularly likely to develop false memories for suggested information that fills that causal role (Chrobak & Zaragoza, 2011). However, little is known about how factors associated with the witnessed outcome (e.g., its valence) might impact false memory development. In the present study, participants were exposed to suggested causal information after hearing short narratives containing neutral, negative, or positive outcomes (but that lacked the relevant causes for those outcomes). Results indicated that participants were more likely to report the suggested causal information at a final memory test if the initial event contained a positive or negative outcome as opposed to a neutral outcome.  
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### ● RECOGNITION MEMORY ●

(2030)

**Part-Set Cuing and Recognition Memory: Evidence Challenging Inhibitory Accounts.** WILLIAM J. MUNTEAN and DANIEL R. KIMBALL, *University of Oklahoma*—In a speeded recognition task, cuing memory with a subset of studied information—part-set cuing—can lead to poor discrimination between studied and unstudied items by reducing the hit rate, a finding interpreted as evidence for inhibition of target accessibility (Oswald, Serra, & Krishna, 2006). The current experiment investigated recognition memory using a response deadline methodology with deadlines of 200ms, 600ms, and 1100ms. Participants studied lists comprising members of four categories that were tested in the presence of part-set cues drawn from two of the categories. Part-set cuing reduced discrimination between studied and unstudied exemplars from studied categories. However, unlike in Oswald et al., the reduction in discriminability was driven by a higher false alarm rate rather than a lower hit rate. Both the higher false alarm rate and the absence of a lower hit rate are problematic for general inhibitory accounts.  
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(2031)

**Effects of Post-cue Duration on Intentional Forgetting of Item and Associative Information.** TYLER BANCROFT, *Dalhousie University*, WILLIAM E. HOCKLEY, *Wilfrid Laurier University*—The accepted explanation of item-based directed forgetting has focused on selective rehearsal at encoding. Items are not intentionally committed to memory prior to the presentation of the instruction cue, but rather are simply maintained in working memory. Those items followed by a Remember (R) cue are elaboratively rehearsed whereas items followed by a Forget (F) cue are not processed further. It follows from this account that the memorial advantage of R over F items should increase with the duration of the cue as subjects withdraw attention from F items and focus on R items. Lee, Lee, and Tsai (2007) found such an interaction for recall but not for item recognition. We replicated and extended these results in tests of item and associative recognition demonstrating different effects of maintenance and elaborative rehearsal on the encoding and retrieval of item and associative information.  
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(2032)

**Unitization and the Word Frequency Effect in Associative Recognition.** JOEL R. QUAMME, LEAH TREMBLE and JESSICA RHODES, *Grand Valley State University*—Previous studies have shown that, whereas item recognition of low frequency (LF) words is better than that of high-frequency (HF) words, an HF advantage is often present in associative recognition (e.g., Clark, 1992). This dissociation has been interpreted as greater use of recollection in associative recognition relative to item recognition. However, some recent work (e.g., Quamme et al., 2007) suggests familiarity-based associative recognition is increased when pairs are encoded as unitary wholes (i.e., compound words), as opposed to separate lexical units. We tested whether encoding of pairs in this manner would influence the word frequency effect in associative recognition. Subjects studied HF and LF pairs of words presented either alone, with a compound definition that combined the meanings of the two words, or with a sentence frame that related the items meaningfully, but did not combine them. A standard HF advantage occurred for pairs presented alone, but was weaker for compound encoding, and was reversed (i.e., an LF advantage) for sentence encoding. The results show the word-frequency effect in associative recognition is sensitive to encoding factors such as the degree of unitization.  
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(2033)

**The Necessity of Theoretical Validity in Signal-Detection Models of Recognition Memory.** JOSHUA D. KOEN, NEAL KROLL and ANDREW P. YONELINAS, *University of California, Davis*—Single-process models of recognition memory often assume that variability in memory strength arises because of encoding variability or failures of attention during study. However, dual-process models assume that the degree of old item variability is determined by factors impacting the contributions of recollection and familiarity, such as delay and amnesia. We tested these accounts by examining recognition memory ROCs, and found that the encoding explanations of memory variability were insufficient to account for performance. Moreover, the results suggest that memory variability is determined by the contributions of recollection and familiarity. Interestingly, the ‘best fitting model’ was entirely dependent on the fit statistic that was chosen. However, the ‘best fitting model’ might not be very informative because all models fit the data exceedingly well. These results highlight the importance of testing the theoretical validity of a model rather than mathematical fit in studies of recognition memory.  
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(2034)

**Testing Continuous and Threshold Accounts of Recollection: Effects of Response Bias.** CALEB J. PICKER and COLLEEN M. PARKS, *University of Nevada, Las Vegas*—Findings of functional differences between recollection and familiarity have convinced most researchers that both processes support recognition decisions, but there is still debate about whether recollection is a continuous process or a threshold process. Continuous and threshold models of recollection predict different receiver operating characteristics yet generally agree on functional differences between the processes. One exception though is the effect of response bias manipulations on recollection. If recollection is continuous, bias manipulations should affect both hits and false alarms in a recollection-driven task, but should only affect false alarms if it is threshold. Because the models agree that familiarity is continuous, continuous recollection models predict the same effect on the two processes whereas threshold models predict a difference. We tested these predictions in familiarity-driven and recollection-driven recognition tasks. Results generally indicate that bias manipulations affect hits and false alarms when performance is familiarity-driven but have little effect on recollection-driven performance.  
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(2035)

**The Effects of Post-encoding Stress on Recollection and Familiarity for Emotional and Neutral Images.** ANDREW M. MCCULLOUGH and ANDREW P. YONELINAS, *University of California Davis*—A variety of empirical methods have shown that post-encoding stress can affect recall, and that the emotionality of the information

may interact with the effects of stress. However, the specific nature of stress effects on memory processes is unclear. Recognition tasks provide a useful approach for exploring how stress affects the processes supporting memory performance. The current research investigated how a laboratory stressor (i.e., the cold-pressor task) affects recognition memory by comparing performance of participants exposed to post-encoding stress with participants in a non-stressed control condition. Recognition was assessed for negative and neutral images using a hybrid remember/know confidence procedure in order to characterize overall performance and to separate recollection- and familiarity-based responses. The results indicate that post-encoding stress significantly improved recognition memory relative to the control condition. Subsequent analyses will examine whether stress influenced recollection and/or familiarity and whether the effects were modulated by the arousal level of the materials. The results suggest that physiological stress can enhance memory for information encountered prior to the stressful event.  
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(2036)

**Assessing a Neural Basis for Differentiation Accounts of Recognition Memory.** PERNILLE HEMMER, AMY CRISS and BRAD WYBLE, *Syracuse University*—Differentiation models of recognition memory predict a strength based mirror effect (SBME) in the distributions of subjective memory strength. Subjective memory strength should increase for targets and simultaneously decrease for foils following a strong encoding list compared to a weak list. An alternative explanation for the SBME is that participants adopt a stricter criterion following a strong list than a weak list. Behavioral experiments support the differentiation account. The purpose of this study was to identify the neural bases for these differences. Encoding strength was manipulated (strong, weak) in a scalp EEG paradigm. At test, foils were presented in blocks containing strong or weak targets, allowing us to investigate the effect of retrieval context on foils. Subjects responded old/new with confidence ratings. We evaluate the strength effects in both early and late waveforms. The data will be used to inform models of memory.  
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(2037)

**Levels of Processing Influences Recollection and Familiarity: Evidence from a Modified Remember/Know Paradigm.** HEATHER SHERIDAN and EYAL M. REINGOLD, *University of Toronto Mississauga*—A modified Remember/Know (RK) paradigm was used to investigate reported subjective awareness during retrieval. Levels of processing (shallow vs. deep) was manipulated at study. Word pairs (old/new or new/new) were presented during test trials, and participants were instructed to respond “remember” if they recollected one of the two words, “know” if the word was familiar in the absence of

recollection, or “new” if they judged both words to be new. Participants were then required to indicate which of the 2 words was old (2AFC recognition). When 2AFC proportion correct performance was computed separately for remember and know response trials, both types of trials showed a strong levels of processing effect. In contrast, the standard RK paradigm’s proportion measures showed a levels of processing effect for remembering but not for knowing. Consequently, we argue that the RK paradigm’s know proportion measure substantially underestimates the effect of levels of processing on familiarity.

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(2038)

**Analogical Resemblance of Passages to Studied Aphorisms Produces Recognition without Identification.** BOGDAN KOSTIC, *Missouri State University*, ANNE M. CLEARY, *Colorado State University*—We created analogical resemblance to studied episodes using aphorisms (e.g., “A watched pot never boils”) and short passages that are well-described by these aphorisms. Participants studied aphorisms then received a test list of stories that would each be well-described by an aphorism. Half of the stories corresponded to studied and half to unstudied aphorisms. For each story, participants attempted to identify the aphorism that described the story, gave a familiarity rating to the story, then indicated whether they were in a “presque vu” state (the feeling of being on the verge of an epiphany). When participants could not identify the aphorism that described the stories, they gave higher familiarity ratings for stories corresponding to studied than to unstudied aphorisms. The rate of presque vu responses for unidentified aphorisms was unaffected by the study-status of the aphorisms, but being in a presque vu state was associated with higher familiarity ratings.

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(2039)

**Item Recognition: Effect of Repetition On Unstudied Lures.** MURRAY SINGER, *University of Manitoba*—The mirror effect pattern of higher correct recognitions and lower false alarms in a strong than a weak memory condition is alternatively partly addressed in terms of (a) the application of a stricter decision criterion to strong than weak test-probes (“criterion shift”) versus (b) a shift, in the negative direction, of the distribution of unstudied lures associated with the strong condition. To directly compare strong versus weak lures, subjects were asked to study items from five category pairs (e.g., cities and birds). Items from one category of each pair were unrepeated and those from the other presented three times. In two-alternative forced-choice testing (2AFC), one-third of the test trials presented one lure related to each of a strong and a weak category, rather than the usual pairing of one target and one lure. In the two-lure probes, subjects’ preference for the weak versus strong lures was virtually indistinguishable. 2AFC recognition is held to reflect the only the relative strength of the two probes. Therefore, this result is inconsistent with the possibility that stimulus repetition shifts the distributions of

unmentioned category members. The theoretical implications of this outcome are considered.

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(2040)

**Encoding Time and the Mirror Effect in Recognition Memory: Evidence from Eyetracking During Reading.** ANGELA M. PAZZAGLIA, ADRIAN STAUB and CAREN M. ROTELLO, *University of Massachusetts Amherst*—Low frequency (LF) words have higher hit rates and lower false alarm rates than high frequency (HF) words in recognition memory, a phenomenon termed the mirror effect by Glanzer and Adams (1985). Reading times are also longer for LF words, which is usually interpreted as reflecting the difficulty of lexical access (Staub, White, Drieghe, Hollway, & Rayner, 2010). We examined the relationship between fixation durations in reading and later recognition memory performance for individual words, to test whether better memory for LF words is due to longer encoding time. One hundred words, half HF and half LF, were presented in matched sentence frames in an incidental study design; eye movements were recorded. The standard frequency effect on eye movements was observed, with longer reading times on LF words. At test, studied words and an equal number of new words were presented in a standard recognition design. The mirror effect was evident, with higher hit rates and lower false alarm rates for LF words. Critically, the time spent fixating a word did not independently predict later memory for that word. This result suggests that better memory for LF words is not due to the additional time spent on these words at encoding.

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(2041)

**Retrieval Failure Contributes to Gist-Based False Recognition.** SCOTT A. GUERIN and CLIFFORD A. ROBBINS, *Harvard University*, ADRIAN W. GILMORE, *Washington University, St. Louis, MO*, DANIEL L. SCHACTER, *Harvard University*—People often falsely recognize items that are similar to previously encountered items. This robust memory error is referred to as gist-based false recognition. A widely held view is that this error occurs because the details fade rapidly from our memory. Contrary to this view, an initial experiment revealed that, following the same encoding conditions that produce high rates of gist-based false recognition, participants overwhelmingly chose the correct target rather than its related foil when given the option to do so. A second experiment showed that this result is due to increased access to stored details provided by reinstatement of the originally encoded photograph, rather than to increased attention to the details. Collectively, these results suggest that details needed for accurate recognition are, to a large extent, still stored in memory and that a critical factor determining whether false recognition will occur is whether these details can be accessed during retrieval.

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(2042)

**Familiarity Breeds Source Errors: When Remembering Now Hurts Source Memory Later.** LINDA A. HENKEL, *Fairfield University*—Two experiments examined how differentially thinking about experienced events can influence young and older adults' memory for what really occurred. Participants saw and imagined pictures of objects (Experiment 1) or performed and imagined simple actions (Experiment 2). An intervening task probed each item 0, 1, or 3 times and required remembering the items in a general way (old or new?), in a more specific manner (perceived, imagined, or new?), or required thinking about items without regard to whether or how they were earlier experienced (e.g., judging function or typicality). Results showed that probing items multiple times increased the number of items successfully remembered on a later memory test but also increased source misattributions. Remembering items without explicitly considering their source increased source errors as much as did the non-memory intervening tasks, and this occurred for both young and older adults, illustrating the negative impact of thinking about and nondiscriminately remembering past events on subsequent source memory accuracy.  
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#### ● IMPLICIT LEARNING AND MEMORY ●

(2043)

**Repeated Presentation is Necessary for Dissociative Learning of Perceptual Priming.** HISATO IMAI and YUKIKO ISHII, *Tokyo Woman's Christian University*—Assuming that the representation of perceptual priming is structural, some parts of a figure would be dissociated and organized to obtain structural descriptions by dissociative learning. In this study, we investigated whether dissociative learning would occur during perceptual priming. Subjects were presented 4x4 dot-matrices with eight lines in the study block, and were tested by 3x3 ones with five lines in the priming block. It was critical that the latter 3x3 matrices were embedded in the former 4x4 ones. Result showed no priming, which suggested that dissociative learning did not occur. We further investigated the effect of repeated presentation of 4x4 matrices, because repetition is one of the critical factors of learning. Significant priming was found when each 4x4 matrix was presented four times in the study block. These results suggest that repetition would be a necessary condition for the dissociative learning to occur in perceptual priming.  
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(2044)

**The Recollective Quality of Memories Following Strategic Category Exemplar Generation.** SARAH K. JOHNSON and TARA L. CHIARELLA, *Moravian College*—Generating a list of category exemplars purportedly engages two fundamental processes: automatic spread of activation and strategic searching to find new subcategories. We explored whether these processes create

differences in the later quality of memory for generated items. In two experiments, subjects generated 16 exemplars consecutively for one category or completed a non-generation control task. A final recognition test included source judgments regarding the color of the words (Experiment 1) or remember-know judgments (Experiment 2). We found significant generation effects in both experiments, regardless of implicit or explicit memory instructions (Experiment 1). However, no substantial differences were found between the generation and control tasks in source memory accuracy or proportion of remember responses, extending findings in this area to encompass a less constrained, more strategic exemplar generation task (also known as verbal fluency). We also report findings regarding context memory for words from within subcategory clusters (engaging automatic processing) compared with words reflecting switches between clusters to address the memorial consequences of this strategic processing.

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(2045)

**Familiarity Is Related to Conceptual Implicit Memory: An Examination of Individual Differences.** WEI-CHUN WANG and ANDREW P. YONELINAS, *University of California, Davis*—Explicit memory is thought to be distinct from implicit memory. However growing evidence indicates explicit familiarity-based recognition memory relies on the same neural process supporting conceptual implicit memory, and that both memory types are sensitive to similar behavioral manipulations. In experiment 1, we tested this hypothesis by plotting recognition memory confidence ROCs to estimate recollection and familiarity, and used a free association task to measure conceptual implicit memory. Results demonstrated that, across subjects, familiarity, but not recollection, was highly correlated with conceptual priming. In contrast, in experiment 2, a comparison of recognition memory and explicit cued recall performance indicated that cued recall was related to both recollection and familiarity. The results are consistent with models assuming that familiarity and conceptual implicit memory rely on similar processes, and indicate that the distinction between implicit and explicit memory may be more apparent than real.

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(2046)

**An Implicit Increase in Positive Attitudes Towards the Products Depicted in Focal but not Peripheral Magazine Advertisements.** KATHERINE M. MATHIS, *Bowdoin College*, TODD A. KAHAN, *Bates College*—Previous research has demonstrated that participants who are exposed to magazine advertisements rate those ads more favorably during a subsequent test phase, compared to those ads they had not seen (Perfect & Askew, 1994). This was true both for explicitly and implicitly studied ads, although participants only remembered the deliberately studied items. The current study sought to determine whether these effects

generalize to the actual products depicted in the advertisements, and whether the type of advertisement (focal or peripheral) matters. Participants deliberately or incidentally studied magazine ads and then were asked to rate ads or products on four dimensions, and finally were asked whether they had seen the ad or an ad for the product in the original study phase. Results replicate and extend the mere exposure effect to the products depicted in focal ads but not peripheral ads.

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(2047)

**Transfer Effects in Contextual Cueing.** EDWARD C. MERRILL and YINGYING YANG, *University of Alabama* (Sponsored by David Boles)—Contextual cueing involves an attentional guidance effect that uses previously experienced visuo-spatial regularities in the environment to facilitate search for a target. Typically, the same objects that are NOT the target appear in the same locations in the display and predict the location of the target. In this research, the location and identity of predictive stimuli was constant throughout acquisition. However, after contextual cueing was evidenced we changed the identity of the nontarget objects (but not their location) to evaluate the degree to which location-object consistency was required for contextual cueing. In one test condition we made a relatively small change in the identity of the predictive stimuli and in a second test condition we made a relatively large change in the identity of these stimuli. The small change in object identity actually increased the size of contextual cueing effect, whereas the large change reduced the size of the effect.

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## ● WORKING MEMORY I ●

(2048)

**Cross-domain Interaction between Verbal and Visual Working Memory.** PAULA GOOLKASIAN and HARRY C. YARBROUGH, *UNC Charlotte*—Working memory is a dynamic system involving multiple stores but some recent studies have been concerned with the degree to which information is held entirely in separate modules or whether there is a common facility that is shared (Morey, Cowan, Morey, & Rouder, 2011; Wood, 2011). We studied the cross-domain interaction between processing and storage components of working memory by using a verbal and visuospatial processing task developed by Jarrold, Tam, Baddeley, and Harvey (2010) and interspersing that task for 18-seconds after presenting four of six to-be-remembered printed words or pictures. Our findings replicated Jarrold et al (2010) by showing that the verbal processing task disrupted serial recall more than the visuospatial task, however, the nature of the processing task was found to interact with the format of the to-be-remembered items. When the items were presented as pictures rather than printed words, serial recall was higher and the verbal

processing task was less disruptive. The findings are discussed within the context of Wood's (2011) three specialized buffers in visual working memory.

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(2049)

**Context Effects on Serial Recall of Music.** BRIAN MATHIAS and CAROLINE PALMER, *McGill University*, PETER Q. PFORDRESHER, *University at Buffalo*, MAXWELL ANDERSON,—Modeling Context Effects on Serial Recall of Music Brian Mathias, Caroline Palmer, Peter Q. Pfordresher, and Maxwell Anderson Although computational models have been proposed for the perception of tones in musical contexts, few have modeled memory retrieval in music performance, a complex serial recall task. We describe a formal model of contextual memory retrieval that predicts effects of context length and production rate on error rates and error types. Skilled pianists performed novel musical phrases that were embedded in long or in short sequence contexts. Both context length and performance rate (tempo) were manipulated. Error rates and error types were consistent with model predictions: serial ordering errors in the embedded phrases spanned greater distances in the long contexts, and the difference in error rates between fast and slower tempi was greater in the long contexts, consistent with predictions of increased activation of the current event from the longer contexts. These findings support the concept that pitch events are uniquely bound to other contextual pitches during retrieval.

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(2050)

**The Disintegration of Visual-Short Term Memory Capacity: The Capacity of Colored Objects Is Most Often Determined by the Number of Features.** SHRIRADHA SENGUPTA, PAUL VERHAEGHEN and PATRICIA M. HEARONS, *Georgia Institute of Technology*—Visual short term memory capacity is considered to be about 4 items, regardless of the number of features the objects consist of. In 6 experiments, we revisited this claim, using 2D representations of 3, 6, or 9 cubes containing 1, 2, or 3 colors each (blocked), thus varying the total number of features from 3 to 27. We used either single centrally located probes, single probes in the original location, or whole-display match-to-sample probes. Mismatch probes contained either one extra-set color, or were recombinations of intra-set colors. In 5 of our 6 experiments, accuracy was determined by the total number of features, not the number of objects. The only exception was whole-display extra-set probing (the probe typically used in the field). One interpretation is that color location within objects creates an exception to the VSTM capacity limit; alternatively, the results might suggest that the VSTM capacity limit is an artifact of the type of probing.

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(2051)

**Recollection and Familiarity in Visual Working Memory.** WEIWEI ZHANG and ANDREW P. YONELINAS, *Univ. of California*—Visual working memory (VWM) provides a critical constraint for various cognitive functions with its limited storage capacity, but the nature of this limit has been the subject of considerable controversy. Some researchers have proposed that VWM stores a limited set of discrete representations, whereas others have proposed that VWM is best characterized as a pool of resources that can be distributed continuously across many features. Here we propose a dual process signal detection model of VWM in which performance is based on recollection which provides discrete item information, and familiarity which provides continuous configural information. We used an orientation change-detection task in which observers attempted to retain several orientations in VWM over a 1-s retention interval and then reported whether a cued item in the test array had the old or new orientation on a 6-point confidence scale. In a series of experiments, we found that manipulations of configural encoding selectively affected familiarity whereas manipulations of item information selectively affected recollection. Thus, working memory consists of both recollection of a few discrete representations and continuous familiarity of configural information.

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(2052)

**Working Memory for Navigation Instructions in Words and Arrows.** BLU MCCORMICK and ALICE F. HEALY, *University of Colorado Boulder* (Sponsored by Vivian Schneider)—In 2 experiments, subjects received and then followed the same navigation instructions presented in either words or arrows, which directed them to move in a 3-dimensional space represented as stacked, 2-dimensional matrices on a computer screen. When neither phonological nor spatial processing was specifically impeded, overall accuracy for implementing the move sequences with a computer mouse was equivalent for processing sequences of directional words and arrows. Furthermore, subjects' self-reported rehearsal strategies included both phonological and spatial components regardless of stimulus type. However, when phonological processing was disrupted by a dual, articulatory suppression task, performance for words declined more than for arrows, and when spatial processing was disrupted by a dual, pattern tapping task, only accuracy for arrows declined. Thus, in this experimental series, the bias of the stimulus type (phonological for words and spatial for arrows) predicted working memory modality effects better than self-reported phonological and spatial rehearsal strategies.

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(2053)

**New Working Memory Inputs Efficiently Overwrite Old Representations.** HIROYUKI TSUBOMI, KEISUKE FUKUDA and EDWARD K. VOGEL, *University of Oregon*—Given its severe capacity limitation, efficient updating of visual working memory (VWM) representation is crucial. Here, we investigated how no longer necessary VWM representations are disregarded. To do so, we presented a circle-cue while participants were maintaining 4 colored squares in VWM. In the “drop” condition, the cue indicated the to-be-tested item, allowing participants to drop the remaining items from VWM. In the “overwrite” condition, the cue was filled with a new color, indicating that all previous items could be disregarded and only this new color need now be retained. While both conditions required the participant to change the memory load from four items to one, the contralateral delay activity (CDA), a neural measure of the number of items in VWM, was more reduced overwrite condition. These results suggest that overwriting old representations with new inputs is more efficient than attempting to drop old representations without overwriting.

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(2054)

**The Sequential Dynamics of Visual Short-Term Memory.** WOUTER KOOL, ANDREW R.A. CONWAY and NICHOLAS B. TURK-BROWNE, *Princeton University and Princeton Neuroscience Institute*—Frequent changes occur in visual input due to eye movements, locomotion, and object motion. Visual short-term memory (VSTM) may help bridge across such changes, and thus it is important to determine how VSTM copes with dynamic input. Using a sequential variant of a technique developed for simultaneous displays, we assessed the probability of storage and precision of stored representations for VSTM of rapid sequences (50ms SOA), as a function of serial position and set size. Probability of memory did not vary by serial position for small sets, but declined for earlier items when capacity was exceeded. Precision also did not vary for small sets, but was lower for earlier items in large sets, especially when subsequent items were close in feature space. The recency bias in how items get prioritized for storage, and the existence of retroactive interference on stored representations, suggest that VSTM is updated in a first-in-first-out manner.

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(2055)

**Developmental Differences in the Irrelevant Sound Effect.** EMILY M. ELLIOTT, KENNETH BARIDEAUX and ALICIA M. BRIGANTI, *Louisiana State University*—Research has indicated that children demonstrate a larger irrelevant sound effect than adults (ISE; Elliott, 2002); however, the exact cause of this developmental difference is not known. The goal of this study was to examine possible



sources that contribute to this difference. Macken, Mosdell, and Jones (1999) found that irrelevant speech presented during and after list presentation produced significant disruption on the recall performance of adults, with larger disruption occurring at the end of encoding and the beginning of retention. The current study addressed the magnitude of the ISE in children and adults by investigating the point in time at which irrelevant sounds were presented. Child participants were shown 4-digit printed lists, and the irrelevant sounds (words and tones) were presented during an encoding and retention interval. The methods were similar for the adult participants, with the exception that 8-item lists were used. The results indicated that serial recall performance was greatly affected during the last half of encoding and the first half of retention for both age groups, but also that the disruption continued throughout retention for the children only.

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(2056)

**Working Memory Is Integral to Visual Search.** DAVID E. ANDERSON and EDWARD K. VOGEL, *University of Oregon*, EDWARD AWH, *University of Oregon*—Previously, Woodman et al. (2001) found that visual search remained efficient when working memory (WM) was loaded, leading to the hypothesis that visual WM is not needed to examine potential search targets. By contrast, we find that capacity limits in visual WM strongly predict search efficiency, suggesting that search items are apprehended by loading them into WM. To reconcile these seemingly contradictory findings, we propose that observers in the Woodman et al study may have released the WM load during search and used long term memory to support memory performance. Electrophysiological data reveal a clear drop in storage-related activity during the visual search phase of this dual task, suggesting that memory items were released from WM during search. Moreover, this drop in storage-related activity was a strong predictor of the ability to maintain search performance when the concurrent memory task was imposed. Thus, WM is integral to visual search.

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(2057)

**Attention, Working Memory and Impulsiveness in High Media Multi-taskers.** MEREDITH E. MINEAR and FAITH BRASHER, *The College of Idaho*—Ophir, Nass, & Wagner (2009) developed the Media Multi-tasking Index (MMI) to measure the extent to which an individual engages in simultaneous use of different media such as texting while studying and listening to music. They proposed that high multi-taskers were worse at dealing with distracting information both from external sources and internal representations in memory. Using the MMI, we surveyed 200 students on their multi-tasking behavior as well as their self-reported impulsiveness and self-control. We also invited 25 high and 25 low multi-taskers into the laboratory and

tested them on measures of predictable task-switching, the attention network test and an item recognition task high in interference. While we did find the MMI score to be positively correlated with impulsiveness and negatively correlated with self-control, we did not find any differences between heavy and light users in attention, task-switching or the ability to deal with interfering information in memory.

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(2058)

**Simple RT Task vs. Chocolate Cravings: The Battle Between Automatic and Conscious Processes.** SUSAN E. RUPPEL and KIM A. PURDY, *University of South Carolina Upstate*—Kemps, Tiggenmann and Grigg (2008) demonstrated that chocolate cravings can impede responses to simple reaction time tasks and more demanding working memory tasks. They suggest that when people with strong cravings are presented with the object of their desire, automatic schemas are activated which take considerable cognitive resources to inhibit; thereby reducing resources available for the experimental tasks (Tiffany, 1990). We replicated Kemps et al., but added Tangney, Baumeister and Boone's (2004) Self-control Scale to compare the effects of self-control to the effects of craving on cognitive ability. Participants were divided into three groups according to their Craving scores and then again according to their Self-control scores. Participants in the Low and High Craving groups performed the task slower than did participants in the Medium Craving group. A similar inverted U-shaped function was observed with the Self-control data, suggesting that both automatic and conscious processes are at work.

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(2059)

**Persisting Through Difficult Tasks: Individual Differences in Working Memory Capacity and Explanatory Style.** JOHN H. LURQUIN and AKIRA MIYAKE, *University of Colorado at Boulder*—Throughout our daily lives, we encounter various tasks that are frustrating and require persistence to complete. However, this ability to persist varies among individuals with some persisting longer than others, and both cognitive and personality variables are likely to jointly influence this ability. In this study, participants performed a laboratory based persistence task involving unsolvable puzzles. Results indicate that both working memory capacity (WMC) and explanatory style (ES) --- how people typically interpret the cause of events --- predict when someone decides to give up. These variables also appear to interact such that for those with an optimistic ES, high WMC is associated with more persistence, whereas, for those with a pessimistic ES, high WMC is associated with less persistence. This suggests that those individuals who may be more used to quickly solving complex problems may be particularly vulnerable to challenges when they have a pessimistic ES. Although past research suggests that performance on these persistence

tasks relies on self-regulatory strength, this is the first direct evidence of their relationship. Furthermore, how WM influences persistence depends on other variables such as ES.

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(2060)

**Does Novel Rule Use Drive the Relationship Between Working Memory Capacity and Raven's Advanced Progressive Matrices?** TYLER L. HARRISON and RANDALL W. ENGLE, *Georgia Institute of Technology* (Sponsored by Gilles Einstein)—One of the most consistent findings in the study of working memory capacity (WMC) is its strong relationship with Gf. However, the reason behind this relationship is poorly understood. A recent paper (Wiley, Jarosz, Cushen, & Colflesh, 2011) finds that WMC is most strongly related to problems of Ravens Advanced Progressive Matrices (RAPM; a typical index of Gf) that require a novel rule combination to solve correctly. For the present study we gave participants two subsets of RAPM (one subset containing all novel rule combinations and another consisting of primarily repeated rule combinations) along with three tests of working memory capacity and three additional Gf tests. The novel rule subset of RAPM predicted WMC and Gf just as well as the repeated rule subset. To evaluate the novel rule hypothesis further, we reanalyzed previous data from our lab and failed to replicate Wiley et al.'s finding.

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(2061)

**The Fluency Heuristic in Recognition Memory: Bound versus Unitized Word Pairs.** MARIANNE E. LLOYD and ASHLEY HARTMAN, *Seton Hall University*, JEREMY K. MILLER, *Willamette University*—Previous research has demonstrated that fluency effects from a masked prime (e.g., Jacoby & Whitehouse, 1989) are eliminated in associative recognition, presumably due to the influence of recollection (Westerman, 2001). The present research investigated whether participants would interpret fluency as evidence of prior study when the word pairs were unitized at encoding. In both a between-participants and within-participants manipulation of encoding type, there were no priming effects for unitized items that were encoded as a single concept (definition of a word pair) relative to those that were arbitrarily bound through embedding the words in a sentence. Further, there were no differences in accuracy as a function of encoding. The findings are consistent with previous research demonstrating that participants adopt global strategies regarding fluency that are difficult to change (Miller, Lloyd, & Westerman, 2008), even when familiarity should be a good cue for memory decisions (e.g., Diana, Ranganath, & Yonelinas, 2008.)

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## ● TESTING EFFECTS ●

(2062)

**Using Low-Stakes Repeated Testing Can Improve Student Learning: How (Some) Practice Makes Perfect.** SARAH GRISON, *University of Illinois at Urbana-Champaign*, STEVEN G. LUKE, *University of South Carolina*, AYA SHIGETO, *Nova Southeastern University*, PATRICK DK WATSON, *University of Illinois at Urbana-Champaign*—Research shows that repeated testing improves retention of information. Because the testing effect may improve student learning, it has been studied in laboratories and on high-stakes course exams. By contrast, we developed classroom experiments to determine whether fast, easy, and non-threatening low-stakes forms of repeated testing improve learning for students in Introductory Psychology. In Experiment 1, answering more in-class questions using student response systems predicted better long-term learning for text concepts not covered in class or read by the students. In Experiment 2, taking online pre-lecture practice quizzes on text concepts predicted better long-term learning, especially when questions were grouped by concept versus distributed. The results indicate that low-stakes repeated testing can aid learning, possibly due to attentional processing that aids memory storage, and reveal how fast and simple pedagogical changes improve learning. In sum, although practice can make perfect, this depends on how teachers design the practice.

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(2063)

**The Negative Testing Effect: When Retrieval Practice Impairs Subsequent Memory Performance.** DANIEL J. PETERSON, *Knox College*, NEIL W. MULLIGAN and PETER A. ORNSTEIN, *University of North Carolina*—The testing effect refers to the phenomenon whereby being tested for some previously studied material leads to levels of recall above and beyond a simple re-presentation of the material. In a series of experiments we consider whether it may be appropriate to conceptualize the testing effect within the item-specific vs. relational framework, an account used to explain a variety of memory phenomena including the generation effect. In the experiments presented here, the generation effect and the testing effect appear to be qualitatively similar memory phenomena as a design which yielded a negative effect of generation yielded a comparable negative effect of retrieval practice. These results suggest that generation and testing may be understood within a common framework, the multifactor account.

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(2064)

**When Is Expanding Retrieval More Effective Than Evenly Spaced Retrieval?** AIMEE A. CALLENDER and ANDREW ROBERTS, *Auburn University*—Experiment 1 investigated if working memory interacts with expanding retrieval schedules. Participants learned word pairs using even spacing (5-5-5) and expanding schedules that varied in the initial retrieval attempt and total number of intervening items (1-2-3, 1-5-9, 3-5-8, 5-8-13). A final test was administered after 10 minutes or 48 hours. Working memory did not affect performance, however the 5-8-13 schedule produced the best performance on the delayed test for all participants. Because the initial retrieval attempt was confounded with the total number of intervening items, Experiment 2 used three schedules that had 26 intervening items (5-8-13, 5-12-9, 1-10-15), one schedule with 30 intervening items (8-12-10), and even spacing (5-5-5). The 1-10-15 schedule produced the best performance on the delayed test, suggesting that longer intervals in an expanding schedule may be an important factor in the effectiveness of expanding retrieval. This factor was investigated in a third experiment.

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(2065)

**Schedules of Retrieval Practice for Durable and Efficient Learning: Is More Always Better?** KALIF E. VAUGHN, KATHERINE A. RAWSON and JOHN DUNLOSKY, *Kent State University*—Substantial prior research shows that retrieval practice improves memory but supports few prescriptive conclusions for how best to schedule practice to achieve durable and efficient learning. Whereas schedules used in most prior research involve a fixed number of trials in a single practice session, students presumably do (or should) initially practice until items are correctly recalled at least once and do (or should) practice in more than one session. But how many times should an item be correctly recalled initially to maximize both durability and efficiency, and do effects persist across subsequent relearning? In Session 1, participants practiced Swahili-English pairs until correctly recalled 1-7 times. All items were tested and then relearned to one correct recall in four subsequent sessions spaced one week apart. Correctly recalling items more times during initial learning had strong effects prior to relearning but substantially diminished effects after relearning. Thus, more is not always better.

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(2066)

**Can Test-Enhanced Learning Occur After Incidental Retrieval?** XIAOPING PU and CHI-SHING TSE, *The Chinese University of Hong Kong*—Testing effect occurs when taking an initial test on the learning materials, compared with restudying them, enhances their retention in the subsequent test. Pyc and Rawson's (2009) retrieval effort hypothesis suggests that more resilient memory traces can be encoded via an effortful retrieval process during the

initial test. We tested this hypothesis by using a 2 (practice strategy: restudy vs. testing) x 2 (practice mode: incidental vs. intentional) between-subject design in Chan and McDermott's (2007) list discrimination paradigm. After the study phase, the testing and restudy groups did the word-stem completion and semantic judgment tasks, respectively, but only the intentional groups were explicitly told to intentionally study or recall learned target words. The process-dissociation procedure was used to tease apart the contribution of effortful retrieval (recollection) and effortless retrieval (familiarity) in the final recognition test. The testing effect was modulated by recollection in the intentional groups, but not in the incidental groups. The intentional testing group also showed higher recollection than the incidental testing group, indicating the essential role of effortful retrieval in producing the testing effect.

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(2067)

**The Testing Effect in Expository and Narrative Texts.** BENTON H. PIERCE, TASIA B. WILLHITE and JESSICA E. MCMINN, *Texas A&M University-Commerce*—A number of studies have examined the benefits of intermediate testing on memory for text material, a phenomenon known as the testing effect. However, these studies have predominantly used expository texts, which are explanatory and descriptive in nature. In the present study, we investigated whether the testing effect would generalize to narrative texts, which are story-like in nature and have a more familiar and straightforward structure than that of expository texts. Participants read either an expository or narrative text, and then either restudied the passage three successive times or attempted to free recall information three successive times after the initial reading. Although we found a standard testing effect for the expository passage, no testing effect was found for the narrative passage. These findings suggest that intermediate testing may be less beneficial when text material consists of events that are causally or thematically related.

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(2068)

**The Role of Elaboration in the Testing Effect.** LEONORA C. COPPENS, KAREN DI SCHUIL, JAN W. VAN STRIEN, PETER P.J.L. VERKOEIJEN and REMY MJP RIKERS, *Erasmus University Rotterdam*—Elaboration is often considered to be a factor in the emergence of the testing effect (i.e., tested information is retained better than restudied information in the long term). According to elaboration theories of the testing effect, retrieval of studied information causes activation of elaborative information related to the target. This activated information facilitates retrieval at a final test. In the present experiment, we manipulated elaboration and retrieval separately to investigate the role of elaboration in the testing effect.

Participants studied sentences about events through restudy or retrieval. We instructed participants to 'just repeat' the sentences (low elaboration condition), or to 'imagine what is described' (high elaboration condition). Participants took a final cued recall test directly after studying or after a week. Whether elaboration instructions enhance or reduce the effects of testing will be discussed along with theoretical implications.

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(2069)

**Response Modality is Irrelevant in Determining the Strength of the Testing Effect.** ADAM L. PUTNAM and HENRY L. ROEDIGER, *Washington University in St. Louis*—Retrieval practice has been shown to be an effective way to enhance memory. Does response modality influence the strength of the testing effect? For example, on a first test, will typing or speaking answers lead to better performance on a second test? Or will just thinking about the answer yield the same benefits as actually producing it? Experiment 1 shows that typing and speaking responses leads to similar performance on a final test, and are comparatively better than making a delayed JOL. Experiment 2 uses a timing procedure to directly compare whether just thinking about an answer will yield the same benefit as explicitly producing it, and shows that both covert and overt retrieval lead to similar performance on a final test. Both experiments suggest that the testing effect is driven by the act of retrieval, and the specific response modality is irrelevant in determining performance.

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(2070)

**Adaptive Memory: Enhanced Location Memory After Survival Processing.** JAMES S. NAIRNE and JOSHUA E. VANARSDALL, *Purdue University*, JOSEFA N.S. PANDEIRADA, *University of Aveiro*, JANELL R. BLUNT, *Purdue University*—Two experiments investigated whether survival processing enhances memory for location. From an adaptive perspective, remembering that food has been located in a particular area, or that potential predators are likely to be found in a given territory, should increase the chances of subsequent survival. Participants were shown pictures of food or animals located at various positions on a computer screen. The task was to rate the ease of collecting the food or capturing the animals relative to a central fixation point. Surprise retention tests revealed that people remembered the locations of the items better when the collection or capturing task was described as relevant to survival. These data extend the generality of survival processing advantages to a new domain (location memory), with new stimulus materials (pictures rather than words), and using a task that does not involve rating the relevance of items to a scenario.

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(2071)

**Testing Over Time: The Effect of Retention Interval.** CHRISTOPHER A. ROWLAND and EDWARD L. DELOSH, *Colorado State University* (Sponsored by Anne Cleary)—Although testing is a robust method by which one can enhance the retention of learned material, the presence and magnitude of the benefit is commonly thought to vary with the duration of the retention interval, such that longer delays yield larger testing effects. Across two experiments, we examined the testing effect for a variety of short durations. Following initial study of word lists, participants received either an intervening test or an additional study opportunity. Afterward, participants were given a 1, 5, or 10 minute distracter between the intervening re-exposure of the material and a final free recall test. For items successfully retrieved on the intervening test, testing yielded better final recall than additional study in all conditions. The magnitude of the testing advantage significantly decreased with longer delays, in contrast to existing characterizations of the testing effect. Implications regarding alternative analyses of testing effect data are also discussed.

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(2072)

**Concept Mapping as a Retrieval Practice Activity.** JANELL R. BLUNT and JEFFREY D. KARPICKE, *Purdue University* (Sponsored by James Nairne)—Practicing retrieval produces better long-term retention than concept mapping, an activity in which students create node-and-link diagrams of concepts in a text (Karpicke & Blunt, 2011). Most previous research has used concept mapping as an elaborative study method, not as an activity requiring students to practice retrieval. We examined concept mapping as a retrieval practice method. Students read educational texts and practiced retrieval either by writing down as many ideas as they could recall (standard free recall instructions) or by creating a concept map. One week later, students took a final test that assessed comprehension and inferencing. Both retrieval practice methods – free recall and concept mapping – produced better performance than elaborative studying with concept mapping, but the two retrieval practice methods themselves did not differ on final test performance, judgments of learning, or ratings of enjoyment, interestingness, or difficulty. Concept mapping can be used as an effective retrieval practice activity.

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## ● SELECTIVE ATTENTION II ●

(2073)

**Selection and Response Processes Underlie Priming of Popout.** BRYAN R. BURNHAM, YANA KIM and SUSANNAH P. BRUNO, *University of Scranton*—Intertrial facilitation and interference effects are ubiquitous in the visual search literature. Some models suggest that intertrial effects reflect a priming mechanism that influences early attentional selection processes; whereas others suggest that



intertrial effects reflect later response-retrieval processes. Lamy, Yashar and Ruderman (2010) proposed a dual-stage account, where intertrial effects reflect both selection and response processes. We used the Priming of Popout (PoP) effect to explore this account. PoP is the finding that singleton search is faster when a target and nontargets are repeated, compared to switched, across trials. Consistent with this dual-stage account, PoP was influenced by response repetition: PoP was observed when a response switched between trials, but was larger when a response was repeated. This response repetition effect was associated only with intertrial facilitation, not interference. Vincentized analyses confirmed that PoP reflects both selection and response-retrieval processes, and that response-repetition effects are localized to intertrial facilitation.

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(2074)

**Feature Selection Strategies and Perceptual Expertise in Configuration Search Tasks.** LINDSEY M. KITCHELL, FRANCISCO J. PARADA, BRANDI L. EMERICK and TOM A. BUSEY, *Indiana University, Bloomington*—Configurations of simple objects often play a role in real world visual search tasks. For example, diagnosing a dislocated joint in an x-ray or individualizing a fingerprint to a single person are both tasks in which the relative locations of features are more important than the identity of simple features. To study the nature of perceptual expertise in a search task in which configurations define the target, we collected eyetracking data while participants played the video game Bejeweled. Participants excel at this task by attending to particular configurations of pieces and ignoring others. We analyzed the eyetracking data at every 30ms interval and we computed the potential point value of that gaze location. We defined a set of meaningful and misleading templates and determined how often experts and novices fixated on each. This statistical feature induction reveals the nature of the strategies that underlie perceptual expertise in this domain.

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(2075)

**Testing a Model of Lag-1 Sparing Between Two Targets in the Same Or Different Locations With Behavior and EEG.** MINGXUAN TAN and BRAD WYBLE, *Syracuse University*—How does spatial proximity affect the encoding of two targets at lag-1 in a rapid serial visual presentation (RSVP) paradigm? A revision of the Episodic Simultaneous Type Serial Token (eSTST) model suggests that targets appearing in the same location at lag-1 are jointly encoded into memory, while spatially separated targets are encoded serially as attention visits one and then the other. Using a dual RSVP paradigm, the current studies seek to validate behavioral and electrophysiological predictions made by the model as to how the brain processes two lag-1 targets when they appear in the same location or different locations. T2 identification accuracy was reduced, but temporal order

accuracy was enhanced for spatially separated targets, confirming the model's behavioral predictions. In EEG, a difference in the amplitude of the P3 between the same-stream and the different-stream conditions matched the model's prediction but there were other differences that the model did not predict.

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(2076)

**Both the Target Prevalence and Importance Influence Radiologists' Miss Rates in the Lesion Searches.** RYOICHI NAKASHIMA, *Tohoku University*, ERIKO MAEDA, TAKEHARU YOSHIKAWA, IZURU MATSUDA and SOICHIRO MIKI, *The University of Tokyo Hospital* KAZUHIKO YOKOSAWA and CHISAKI WATANABE, *The University of Tokyo*—In screening tasks, rare targets are often missed (the prevalence effect; e.g., Wolfe et al., 2005). Previous studies (Nakashima et al., 2009, 2010) suggest that a strong recognition of the importance of lesions can be effective in preventing missed identifications of rare lesions. The present study used a visual search task to investigate a direct relationship between target importance and target prevalence. Importance and prevalence of targets were orthogonally manipulated in searches for a tumor on computed tomography (CT) images. Participants were novices and radiologists. Results indicated that both novices and radiologists missed targets more often in the low than in the high prevalence conditions. Further, for radiologists miss rate in the low importance condition was much higher than in the high importance condition. This indicates that radiologists may have a specialized ability to detect highly important lesions based on the recognition of the importance of lesions.

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(2077)

**Binding, Aging and Emotion in Taboo Stroop Tasks: Data and Theories.** ELIZABETH R. GRAHAM, *Pomona College; Claremont Graduate University*, LAURA W. JOHNSON and DONALD G. MACKAY, *University of California, Los Angeles*, DEBORAH M. BURKE, *Pomona College*—Two experiments demonstrated four theoretically significant, age-invariant effects of emotion in the taboo Stroop paradigm. Taboo Stroop interference is longer color naming latencies for taboo than neutral words. Taboo context memory enhancement is better recognition of color or location of taboo than neutral words. Taboo event memory enhancement is better recall of taboo than neutral words. Repetition by consistency by contextual feature interactions for taboo words refer to greater reductions in color naming latencies with repetition of taboo words in consistent colors than consistent locations. All four effects remained constant with aging, contrary to predictions of inhibitory deficit theory and socio-emotional selectivity theory, but consistent with binding theory, where emotional



stimuli trigger age-invariant reactions prioritizing binding of contextual features to the source of emotion. Unlike resource capacity and inhibitory theories, binding theory also predicted the repetition by consistency by contextual feature interaction observed for taboo words.

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(2078)

**Intent to Remember and Von Restorff (Isolation) Effects Reveal Attentional Processes.** RICHARD A. BLOCK and KRISTA D. MANLEY, *Montana State University*—A classic finding in the memory literature is that subjects remember items that are isolated, distinctive, or salient compared to items lacking in these characteristics. This finding is usually attributed to von Restorff (1933). Block (2010) found that intent to remember a specific type of picture also enhances the subsequent recognition of it, and he suggested that increased attention to target stimuli is implicated. The present study focused on the possible link between the attentional processes involving both of these effects. Subjects saw a series of various types of pictures, with some subjects being instructed to remember targets, such as human faces. The intentional memory effect was replicated. Other findings clarify the relationship between the von Restorff and intent-to-remember effects.

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(2079)

**Clutter Slows Visual Search but Improves Contextual Cueing.** AMANDA E. VAN LAMSWEERDE and MELISSA R. BECK, *Louisiana State University*, MAURA C. LOHRENZ, *Naval Reserch Laboratory*, HUY TRAN, *Louisiana State University*—When searching for a target, response times decrease when search stimuli are repeated, possibly because memory guides attention to target locations (contextual cueing; Chun & Jiang, 1998). However, memory is not always used to improve search efficiency (Kunar, Fusberg, & Wolfe, 2008). This experiment tested the hypothesis that memory is more likely to be used to guide visual search as search becomes very difficult. Participants searched for a target in maps of low, medium, or high clutter. Response times increased as clutter increased. Furthermore, response times decreased for repeated high-clutter maps, but not for repeated low- or medium-clutter maps. The number of fixations on high-clutter maps also decreased with repetition, demonstrating that search became more efficient. These results support the hypothesis that participants will use memory to guide visual search if the search task is sufficiently difficult.

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(2080)

**Hypothesis Generation in a Probabilistic Visual Search Task.** DANIEL R. BUTTACCIO and SOWON HAHN, *University of Oklahoma*, NICHOLAS D. LANGE, *University of London Birkbeck*—In a series of experiments we investigated how participants utilize probabilistic

environmental information in a visual search task. Participants searched an array for a rotated “T” amongst rotated “Ls”, with each item being unique in color. On each trial a background appeared prior to (and during) the array. The probabilistic relationship between the background(s) and the identity of the upcoming target was manipulated in order to provide complete, partial, or no diagnostic information as to the forthcoming target. The current results indicate that participants were only able to use the probabilistic cues when the relationship between the background and target likelihood was explicitly developed. However, under implicit learning participants were unable to utilize the diagnostic background cues to aid search and relied on a less effective heuristic of color diagnosticity. We suggest that successful utilization of probabilistic environmental cues is mediated by memory retrieval in the process of hypothesis generation.

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(2081)

**Capturing Attention: Effects of Ancient and Modern Threatening Stimuli on Attentional Blink.** SERGE ONYPER, ALAN SEARLEMAN and MEGAN DERBY, *St. Lawrence University*—The current study examined the effects of ancient and modern threatening stimuli on attentional blink. The evolved fear hypothesis would predict that ancient threatening stimuli (e.g., snakes and spiders) capture attention more efficiently compared to other threatening or non-threatening stimuli. The relevance superiority hypothesis suggests that both ancient and modern threats (such as guns and syringes) capture attention equally well. Hence, the relevance of threat, rather than its evolutionary origin, should lead to a more efficient attentional response. Results indicated that compared to non-threatening stimuli, both modern and ancient threatening stimuli captured attention more effectively compared to neutral stimuli up to 375 ms. There was no difference in detection accuracy of ancient and modern threats. We conclude that the human ability to allocate attention is influenced by the relevance of threat, rather than its phylogenetic origin.

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(2082)

**Is Attention Biased Toward Mood-congruent Stimuli? The Effect of a Negative Mood Induction on Attention to Emotional Images.** KRISTIN R. NEWMAN and CHRISTOPHER R. SEARS, *University of Calgary*—Researchers have documented attentional biases in the processing of emotional information, such that positively and negatively valenced stimuli are given priority and attended to more than neutral stimuli (e.g., Yiend, 2010). This phenomenon is thought to reflect either a mood-congruent processing bias or a mood regulation strategy. To distinguish between these accounts, participants experienced a negative mood induction and its impact on their attention to emotional images was assessed, relative to another group

of participants who experienced a neutral mood induction. All participants viewed sets of negative, positive, and neutral images while their eye fixations were tracked and recorded, to assess the amount of attention each type of image received over an 8 second trial. Recognition memory for the images was evaluated 14 days later. We found that attention to emotional images was affected by a negative mood induction, but not in a manner consistent with a mood-congruent processing bias.

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(2083)

**What Stimulus Attributes are Enhanced by Attention?** WILLIAM PRINZMETAL, ARIEL ROKEM and MICHAEL A. SILVER, *University of California, Berkeley*—In studies of visual attention, performance is often rendered difficult by degrading the stimulus (adding noise, reducing contrast). We investigated the impact of several types of stimulus degradation on the perceptual effects of voluntary spatial attention. Subjects performed orientation judgments on Gabor patches, and spatial attention was directed using spatial-cueing paradigms. In the first experiment, subjects performed an orientation discrimination made difficult by making the orientation difference small. The second experiment employed an anti-cueing design in which the cue instructed subjects to perform a discrimination in an opposite location. External white noise was added to the targets to make their detection difficult, and orientation thresholds were obtained. In both experiments, voluntary attention affected accuracy, but involuntary attention did not. In Experiments 3-5, predictive cues were used. Performance was limited by adding external noise in Experiment 3 and by using low-contrast stimuli in Experiment 4. Experiment 5 replicated Experiment 1 with fiduciary markers to eliminate possible effects of location uncertainty. The results suggest that attention enhances both fine and coarse orientation discrimination

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(2084)

**Mind-Wandering Along Familiar Routes: A Driving Simulator Study.** MATTHEW R. YANKO and THOMAS M. SPALEK, *Simon Fraser University*—We have shown that, as drivers become more familiar with a route, they respond less promptly to sudden events. This was attributed to increased mind-wandering along familiar routes. To date, however, our investigations of this effect have been limited to responses to peripheral events (e.g., a dog running onto the road). Still unclear is how route-familiarity affects other variables (e.g., following behaviour, RT to central events). In the present work, participants followed a vehicle along a route with which they were either familiar or unfamiliar. During the experimental session, the lead-vehicle braked at random locations, forcing participants to brake to avoid a collision. Participants were also required to respond with a button press when they noticed pedestrians heading towards the road from a sidewalk. In Exp. 1 we found that familiar drivers follow the lead vehicle more closely, brake more aggressively, and are slower to notice approaching

pedestrians. In Exp. 2, with following distance held constant, RTs to central and peripheral events were longer for familiar drivers. Consistent with the mind-wandering hypothesis, all these effects were eliminated in Exp. 3 when drivers were made to focus on the driving task.

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## ● COGNITIVE CONTROL II ●

(2085)

**Electrophysiological Evidence for Sensitization of Somatic Threat Detectors.** ROBERT DOWMAN, NINA CAREY and GREGORY DORCHIES, *Clarkson University*—Our previous work using the Posner cuing paradigm suggests that the attentional bias towards painful electrical target stimuli is either due to a stimulus-driven threat detection process, where somatic threat detectors in the dorsal posterior insula facilitate the shift of attention towards the unattended threat, or to attentional set, where the subject voluntarily allocates attention to a possible painful target even when cued to attend elsewhere. We tested these hypotheses by presenting painful and weak non-painful electrical target stimuli in the same block. The electrophysiological data revealed that both the painful and non-painful stimuli activated the somatic threat detectors. This contrasts with our earlier studies showing that non-painful stimuli do not activate the threat detectors when they are presented in the absence of any painful stimuli. This suggests that the threat detectors become sensitized to non-threatening somatic stimuli when they are presented in the same context as somatic threats.

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(2086)

**The Effect of Shifting Location on Cognitive Control.** JASON F. REIMER, *California State University, San Bernardino*, GABRIEL A. RADVANSKY, *University of Notre Dame*, THOMAS C. LORSBACH, *University of Nebraska at Omaha*, JOSEPH J. ARMENDAREZ, *California State University, San Bernardino*—According to goal maintenance theory (e.g., Braver & West, 2008), cognitive control is based on one's ability to represent and maintain goal information in working memory. Recently, Zacks et al. (2007) proposed that event segmentation is a control process that regulates the contents of working memory. Together, these two theories lead to the prediction that in some cases shifts in spatial location may improve the representation and maintenance of goal information in working memory. The results of four experiments showed that when cues and probes were in different locations, goal information was represented and maintained better than when they were in the same location. The shift effects found in these experiments were (a) specific to location and, thus, were interfered with by other forms of spatial processing (e.g., mental rotation), and (b) were not caused by general differences (or similarities) in features of the cues and probes (e.g., color).

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(2087)

**Can Performance in Task-Cuing Experiments Be Explained in Terms of Associative Learning?** C. FORREST, S. MONSELL and I.P.L. MCLAREN, *University of Exeter*—Although task-cuing experiments are typically presented as explorations of high-level cognitive control, most can be construed in associative learning terms, and are often formally equivalent to conditional discrimination experiments. This raises the question of whether standard associative learning mechanisms can account for typical task-switching phenomena. We presented human subjects with a cue followed after either a short (100 ms) or long (1200 ms) interval by one of four digits. One group was instructed with task rules— e.g. if pink background, classify digit as odd/even, if blue, as high/low (task-rule condition). A second group of subjects was instructed or trained on specific cue + stimulus → response mappings (CS-R condition). Switch costs were observed even in the CS-R condition. However, the pattern of switch costs, response congruence and preparation effects suggests associative retrieval of responses in the CS-R group but rule-based classification by the task-rule group. Email: I.P.L. McLaren, [i.p.l.mclaren@exeter.ac.uk](mailto:i.p.l.mclaren@exeter.ac.uk)

(2088)

**Reward Modulates Adaptive Binding in Cognitive Control.** SENNE BRAEM and TOM VERGUTS, *Ghent University*, CHANTAL ROGGEMAN, *Karolinska Institutet, Stockholm*, WIM NOTEBAERT, *Ghent University*—Cognitive control was recently conceptualized as a binding process strengthening task-relevant associations (Verguts & Notebaert, 2008; 2009). In addition, various studies have demonstrated how reward increases binding (e.g. Colzato, van Wouwe, & Hommel, 2007; Kelley, 2004; Reynolds, Hyland, & Wickens, 2001; Waszak & Pholulandeth, 2009). Combining these two ideas, we predicted that reward interacts with trial-to-trial adaptations in cognitive control. We tested this combining both a single flanker task (Experiment 1) and a task switch paradigm (Experiment 2) with rewards. Both experiments confirmed that adaptations after conflict were enhanced when preceded by reward. Moreover, individual differences, as measured by the Behavioural Activation Scale, show that participants' sensitivity to reward predicted modulation of these trial-to-trial adaptations. Email: Senne Braem, [senne.braem@ugent.be](mailto:senne.braem@ugent.be)

(2089)

**Affect-Movement Incompatibility Impairs Evaluation and Counting.** CHRISTOPHER A. STEVENS and CHRISTINA E. JOHNSON, *Penn State University*, RICHARD A. CARLSON, *Penn State University*—Previous research suggests that affective signals influence cognitive control. Here we explore the impact of activating these codes on event counting, a cognitive task that requires sustained cognitive control. Participants evaluated words as positive or negative by moving them to the right or left. In

addition, they counted the number of positive and negative words in each trial. The congruity of the mapping between the affective value of the word and the movement direction varied between subjects. In the congruent condition, participants moved positive words in a positive direction (to the right) and negative words in a negative direction (to the left). This mapping was reversed in the incongruent condition. Participants in the incongruent condition showed a marked decrease in both counting accuracy and evaluation accuracy, but little systematic bias in counting errors. Results suggest that mismatches between affective codes can interfere with updating the contents of working memory. Email: Richard A. Carlson, [racarlson@psu.edu](mailto:racarlson@psu.edu)

(2090)

**The Contribution of Inner Speech to Cognitive Control: The Effects of Articulatory Suppression in a Go/No-Go Task.** MIRANDA M. RIETER and AKIRA MIYAKE, *University of Colorado at Boulder*—In this study, we systematically examined the role of inner speech with in a go/no-go task to understand if people are recruiting language for this task, and, if so, exactly in what way. It is hypothesized that inner speech will be spontaneously used for the task and that it will assist in response inhibition in no-go trials but not in go trials. This paradigm is based on Duncan et al.'s (2008) go/no-go paradigm where certain rules are mapped onto go trials and other rules are mapped onto no-go trials. In Experiment 1, articulatory suppression led to significantly reduced accuracy in no-go trials. Because go trials were more frequent in Experiment 1, Experiment 2 varied the frequency of go and no-go trials and showed the same pattern of results for no-go trials in both frequency conditions, thus ruling out the possibility that inner speech contributes more on less frequent trials. In Experiment 3, the rules for go and no-go trials were reversed to show that the effects were not specific to the rules or the pairings of the rules and that participants were still less accurate in no-go trials under articulatory suppression. These results suggest that people are recruiting inner speech to help them stop in this task. Email: Akira Miyake, [akira.miyake@colorado.edu](mailto:akira.miyake@colorado.edu)

(2091)

**Are S-R Rules Represented Phonologically for Task-Set Preparation and Maintenance?** FELICE VAN 'T WOUT and STEPHEN MONSELL, *University of Exeter*—Accounts of task-switching generally assume that the current task's stimulus-response (S-R) rules must be elevated to and maintained in a privileged state of activation. There is some evidence that phonological representations might be involved in task-set preparation, but the nature of this contribution remains unclear. In three experiments we tested the hypothesis that the phonological buffer is used to represent S-R rules, by manipulating the word length or phonological similarity of the stimulus terms in a task-cuing paradigm. Participants switched between classifying sets of images depicting nouns of longer or shorter spoken duration

(Experiment 1), or between sets of consonants (Experiment 2) or objects (Experiment 3) with phonologically similar or dissimilar names. Neither manipulation affected task switching performance. An effect of phonological similarity could be detected only at the start of practice, suggesting a very transient role of the phonological buffer in representing S-R rules.

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(2092)

**Verbal Short Term Memory Contributions to Task Choice and Performance.** CHRISTINA WEYWADT and KARIN M. BUTLER, *University of New Mexico*—The role of passive verbal short term memory in both top-down and bottom-up task choice and performance processes was examined in two voluntary task switching experiments. We manipulated preparatory interval, bottom-up influences on task choice (stimulus repetitions or stimulus changes) and whether the concurrent task prevented the use of verbal short term storage (i.e., articulatory suppression) or not (i.e., foot-tapping). Preliminary evidence suggests that available phonological loop resources support random task choice, especially when the environment biases choice based on bottom-up processes, but these effects do not interact with preparation interval. Task switch, but not repetition, performance is slowed by a verbal load.

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(2093)

**The Time Course of Uncertainty and Perceptual Responses.** ALEXANDRIA C. ZAKRZEWSKI, BARBARA A. CHURCH and J. DAVID SMITH, *University at Buffalo*—Shiffrin & Schneider (1977) hypothesized that indeterminate internal representations and inconsistent representation-response mappings create the need for controlled processes that resolve indeterminacy and mediate inconsistency. These controlled processes were assumed to be more deliberate, more voluntarily, and slower to unfold. However, whether humans' uncertainty responses (avoiding difficult questions because of lack of knowledge) have a different or slower time course than the primary perceptual responses in psychophysical tasks remains unexplored. The purpose of the present study was to explore the time course of the uncertainty response compared to primary responses in a psychophysical discrimination task. In a series of experiments, we found that under short decision deadlines (600 ms), unlike primary perceptual responses, uncertainty responses were greatly reduced, suggesting that uncertainty responding is a slower more controlled decisional process in humans. The results are discussed in terms of the role of conscious controlled processes in metacognition and uncertainty.

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(2094)

**Differential Interference Effects of Negative Emotional States on Subsequent Semantic and Perceptual Processing.** MICHIKO SAKAKI, *University of Southern California*, MARISSA A. GORLICK, *University of Texas, Austin*, MARA MATHER, *University of Southern California*—Encountering negative events can interfere with cognitive processing of subsequent stimuli. The present study investigated whether encountering negative events has similar interference effects across different types of cognitive processing. Presentation of negative pictures produced slower reaction times than neutral or positive pictures in multiple tasks that require semantic processing, such as natural/man-made judgments about drawings of objects, commonness judgments about objects, and categorical judgments about pairs of words. In contrast, negative picture presentation did not interfere with subsequent perceptual judgments (e.g., color or size judgments about objects and words). The subjective arousal level of negative pictures did not modulate the interference effects on semantic/ perceptual processing. These findings suggest that encountering negative emotional events impairs only some types of subsequent cognitive processing. In general, it interferes with semantic processing of subsequent stimuli more strongly than perceptual processing, regardless of arousal.

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(2095)

**The Combined Attention Systems Test: Simultaneous Measurement of Endogenous Control of Orienting, Timing, and Filtering.** MICHAEL A. LAWRENCE, SHANNON A. JOHNSON and RAYMOND M. KLEIN, *Dalhousie University* (Sponsored by Jean Saint-Aubin)—The Attention Network Test (ANT) is a simple computerized game that promises measurement of multiple facets of attention within a short administration period. In recent years, studies employing the ANT have proliferated, likely due to the ease of administration and early results supporting the psychometric properties of the ANT. However, subsequent critiques have identified deficiencies in the ANT, both theoretical and psychometric. We present a new tool, the Combined Attention Systems Test (CAST). Preliminary normative data suggest reliable measurement of 4 phenomena of attention: (1) endogenous temporal orienting; (2) arrow-induced spatial orienting; (3) flanker conflict resolution; (4) spatial Stroop conflict resolution. Furthermore, the data provide evidence for several reliable interactions: super-additivity between (1) and (2), sub-additivity between (2) and (3), sub-additivity between (2) and (4), and sub-additivity between (3) and (4). These interactions have important theoretical implications that will be elaborated.

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(2096)

**Generalization/Discrimination and Conflict Adaptation Effects.** THOMAS HUTCHEON and DANIEL H. SPIELER, *Georgia Institute of Technology*—Performance in interference tasks is better when the current trial is preceded by an incongruent relative to a congruent trial, referred to as the conflict adaptation effect (Botvinick et al., 2001). We argue that some or all of this effect is due to the observer updating of the estimate of informativeness of stimulus dimensions. If so, the influence of prior trials depends on how individuals generalize across items or discriminate between items. Conflict adaptation effects occur when generalization is encouraged as when all words are equally associated with specific conditions and responses. We show that conflict adaptation does not occur when discrimination is encouraged as when individual words are differentially associated with conditions and response. We demonstrate that the presence or absence of the conflict adaptation effect can be manipulated within individuals by varying item properties to either encourage generalization or discrimination.

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(2097)

**Putting Attention Back in Control: Transfer Between Lists of Different Congruency Proportions is Asymmetrical.** EVAN F. RISKO, *Arizona State University*—The proportion of congruent trials in a Stroop task has a strong impact on the magnitude of the Stroop effect. This result is typically understood in terms of the proportion congruent modulating the extent to which the participant attends to the irrelevant dimension. This account makes the interesting prediction that transitions between different proportion congruent conditions should be asymmetrical. If a low proportion congruent reduces attention to the irrelevant dimension, then this should decrease the likelihood of noticing a change in the utility of the information on that dimension. If a high proportion congruent increases attention to the irrelevant dimension, then this should increase the likelihood of noticing a change in the utility of the information on that dimension. A test of this idea supports the prediction; specifically there is asymmetrical transfer between different proportion congruent conditions. The implications of this result for understanding cognitive control are discussed.

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(2098)

**The Shielding Function of Task Sets and Its Relaxation During Task Switching.** GESINE DREISBACH, *University of Regensburg*, DORIT WENKE, *Technical University of Berlin*—In order to pursue goal directed behavior, the cognitive system must be shielded against distraction but this shielding should be relaxed in response to changing demands from the environment. Two task switching experiments were conducted where an irrelevant stimulus feature was varied randomly, orthogonal to the task. The presence or absence of an interaction of the

irrelevant feature (switch vs. repetition) and the response (switch vs. repetition) was taken as evidence for the absence or presence of task shielding, respectively. Replicating previous results, irrelevant feature and response did not interact on task repetitions, indicating successful shielding. On task switches however, the irrelevant feature interacted with the response, supporting the assumption that task shielding is temporarily relaxed during task switching.

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## ● SPEECH PERCEPTION II ●

(2099)

**Interaction of Prior and Subsequent Context in Spoken Word Recognition.** CHRISTINE M. SZOSTAK and MARK A. PITT, *Ohio State University*—Speech can contain lexical ambiguities, such as when an extraneous noise masks phonemes distinguishing a word from its lexical competitors (e.g., "?ing" where "wing, ring, sing" are all possible). Yet listeners appear to recognize the word intended by the talker with minimal effort. When semantic context follows an ambiguity (e.g., "The ?ing had feathers"), such context aids resolution of the ambiguous word. Little is known about how such effects are modulated by prior context (e.g., "The veterinarian said that the ?ing had feathers"). We explored this question by measuring changes in recognition induced by subsequent context when a prior context was either present or absent. Findings suggest that prior context weakens but does not eliminate the effect of subsequent context on lexical selection. Implications for theories of spoken word recognition will be discussed.

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(2100)

**Effects of Reading Task on Attentional Span During Reading.** JOHANNA K. KAAKINEN and JUKKA HYONA, *University of Turku*—This study examined whether reading task influences the size of the attentional span during reading using the eye-movement contingent display change paradigm. In Experiment 1, thirty participants read sentences containing adjective-noun pairs while their eye movements were recorded. The size of the display change effect on the noun (its letters were initially replaced with random letters) was examined during proofreading vs. reading for comprehension. The results showed that the size of the change effect did not depend on the reading task. In Experiment 2, thirty-six participants read a long expository text describing four different countries from one of two possible perspectives ("Imagine that you will have to move to Honduras / Pitcairn Island") or with the instructions to read for comprehension. The size of the change effect on target words within predefined perspective-relevant and -irrelevant sentences was examined. The results are discussed in the light of the current theories of eye movement control during reading.

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## (2101)

**Listening To Speech in Noise: Older Listeners' Individual Differences in a Speeded-Response Task.**

ALEXANDRA JESSE, *University of Massachusetts, Amherst*, ESTHER JANSE, *Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands*—Older listeners are more affected than younger listeners by background noise. In this study, we examined which perceptual and cognitive abilities contribute to older listeners' individual differences in recognizing speech in various listening conditions. Unlike in previous studies, we tested older adults in a speeded-response task where processing time, and hence post-perceptual processing, was limited. Sixty-six older adults with varying degrees of hearing loss were asked to press a button when they detected the phoneme 'p' in meaningful sentences. Accuracy and response speed were to be maximized. The to-be-monitored speech stream was presented alone or with an informational masker (single-speaker noise) or an energetic masker (matched speech-shaped noise). Target detection was affected by both types of noise. Detections were slower and less accurate in the informational than in the energetic masking condition. Results of testing hearing acuity, temporal processing, attentional abilities, and working memory as predictors will be discussed.

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## (2102)

**Phonetic Convergence after Perceptual Exposure to Native and Nonnative Speech: Comparison of Findings from XAB Perception Tests and Acoustic Measurement.** MIDAM KIM and ANN R. BRADLOW, *Northwestern University*—This study investigates phonetic convergence by native English speakers after exposure to speech by a native or a nonnative speaker of English. Model speakers were two native speakers of English and two high proficiency speakers of Korean-accented English. Participants 1) read two sentence sets, 2) were then exposed to one of the sentence sets either through auditory (experimental group 1 & 2) or visual inputs (control groups 1 & 2), and 3) read the sentence sets again. Pre-exposure and post-exposure readings were compared by XAB perception tests and acoustic measurement of sentence duration and pitch range. Results from the XAB perception tests illustrate that listeners judged participants as having converged towards one of the two native models and towards both nonnative models. The acoustic measurements show that the results from the XAB perception tests pattern with the pitch range of the sentences but not with the durations of the sentences.

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## (2103)

**Online Spoken Word Recognition is Sensitive to Phonological Rules.** ASHLEY W. FARRIS-TRIMBLE and BOB MCMURRAY, *University of Iowa*—While phonetic processes like coarticulation clearly affect spoken word recognition, the influence of abstract phonological processes has been debated. We taught participants an artificial lexicon in which nasal prefixes required voicing in the following consonant, resulting in alternations [tos@an#dos] and non-alternating forms [dof@an#dof]. After training, we measured real-time activation of the words with an eye-tracking paradigm. Experiment 1 (N=53) showed that in contexts supporting alternation [an#d...], participants fixated referents in which the segment was underlying (/dof/) and referents in which it resulted from alternation (/tos/). Thus, the phonological processes that produce words affect the lexical competitor set. In experiment 2 (N=16), the alternating form of some words was withheld during training. The Experiment 1 findings held for trained words but did not generalize. Thus, words that are similar because of phonological processes do compete during word recognition, but this may be attributed to stored lexical variants rather than rule application.

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## (2104)

**The Role of Episodic Memory in Talker-Specific Adaptation.** ALISON M. TRUDE, *Department of Psychology, University of Illinois at Urbana-Champaign*, MELISSA C. DUFF, *Department of Neurology, University of Iowa Carver College of Medicine*, SARAH BROWN-SCHMIDT, *Department of Psychology, University of Illinois at Urbana-Champaign* (Sponsored by David Irwin)—Listeners usually understand various talkers' speech easily despite variability. While there is no consensus on how we learn and adapt to the speech characteristics of different talkers, one proposal is that we store talker-specific information in episodic memory. To test this proposal, 4 hippocampal amnesic patients with severe declarative memory impairment completed a task in which they heard 2 talkers, one with an unfamiliar accent where /æ/ raises to [eɪ] before /g/ (e.g., bag [beɪg]). Eye gaze was monitored as they viewed pictures of an -ack word (back), a same-onset -ag word (bag), and 2 unrelated words, and heard one of the talkers name a picture. When the accented talker said back, competition from bag should be reduced because it does not share a vowel with the target. If talker adaptation relies on episodic memory, the amnesic participants should fail. However, three of the four amnesics performed like healthy adults: On -ack trials, competition was reduced when hearing the accented, vs. the unaccented, talker. The participant who did not show adaptation had the most widespread damage. These results suggest that episodic memory may not underlie listeners' ability to use talker-specific knowledge when interpreting speech.

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(2105)

**Listen Closely: Recognition Memory for Foreign-accented Speech.** JESSICA E.D. ALEXANDER, TASHAUNA L. BLANKENSHIP and KRISTEN E.T. MILLS, *Concord University* (Sponsored by Lynne Nygaard)—Previous research has shown that difficult-to-read fonts led to better memory for printed content than easier-to-read fonts (Diedmand-Yauman, Oppenheimer, & Vaughan, 2011). The current study examined how spoken language presented in native and foreign accents may affect memory for auditory information. A recognition memory task with three study-test blocks was administered. During the study, listeners were presented with easy and hard monosyllabic words spoken by Spanish-accented and native English speakers. After a brief distracter task, they completed a recognition memory test in which they indicated whether the words had been heard previously. Listeners showed better recognition memory for Spanish-accented than for native English words and better memory for hard words than for easy words. As in previous research, less intelligible stimuli led to more accurate recognition than the more intelligible stimuli. Perceptually difficult linguistic stimuli may help participants to engage in deeper levels of processing for the linguistic content.

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(2106)

**Perceptual and Cognitive Predictors of Non-Native Phoneme Discrimination.** VERA KEMPE, *University of Abertay Dundee*, JOHN C. THORESEN, *University of Durham*, NEIL KIRK, *University of Abertay Dundee*, PATRICIA J. BROOKS, *City University of New York*, FELIX SCHAEFFLER, *Queen Margaret University Edinburgh*—We examined perceptual and cognitive predictors of successful discrimination of non-native phonological contrasts. Seventy-two adult native English speakers (36 men) performed AX discrimination tasks for Norwegian word pairs containing the /ç/-/ʃ/ consonant contrast, the /y/-/i/ vowel contrast, or the rising-dipping tonal contrast as well as for non-linguistic stimuli containing amplitude envelope rise time modulations, sine-wave replica of formants (F1/F2) or of tonal (F0) contours. Sensitivity (A') to the three Norwegian contrasts was positively correlated but differed significantly such that performance was best for consonants and poorest for tonemes. Gender and non-verbal IQ predicted performance on non-linguistic contrasts with men outperforming women. Sensitivity to sine-wave replicated tonal contours was the strongest predictor of performance on all three linguistic contrasts. These results underscore the importance of both basic auditory and complex cognitive processing abilities for adult non-native phoneme discrimination, and corroborate findings that men show an advantage in temporal auditory information processing.

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(2107)

**Individual Differences in the Ability To Discriminate Foreign Language Phonological Contrasts.** ANITA R. BOWLES, NOAH H. SILBERT, SCOTT R. JACKSON and CATHERINE J. DOUGHTY, *University of Maryland, Center for Advanced Study of Language*—Some foreign language phonological contrasts are difficult for adults to perceive and to acquire (Iverson et al., 2003). Although prior research has shown that training can improve discrimination of some contrasts, (e.g., Logan et al., 1991), little research exists on individual differences in discrimination ability prior to training. Our work on foreign language aptitude suggests that learners differ in the ability to acoustically discriminate difficult foreign language consonantal contrasts that would fall within a single native language phonemic category. We present results from a series of correlational studies that measured individual differences in the ability of English native speakers to make “same or different” judgments about sets of difficult Hindi consonant contrasts. Discrimination accuracy is described in relation to individuals’ performance on a series of cognitive and perceptual tests also hypothesized to measure foreign language aptitude, including executive control, working memory, long-term memory, perceptual/motor speed, and musical aptitude.

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(2108)

**Children’s Eye Movements When Reading Rotated Text: The Importance of Digraphs.** JULIE A. KIRKBY, *Bournemouth University*, RACHEL E. PYE, *University of Winchester*, PATRICIA M. RIDDELL, *Reading University*, SIMON P. LIVERSEDGE, *University of Southampton* (Sponsored by Hazel Blythe)—Digraphs are pairs of letters in words that combine to make one phoneme. We examined whether children represent digraphs in the lexical identification system. We measured eye movements as they read sentences containing a target word in one of four conditions: 1) no rotation, 2) digraph rotated congruently (where both letters were rotated in the same direction) 3) digraph rotated incongruently (each letter of the digraph was rotated in opposite directions) or 4) random rotation. Preliminary analyses showed a consistent effect of rotation congruency such that reading times for the congruent and control conditions were not different, but were reliably shorter than for the incongruent and random conditions which themselves were not different. This effect occurred for first fixation duration, gaze duration and total time on the target word. This suggests that digraphs are represented in the word identification system and are important during lexical access.

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## ● PSYCHOLINGUISTICS II ●

(2109)

**The Influence of Background Speech On Lexical Competition During Spoken Word Recognition.** SUSANNE M. BROUWER and ANN R. BRADLOW, *Northwestern University*—This study examined how background speech affects phonological competition during spoken word recognition. In a visual-world experiment, English participants listened to target words while looking at four pictures on the screen: a target (e.g. "candle"), an onset overlap competitor (e.g. "candy"), an offset overlap competitor (e.g. "sandal"), and a distractor (e.g. "lemon"). The target words produced by talker A were mixed with talker B's productions of the onset overlap competitor (Onset noise condition, e.g. "candle-candy") or with the offset overlap competitor (Offset noise condition, e.g. "candle-sandal") at a +2dB signal-to-noise ratio. Results showed that the competitor produced by the background talker was fully suppressed in both conditions such that listeners experienced competition only from the offset overlap competitor in the Onset noise condition, and only from the onset overlap competitor in the Offset noise condition. These findings suggest that the content of background noise can dramatically alter phonological competition patterns.

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(2110)

**Skilled Deaf Readers have an Enhanced Perceptual Span in Reading.** NATHALIE N. BELANGER and RACHEL I. MAYBERRY, *University of California, San Diego*, TIMOTHY J. SLATTERY, *University of South Alabama*, KEITH RAYNER, *University of California, San Diego*—Recent evidence suggests that deaf people have enhanced visual attention to simple stimuli in the parafovea/periphery in comparison to hearing people. Although a large part of reading involves processing the fixated words in foveal vision, readers also utilize information in parafoveal vision to pre-process upcoming words and decide where to look next. We addressed the question as to whether auditory deprivation affects low-level visual processing during reading and compared the perceptual span of deaf signers who were skilled readers to that of skilled hearing readers. Skilled deaf readers had a wider perceptual span relative to skilled hearing readers. These results provide the first evidence that deaf signers' enhanced attentional allocation to the periphery is used during a complex cognitive task such as reading.

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(2111)

**When Lexical Access for Ambiguous Words Can Be Reordered.** MALLORIE LEININGER and KEITH RAYNER, *UCSD* (Sponsored by Barbara Juhasz)—Readers experience processing difficulties when reading biased homographs preceded by subordinate biasing contexts.

Attempts to overcome this processing deficit by further instantiating the subordinate meaning have often failed to eliminate the subordinate bias effect. The present study examined the processing of biased homographs preceded by single-sentence contexts that instantiated the subordinate meaning. We varied whether this preceding context contained a prior instance of the homograph or a control word/phrase. Having previously encountered the homograph in its subordinate meaning earlier in the sentence reduced the subordinate bias effect for the subsequent encounter, while simply instantiating the subordinate meaning did not. We compared these reductions in reading times to conditions in which the dominant meaning was instantiated by preceding context that included either the homograph or a control word/phrase in order to verify that the reductions observed in the subordinate cases were not simply a benefit of recent lexical access through repetition.

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(2112)

**Syntactic Priming in Natural Language Comprehension: Evidence from Auditory Event-Related Potentials.** KERRY LEDOUX, TREVOR A. BROTHERS and BARRY GORDON, *Johns Hopkins University*—Recent event-related potential (ERP) evidence has demonstrated the existence of syntactic priming effects in the comprehension of written language. We sought to extend these findings by testing for syntactic priming effects during the comprehension of spoken sentences. In an auditory ERP experiment, we presented participants with target sentences containing reduced-relative clauses. Each target was preceded by a prime sentence that contained either a similar (reduced-relative prime) or a dissimilar (main-clause prime) syntactic construction. The results from this experiment were similar to those reported previously for visual stimuli: reduced-relative primes elicited a larger positivity (P600) than did main-clause primes, reflecting the greater syntactic parsing demands of these sentences. Reduced-relative targets that were preceded by a main-clause prime were more positive than the same target sentences following a reduced-relative prime. We conclude that the mechanisms underlying syntactic priming are similar across input domains (auditory and visual).

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(2113)

**Semantic Integration in Chinese Sentence Comprehension.** HSIN-CHIN CHEN, YI-TING TSENG and PENG-YU CHEN, *National Chung Cheng University*—Language comprehension involves semantic retrieving, selection, and integration. Whereas the bilateral activation, integration, and selection (BAIS) model suggested an important role of anterior middle/superior temporal gyri in semantic integration (Jung-Beeman, 2005), the memory, unification, and control (MUC) model proposed that semantic unification involved the activation of inferior

frontal gyrus (Hagoort, 2005). Applying the violation paradigm, Wang et al. (2008) and Zhu et al. (2009) suggested that the MUC model was better describing the semantic integration in Chinese sentence comprehension. However, it is arguable that their manipulation actually examined the semantic selection, and that semantic unification is different from semantic integration. The present study investigated semantic selection and integration by examining the constraint and the ambiguity effects in a Chinese sentence judgment task with blood flow changes monitored by near infrared spectroscopy (NIRS). Our results supported the important role of anterior temporal gyri in semantic integration proposed by BAIS model.

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(2114)

**Explaining the Verb-Repetition “Boost”: Interactions Between Verb Subcategorization and Syntactic Priming During Reading.** TREVOR A. BROTHERS, KERRY LEDOUX and BARRY GORDON, *Johns Hopkins University*—The interaction between verb-specific syntactic (subcategorization) information and syntactic priming effects were investigated using a self-paced reading paradigm. Verbs that regularly participate in reduced relative (RR) clauses, as determined by corpus analysis (“The woman burdened by her parents..”) showed smaller garden path effects relative to verbs that poorly predict an upcoming RR clause (“The soldier pleaded by his wife..”). Syntactic priming effects (a reduction in the reading time of a target sentence, relative to a prime sentence containing the same verb in the same structure) were observed only for verbs that occurred infrequently in RR constructions in the corpus. These results suggest that exposure to syntactic primes can update a verb’s subcategorization preferences, and that this updating mechanism may account for the verb-repetition “boost” seen during syntactic priming.

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(2115)

**Processing Relative Clauses in Supportive and Biasing Contexts.** WILLIAM R. BATTINICH and WILLIAM H. LEVINE, *University of Arkansas* (Sponsored by Joel Freund)—In a self-paced reading experiment, subjects read English object- and subject-extracted relative clauses (RCs) embedded in three types of contexts. One context referentially licensed both the object and subject RCs, and the other contexts were biased toward only the object RCs or only the subject RCs. Subject RCs were read faster than object RCs when the contexts licensed both clause types and when the contexts were biased toward subject RCs. However, when the contexts were biased toward object RCs, reading times for object and subject RCs did not differ. The results offer two important findings. First, a referentially-supportive context which licenses both subject and object RCs may not support both equally, demonstrated by the usual object-subject RC reading-time difference when both clause types were referentially licensed. Second, supportive

biasing contexts may reduce the object-subject reading time difference, possibly through expectation-based or referentially-based mechanisms.

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(2116)

**Effects of Information Status and Word Frequency on Eye Movements in Reading.** ASHLEY BENATAR, CHARLES E. CLIFTON and ADRIAN STAUB, *University of Massachusetts Amherst* (Sponsored by Jerome Myers)—Two experiments examined the effect of linguistic focus on eye movements in reading by manipulating a question prior to a sentence containing a target noun. The critical sentence was held constant across conditions. In addition, the interaction of focus and word frequency was explored. Target words were read faster (i) following a question that encouraged narrow focus on the target word compared to broad focus on the entire sentence and (ii) when the critical word denoted given information (due to the presence of a synonym or subordinate member of the category in the context sentence), compared to when the target word received contrastive focus. These results suggest that reading time on a word may be determined by the degree to which it introduces contextually salient information. Though word frequency effects were evident in both experiments, with longer reading times for low frequency words, there was no evidence for an interaction between focus and frequency. This lack of interaction suggests that focus effects may arise post-lexically.

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(2117)

**Real Time Mouse Tracking Studies of Syntactic Processing.** DAVID CAPLAN, JOSHUA LEVY, REID VANCELETTE and JENNIFER MICHAUD, *MGH*—Mouse tracking has been used to study the effect of visual input on the resolution of syntactic ambiguities. In existing studies (Farmer et al, 2007), trajectories have been normalized to allow for the examination of maximum deviations towards competing inputs. We have used mouse tracking to study the interpretation of unambiguous sentences with various syntactic structures in real time. We have contrasted active and passive sentences, cleft subject and cleft object sentences, and sentences with a pronoun or a common noun. In each case, we have found effects of sentence type on trajectories at the point of disambiguation; in some cases, we have found effects early, which we attribute to expectations or previously unsuspected differences in intonation contours. The results illustrate the potential utility of this technique in the study of various aspects of sentence comprehension.

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(2118)

**Chinese Speakers Do not Think about Time Differently than Portuguese Speakers.** GUILHERME B. SANVIDO and JULIO C. DE ROSE, *Universidade Federal de São Carlos, Brazil*, JENN-YEU CHEN, *National Cheng Kung University, Taiwan*—Earlier studies tested the hypothesis of linguistic determinism using a spatial priming procedure, in which participants judged statements about the temporal order of events, preceded by primes comprised of pictures of either vertical or horizontal spatial relations. In one study, speakers of Mandarin responded faster after vertical primes than horizontal primes, while speakers of English responded in an opposite way. The results were attributed to a predominance of vertical time metaphors in Chinese. However, these results were not replicated in subsequent studies. The present study used a similar procedure to compare judgments of bilingual Chinese and Brazilians, speakers of, respectively, Mandarin or Portuguese, and with English as a second language. Overall, both Chinese and Brazilian participants responded to the temporal statements slightly faster after the horizontal primes than after the vertical primes, but the differences were not statistically reliable. These results were consistent with those of previous failed replications and suggested that Chinese speakers do not think about time differently than English (or Portuguese) speakers, in so far as they are probed by the spatial priming paradigm.

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### ● BILINGUALISM I ●

(2119)

**Verbal Recognition Memory in Bilinguals: The Word Frequency Effect.** LYNN LUO, MARGOT SULLIVAN, VERED LATMAN and ELLEN BIALYSTOK, *York University*—In previous research, the usual bilingual disadvantage in linguistic tasks was exacerbated with low frequency words (Gollan et al., 2008). It is unclear, however, if this effect would also be found with controlled verbal processing, an area in which bilinguals should show an advantage. In a study of verbal fluency, the bilingual control advantage was independent of the linguistic disadvantage (Luo et al., 2010). This present study examined the effect of bilingualism and word frequency in controlled memory processes using the remember/know paradigm. Twenty monolinguals and 20 bilinguals studied high- and low-frequency words in a mixed list, then made an old/new judgment and a remember/know/guess judgment. Bilinguals showed superior levels of recollection relative to the monolinguals, and low frequency words were better recollected than high frequency words, with no interaction between bilingualism and word frequency. These results indicate that 1) bilingualism is associated with a control advantage in verbal memory, and 2) this control advantage does not interact with factors affecting linguistic representation, such as word frequency.

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(2120)

**Searching for a Bilingual Advantage in the Tail of Reaction Time Distribution in the Stroop Switching Task.** CHI-SHING TSE, *The Chinese University of Hong Kong*, JEANETTE ALTARRIBA, *University at Albany, State University of New York*—Relative to monolinguals, bilinguals respond faster to incongruent vs. congruent trials in a Stroop task (Bialystok et al., 2008) and show reduced switching costs in a switching task that involved simple stimuli varied in color and shape dimensions (Prior & MacWhinney, 2010). These can be attributed to bilinguals' experiences managing attention between two languages, thus enhancing their conflict resolution, goal maintenance, and set-switching abilities. Our study tested how bilinguals' varied L1 and L2 self-rated proficiencies affect their Stroop switching performance. The color- and word-naming trials were either blocked (i.e., pure block) or intermixed in a fixed ABBA pattern (i.e., mixed block). We examined RT data at both mean and distributional levels. After controlling for age, gender, and socioeconomic status, bilinguals with high L1/L2 proficiency performed better than those with imbalanced L1/L2 proficiencies, and in turn, those with low L1/L2 proficiency. The difference was larger at the distribution (vs. mean) level of RT performance and stronger in the mixed (vs. pure) block. Implications for the mechanisms underlying bilingual advantage are discussed within the attentional control framework (Balota & Faust, 2001).

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(2121)

**Too Much of a Good Thing: When Stronger Bilingual Inhibition Leads to Poorer Performance.** ANAT PRIOR, *University of Haifa*—Inhibitory control and monitoring abilities of bilingual and monolingual university students were compared, in a paradigm requiring participants to switch between performing three distinct tasks. Inhibitory control was gauged by n-2 task repetition costs, namely decreased performance on sequences of ABA relative to CBA, due to persisting inhibition of the recently abandoned task. Bilinguals showed slower response times and larger n-2 repetition costs, which reflect stronger inhibition of a no-longer relevant task to facilitate a switch into a new task. Monitoring ability was measured by the 'fade-out effect', which reflects adaptation to simpler task demands when a single task block immediately and unexpectedly follows mixed task blocks. Bilinguals did not differ from monolinguals in the magnitude or trajectory of the fade-out effect. Thus, results support the notion of increased bilingual inhibitory control, even when it is detrimental to performance, and do not demonstrate a bilingual advantage in monitoring.

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(2122)

**Task and Language Switching in Young and Older Bilinguals.** GALI WEISSBERGER, *UCSD/SDSU*, TAMAR H. GOLLAN, *UCSD*, CHRISTINA E. WIERENGA and MARK W. BONDI, *UCSD/VA San Diego Healthcare System*—Bilingual advantages in executive control tasks imply intimate connections between linguistic and nonlinguistic task control. We tested this hypothesis by comparing aging effects on linguistic and non-linguistic switching. Thirty young and thirty aging bilinguals completed a cued language-switching task and a color-shape switching task that previously revealed bilingual advantages. Both tasks reveal significant switching and mixing costs, and age-related slowing. Both tasks revealed evidence of impaired inhibitory control in older bilinguals, and five older bilinguals who could not do the color-shape task exhibited significantly larger language-switching costs than matched controls. However, age-related slowing was far greater for the color-shape than for the language task, and only the language task revealed an age-related increase in switching and mixing costs. These similarities and some striking differences between tasks imply partially shared mechanisms of task and language control while demonstrating relatively preserved ability to perform expert-tasks (i.e., language) in aging.  
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(2123)

**Bilingual Cognitive Advantages Reduced When Controlling for Background Variables.** MEDHA TARE and JARED A. LINCK, *University of Maryland Center for Advanced Study of Language* (Sponsored by Joseph Danks)—Much recent research has focused on the cognitive advantages associated with bilingualism (Adesope et al., 2010); however, some have questioned whether these advantages are more a consequence of demographic factors such as SES rather than the cognitive skill involved in managing two languages (Morton & Harper, 2007). The technique of propensity score matching was employed to statistically equate monolingual and bilingual young adults to the greatest extent possible on demographic factors such as age, education, and pay grade, as well as measures of general intelligence and verbal ability. Preliminary analyses indicate that, with these controls in place, bilinguals perform similarly to monolinguals on tasks measuring working memory and task switching, but significantly worse on a measure of inhibitory control. These results suggest that factors other than bilingualism per se may be driving any purported bilingual cognitive advantages. The implications of these results for theories of bilingual language control are discussed.

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(2124)

**Bilingual Experience Enhances Subcortical Encoding of Sound.** ANTHONY SHOOK, VIORICA MARIAN, JEN KRIZMAN and NINA KRAUS, *Northwestern University*—The present study examined the relationship between bilingual experience and the processing of auditory information at the subcortical level. Auditory brainstem responses were measured in 60 adolescents (matched on IQ and socioeconomic status) of varying second language proficiency. When listening to the syllable ‘da’ presented in six-talker babble, bilinguals demonstrated more robust encoding of the auditory stimulus relative to monolinguals. Specifically, bilinguals showed enhanced encoding of the spectral amplitude of the fundamental frequency (F0). In addition, bilinguals showed behavioral advantages in tasks measuring sensory processing and executive functioning. Performance on these tasks positively correlated with the strength of F0 encoding, indicating a relationship between the enhanced auditory processing found at the subcortical level and bilingual advantages in perceptual and cognitive tasks. The findings indicate that bilinguals have enhanced neural processing of specific sound elements, and suggest a possible relationship between auditory encoding, and perceptual/cognitive abilities.  
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(2126)

**Cross-Script Phonological and Cognate Translation Priming Effects for Japanese-English Bilinguals.** MARIKO NAKAYAMA, *Waseda University*, CHRISTOPHER R. SEARS, *Calgary University*, YASUSHI HINO and YUU KUSUNOSE, *Waseda University*, STEPHEN J. LUPKER, *University of Western Ontario*—Using a masked priming paradigm, the impact of phonological similarity between L1 primes and L2 targets was examined for bilinguals with script-different languages (i.e., Japanese-English bilinguals). Lexical decisions to targets were facilitated when targets were primed by phonologically-similar primes, with the size of the priming effect being similar for high- and low-frequency targets and for more- and less-proficient bilinguals. When targets were primed by cognate translation primes (primes that are both phonologically and semantically similar), significantly larger priming effects were observed. However, in contrast to the phonological priming effects, the cognate translation priming effects varied as a function of target frequency and bilingual proficiency. The implications of these results for current models of bilingual lexical representations are discussed.

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(2127)

**Development of L2 Verb Conjugation Skill in a Classroom Spanish Intervention.** NORA PRESSON and BRIAN MACWHINNEY, *Carnegie Mellon University*—Even with years of practice, adult second language (L2) learners often fall substantially short of native-like competency, and grammar is especially difficult (Birdsong, 2005; Hernandez & Li, 2007). The current study uses a training intervention (3 practice sessions with either explicit metalinguistic feedback or a familiar example) for conjugating regular and subregular Spanish verbs to test predictions about single- and dual-route models of L2 morphological processing, testing the dual-route model prediction that subregular verbs will not be composed of a stem and ending but rather retrieved as a whole word form. Participants were undergraduates (N=106) in first-semester Spanish. Before and after training, students showed lower accuracy for subregular verb forms requiring an irregular transformation than the same verbs without an irregular transformation, indicating a compositional approach to subregular verb production in line with single-route models. Explicit instruction in subregular patterns led to greater accuracy, restricted to subregular verbs. Accuracy levels were also affected by verb tense and the type of subregularity. Results show how students approach production of complex grammatical forms early in training, and suggest that providing explicit statements of relevant irregularity transformations can improve learning of those transformations.  
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(2128)

**Age and short term sleep deprivation.** ELISHEVA BEN-ARTZI, *Center for Academic Studies*, EPHRAIM GROSSMAN, *Bar Ilan University*, HARVEY BABKOFF, *Ashkelon Academic College and Bar-Ilan University*—Recent studies report that the elderly are less affected by sleep loss and report higher levels of subjective arousal than younger people when assessed during the morning. This is consonant with reports that aging is often accompanied by advanced sleep syndrome and phase shift in the circadian rhythm leading to better performance during morning hours. In the present study we ask whether the reported ability of the elderly to withstand the effects of sleep loss is due to their circadian phase shift, or does aging provide protection against sleep loss even when circadian phase advance is controlled. We measured subjective arousal ratings, working memory and choice RT on a morning following 26 hours of sleep deprivation in 41 individuals aged 20-70. Circadian phase, measured by sleep onset and wake times was significantly advanced in older individuals as was the subjectively reported tendency to "morningness". There were significant age-related decrements in choice RT and working memory and higher levels of arousal with and without sleep deprivation. In addition, the negative impact of sleep deprivation on working memory was significantly

reduced among older individuals even when controlling for the advanced circadian phase.

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## ● REASONING AND PROBLEM SOLVING ●

(2129)

**To Go or to Stay: the Foraging Behavior in Two Interleaving Puzzles of Younger and Older Information Seekers.** JESSIE CHIN, WAI-TAT FU and ELIZABETH L. STINE-MORROW, *University of Illinois at Urbana-Champaign*—Cognitive foraging used the metaphor of animal foraging over patches of food to study how people allocate time to multiple resources for obtaining information. We used the word search puzzle paradigm to examine age differences in cognitive foraging behavior, especially when younger and older adults switch between patches (i.e., word puzzles). Results showed that older adults were able to adjust their departure time and switch frequencies depending on patch densities and switch time costs, and found as many words as younger adults in the puzzles despite their age-related change in processing capacities. Although older adults needed more time to find a new word in the puzzle, they adaptively persisted longer and switched fewer times between puzzles than younger adults to improve their performance. The connections between age differences in information uptake rates and the time to switch to different patches were also discussed.  
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(2130)

**How Bad Are "Bad" Explanations?** JOOYONG PARK and KYUNG HWA KIM, *Seoul National University*—Explanations are ubiquitous in our daily lives and scientific activities. Although explanations are necessarily incomplete, people can discern their value in a continuum within a context. Previous studies on explanations have compared good explanations with bad ones. However, bad explanations do not take one form. There are at least three different types of bad explanations: irrelevant explanations, tautology, and wrong explanations (e.g., For a question of "Why do twins look alike?"; 'Because they can be identified by a sonogram,' 'Because they are twins,' and 'Because they share the same sex chromosome', respectively). The present study examines peoples' judgment of various explanations for some mundane events. In a series of experiments, we found that mean ratings on the satisfaction scale were lowest for the irrelevant explanations, followed by wrong explanations and tautology. However, analysis of questions at the individual level revealed a complex pattern for wrong explanations and tautology.  
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(2131)

**Validation of a Workplace-Relevant Divergent Thinking Task.** MELODY S. BERENS, SERGEY BERENS, ALEXEI SMALIY, TIMOTHY GEORGE, JANET COOK and HENK J. HAARMANN *University of Maryland College Park*—Divergent thinking measures (e.g., Torrance Test of Creative Thinking, TTCT) are proposed to be predictive of performance on a variety of activities, including analysis. However, the items of such general divergent thinking tests have low-face validity for any specific profession, making it more difficult to draw conclusions about the impact of creative thinking within that field. We developed a face-valid test of divergent thinking, modeled on the Verbal TTCT, directed at the types of problems that professional analysts undertake. To validate our task's measurement of creative thinking, we administered our face-valid creative thinking task and a standardized creative thinking task to participants, and found that scores on the two creative thinking tasks were significantly correlated ( $p < .05$ ), providing validation for our face-valid task. Results for each type of question and its correlation with performance on the standardized creativity task will be discussed.

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(2132)

**The Influence of Mood on Inductive Reasoning.** ANNIE GUILLEMETTE and ISABELLE BLANCHETTE, *Université du Québec à Trois-Rivières*—Little research has examined the influence of emotion on inductive reasoning. This project explores how people reason by induction while in different emotional states. Mood (happy, sad or neutral) was induced using an autobiographical memory procedure before participants completed a category-based induction task. Participants ( $n=100$ ) had to indicate their degree of certainty in the conclusion of 20 diverse and non-diverse inductive arguments. Results show that mood has a differential impact on inductive reasoning depending on academic performance. Specifically, participants who reported lower academic performance showed increased certainty in the conclusions of all inductive arguments when they were sad, independently of diversity. By contrast, participants with higher academic performance reported increased certainty for diverse arguments when they were in emotional states (happy or sad), particularly when they were in a happy mood. Results suggest that emotion represent a different source of information for category-based induction depending on cognitive abilities.

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(2133)

**Base-rate Probabilities Are (Sometimes) Accessible to Intuitive Processes.** GORDON PENNYCOOK, *University of Waterloo*, DRIES TRIPPAS, *University of Plymouth*, SIMON HANDLEY, *University of Plymouth*, VALERIE THOMPSON, *University of Saskatchewan*—The tendency to neglect base-rates is commonly explained by dual-process

theorists as such: Stereotypes are relied on because they are easily accessible and cued by intuitive (Type 1) processes whereas base-rate information requires deliberative analytic (Type 2) thought to process (Barbey & Sloman, 2007). We explored the latter claim in two experiments using an instructional manipulation. In our first experiment participants had to respond either on the basis of the stereotype (beliefs) or the base-rate information (statistics). In a second experiment, Type 2 processing was limited through the means of a 5 second deadline. Results suggest that both the stereotype and the base-rate can be processed relatively effortlessly through Type 1 processing. This suggests that the efficiency of conflict detection during base-rate neglect is due to a conflict between two Type 1 outputs as opposed to a Type 1 output (stereotype) and a Type 2 output (base-rate).

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(2134)

**Biases in the Perception of Research Sample Size Adequacy.** RICHARD B. ANDERSON, *Bowling Green State University*—Evaluating the adequacy of evidence supporting a conclusion is a central to the task of inductive inference and reasoning. In a series of experiments, participants saw a description of scenario in which an agent used a random sample to draw an inference about a proportion in a population. The participants had been given prior information about the population that was consistent, inconsistent, or neutral with respect to the sample characteristics. The prior information biased participants' perception of adequacy of the sample size and of the agent's rationality. The results were interpreted in the context of hindsight bias, belief bias, and egocentrism in the perception of false beliefs.

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(2135)

**Semantic Search Strategies in the Remote Associates Test.** KEVIN A. SMITH, DAVID E. HUBER and EDWARD VUL, *University of California, San Diego*—The Remote Associates Test (RAT) has been widely used to research many phenomena including creativity, incubation, and intuition, but the processes people use to produce answers is not well studied. In the RAT, people are given three cues ('bee', 'comb', 'dew') and must find a word related to all three ('honey'). We investigated how people solve RAT problems by asking subjects to provide sequential guesses. We evaluated how people generated these guesses by using Latent Semantic Analysis to measure the similarity between each of these guesses and the cues, answer, and other guesses. We found evidence of several systematic strategies people use: a) although responses are influenced by all three cues, guesses are mostly generated in proximity to a single cue, b) guesses have a sequential dependency indicating that people search by chaining their guesses, and c) over time, people explore potential solutions further and further from the cues.

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(2136)

**How Search in the Mind Guides Search in the World.**

DOUGLAS B. MARKANT and TODD M. GURECKIS, *New York University*—Our study investigates the interplay of two cognitive search processes: internal search through the space of plausible hypotheses, and external search to gather data to test those hypotheses. Existing theories of hypothesis testing has largely fallen into two extreme camps (either people fail to generate alternative hypotheses or they perform optimal Bayesian inference). In contrast, we present a novel model-based analysis that estimates a learner's capacity for representing alternative hypotheses based on their information collection decisions. The model approximates Bayesian inference by stochastically sampling plausible hypotheses and provides a natural account of findings of sub-optimal hypothesis testing behavior (e.g., confirmation bias). Our results suggest that people use a relatively small set of hypotheses to guide information search, and that their efficiency thus depends on the local structure of the hypothesis space (e.g., people are most efficient when mentally searching in "patches" of clustered, highly similar hypotheses).

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## ● ANIMAL COGNITION AND LEARNING ●

(2137)

**Promiscuous Pandas and Monogamous Otters: Does the Range Size Hypothesis Predict Sex Differences in Spatial Ability in the Order Carnivora?**

BONNIE M. PERDUE, *Georgia State University*, REBECCA J. SNYDER, *Zoo Atlanta*, TERRY L. MAPLE, *Palm Beach Zoo & Florida Atlantic University*—Sex differences in spatial cognition have been reported for many species ranging from voles to humans. The range size hypothesis predicts that sex differences in spatial ability will occur in species in which one sex has a larger range than the other, a pattern that results from the mating system. In the first test of this hypothesis in the order Carnivora, we observed sex differences in spatial ability in giant pandas, a promiscuous species in which males inhabit larger ranges than females. Notably, we also tested Asian small-clawed otters, a related monogamous species in which males and females share home ranges, and found no sex differences on the same spatial task. All subjects in these studies were raised in captivity and never actually inhabited different range sizes, thus emphasizing the importance of biological rather than experiential factors underlying sex differences in spatial cognition.

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(2138)

**Dimensional Matching in Pigeons.**

DOUGLAS S. GRANT, *University of Alberta*—Two groups of pigeons were trained on a dimensional matching task in which reinforcement depended upon whether the sample was a color or line but was independent of which color or line was

presented. Group 4 was trained with 4 exemplars (2 colors and 2 lines) and Group 12 was trained with 12 exemplars (6 colors and 6 lines). Retention testing revealed equivalent rates of forgetting on color-sample and line-sample trials in both groups. After retention testing, Group 4 was exposed to nonreinforced transfer trials in which the sample was 1 of the 12 exemplars that had not been presented during training. All birds showed strong positive transfer on novel color-sample trials and complete transfer on novel line-sample trials. These data suggest that the pigeons categorized the samples as a color or a line.

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(2139)

**Asymmetric Retention Functions for Hedonic Samples in Rats: The Effect of Within-Session and Between-Session Variation in Retention Interval.**

ANGELO SANTI, SABRINA SIMMONS and SHANNON MISCHLER, *Wilfrid Laurier University*—Rats were trained in a symbolic delayed matching-to-sample task to discriminate hedonic sample stimuli that consisted of food or no food. Retention functions decreased more rapidly on trials initiated by a food sample, than on trials initiated by a no-food sample when retention intervals were manipulated within session. If rats are using a default response strategy to select the comparison associated with a no-food sample, then the retention functions should be asymmetric regardless of whether the retention interval is manipulated within or between sessions. Unlike within session changes in retention interval, between-session changes did not result in steeper forgetting functions for food samples. These results in rats are consistent with previous findings reported in pigeons (Wixted, 1993). They suggest that responding on no-food sample trials is based on memory of non-occurrence rather than a default response strategy.

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(2140)

**Running-based Taste Aversion Learning in Wistar, Sprague-Dawley, Fischer, and Lewis Rats.**

SADAHIKO NAKAJIMA, *Kwansei Gakuin University*—Voluntary wheel running works as an effective agent to establish conditioned taste aversion (CTA). This phenomenon has been demonstrated in rats (see Boakes & Nakajima, 2009, in "Conditioned Taste Aversion" edited by Reilly and Schachtman, Oxford Univ. Press, for a review) as well as in golden hamsters (Masaki, unpublished data) and humans (Havermans et al., 2009, *Appetite*, 53, 442-445). In rat research, some strains have been used for demonstrating running-based CTA, but no study of which I am aware has examined strain differences. The present research aims to explore this issue. Study 1 compared running-based CTAs of Wistar and Sprague-Dawley rats from two suppliers: CrIj:WI, Jbc:WI, CrIj:CD(SD), and Jbc:SD. The target taste was either salty (NaCl+MSG, Test 1), sweet (saccharin, Test 2), bitter (denatonium, Test 3), or sour (citric acid, Test 4) solution. Study 2 compared Fisher (F344/DuCrIj) and Lewis (LEW/ClCrIj) rats with sweet (saccharin, Test 1) and



salty (NaCl+MSG, Test 2) solutions. In neither study were there any strain differences in running-based CTA with any target tastes examined.

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(2141)

**Discrimination Learning and Conditioned Reinforcement in Chain Schedules.** MATTHEW C. BELL, *Santa Clara University*—A series of studies investigated the putative dependent relationship among stimuli in a chain schedule. Pigeons were exposed to a two-component multiple schedule with chain schedules of reinforcement in each component. Stimuli in both chains were identical except for a middle link stimulus. Initial probabilities of reinforcement were 0.50 for both chains, later switched to 1.0 for one chain and 0.0 for the second chain. When probabilities were 1.0 and 0.0, more responding to the food-correlated middle-link stimulus (109 resp/min) occurred compared to the comparable stimulus correlated with extinction (75 resp/min), showing subjects were sensitive to the change in probability. The critical measure was responding on the terminal link. We predicted differential terminal-link responding, supporting an associative relationship between links. There were no significant differences in terminal link responding for the food and extinction links (98 resp/min and 91 resp/min, respectively), challenging our hypothesis.

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(2142)

**Serotonergic Regulation of Risk Assessment in Hermit Crabs (*Coenobita clypeatus*).** KIRANDEEP K. SUMRA, ZUNERA GHAZNAVI and W. DAVID STAHLMAN, *University of California, Los Angeles*—Recent work in our lab has elucidated the factors (e.g., non-associative learning) that modulate the responsiveness of hermit crabs to simulated approaching stimuli (Chan et al., 2010; Stahlman et al., under review). Studies have found that serotonin (5HT) mediates sensitization and dishabituation of withdrawal reflexes in invertebrates (e.g. gill-siphon withdrawal in *Aplysia*; Brunelli et al., 1976). We report results from two experiments in which we repeatedly presented a simulated visual predator to hermit crabs that had been treated with either 5HT or methysergide, a serotonin antagonist. We describe strong evidence that 5HT modulates the animals' withdrawal response to the visual predator over trials, indicating a role for serotonin in non-associative learning and risk assessment in hermit crabs. In particular, we find that administration of methysergide facilitates habituation to the visual predator and blocks sensitization to an arousing auditory stimulus. We discuss the implications of these results, relate them to the vast body of current literature, and suggest future directions for research.

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(2143)

**The Effect of Nicotine on Rats' Impulsive and Timing Behavior.** KOSUKE SAWA and NAOYA MUROTA, *Senshu University*, HISATSUGU MIYATA, *The Jikei University*—The present study assessed the effect of nicotine on impulsivity by using the behavior to keep pressing a lever in rat's intracranial self-stimulation (ICSS) paradigm. On reinforcement trials, rats were required to keep pressing a lever for 4 seconds to obtain electrical stimulation, and to release the lever to move into next trial. On non-reinforcement trials, where no reinforcement was available even if they could keep pressing a lever, were interspersed among the reinforcement trials. On reinforcement trials, nicotine decreased response latencies and accelerated to release the lever after reinforcement. On non-reinforcement trials, however, nicotine had little effects on behavior to release the lever, which suggested that the effect of nicotine to accelerate releasing a lever was more likely to be mediated by nicotine-induced sensitization of brain reward system, rather than enhancement of motor activity. Implications of the results for the impulsive behavior and the time perception were discussed.

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(2144)

**Parallels between Renewal after Blocking and after Interference.** GONZALO MIGUEZ, HENRY CHAM and RALPH R. MILLER, *SUNY-Binghamton*—Blocking (i.e., Cue A-US pairings in Phase 1 and AX-US pairings in Phase 2) has been one of the signature phenomena in Pavlovian conditioning. Its discovery has promoted the development of numerous associative models, most of which viewed blocking as a form of cue competition phenomena (i.e., a decrease in responding due to training two conditioned stimuli conjointly). In two experiments using rats in a fear conditioning paradigm (i.e., lick suppression), we found that both forward-blocking (Experiment 1) and backward-blocking (Experiment 2) can be influenced, due to the nature of the design, not only by cue competition mechanisms but also by proactive or retroactive interference (i.e., a decrease in responding without a concurrent presentation of the two cues), respectively. Specifically, we show that renewal of forward-blocking parallels the renewal of proactive interference, while renewal of backward-blocking parallels that of retroactive interference.

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(2150-2154)

**Grant Funding Agencies.** Information about various grant funding agencies is available. Representatives will be available throughout the conference.



## POSTER SESSION III

Friday Evening

Convention Center Ballroom 6 ABC

Viewing 4:00 p.m.-7:30 p.m., Author Present 6:00 p.m.-7:30 p.m.

(3003)

## ● VISION II ●

(3001)

**Mechanism(s) for Apprehending Numerosity Based On Several Visual Properties.** CHARLES CHUBB, CHARLES E. WRIGHT, ELHUM SHAMSHIRI and MEGAN WANG, *Cognitive Sciences, University of California - Irvine*—Do visual numerosity judgments depend only on the perceptual strength of the difference between targets versus distractors? If so, then the visual property that makes targets different from distractors should not matter. Specifically, if the perceptual strength of the difference between targets of type T1 and distractors of type D1 is equal to the perceptual strength of the difference between targets of type T2 and distractors of type D2, then these two combinations of targets and distractors should support identical performance across various tasks requiring numerosity judgments. Data from four observers making four different numerosity judgments failed to show this invariance: their judgments depended on more than simply the perceptual strength of the difference between targets versus distractors. These results suggest that more than one mechanism is involved in numerosity judgments (e.g., parallel individuation and analog magnitude estimation) and that these processes have differential access to information conveyed by the visual properties of color saturation, size, and orientation.

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(3002)

**Display Strobing Reduces Visual Blur During Whole-Body Vibration.** MARY K. KAISER, BERNARD D. ADELSTEIN, ROBERT S. MCCANN, BRENT R. BEUTTER and MARK R. ANDERSON, *NASA Ames Research Center*—In a number of aerospace environments (e.g., rocket launches), crews are exposed to significant whole-body vibrations. We examined the impact of x-axis (sternum-to-spine) vibrations on operators' ability to read flight-relevant displays. Readability decreased with increasing vibration amplitude and decreasing font size, with notable variability in tolerance among observers. We then examined the efficacy of strobing the display at a frequency at or near the dominant vibration frequency (12 Hz), varying both duty cycle and phase angle between the strobe onset and vibration cycles. While we noted individual differences in "preferred" phase angle, strobing proved an effective mitigation to vibration; error rates and reaction times with strobed displays approached those achieved in the non-vibrating baseline. Further studies are needed to determine the efficacy of strobing for multi-axis, multi-frequency vibrations, and for displays with motion-carried information.

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**Direct control of Fixation Duration in Scene Viewing: The Saccade-Contingent Change Paradigm.**

MACKENZIE G. GLAHOLT and KEITH RAYNER, *University of California San Diego*, EYAL M. REINGOLD, *University of Toronto Mississauga*—Participants viewed scenes for a later recognition memory test. Eye movements were monitored, and for selected fixations, the scene was unchanged (the null change control condition), or was replaced by a low-pass filtered or high-pass filtered version of the scene. These unpredictable display changes were triggered and executed during the saccade prior to a critical fixation and the normal scene was restored during the subsequent saccade which terminated this fixation. Fixations following the change were lengthened compared to the control condition, and more so for low-pass than high-pass filtering. Importantly, this difference in fixation duration as a function of filtering type was substantially attenuated when filtered scenes were presented upside down (inverted), indicating that the nature of the scene information that is processed during the fixation partially determines the timing of the saccade that terminates the fixation. Implications for models of eye movement control during scene viewing are discussed.

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(3004)

**OMG did u c that? An Investigation of Technology Usage and Metacognition in Producing Driving Errors.**

BONNIE L. ANGELONE, *Rowan University*, MELISSA R. BECK, *Louisiana State University*, DANIEL T. LEVIN, *Vanderbilt University*—"Driver distraction" is the most commonly cited cause of automobile accidents, and with the increase in mobile technologies, distractions have shown an exponential increase. People's understanding and use of text messaging while driving are less understood than other cell phone use while driving. One possible mechanism underlying driving errors may be people's incorrect intuitions about how their visual system operates. The current study examined the degree to which cell phone use while driving (call and texting) predicted driving errors. In addition, we investigated the degree to which individuals' intuitions of visual behavior predicted driving errors. Participants completed the Visual Metacognition Questionnaire (VMQ) and questions assessing recent occurrences of driving errors and cell phone use. Regression analyses revealed cell phone use while driving was not a significant predictor of driving errors. However, sending text messages significantly predicted driving errors. Interestingly, only a small subset of metacognitive intuitions predicted driving errors.

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(3005)

**“Unconscious Perception” Effects in Exclusion Tasks Are Methodological Artifacts.** GARY D. FISK, *Georgia Southwestern State University*, STEVEN J. HAASE, *Shippensburg University*—Exclusion tasks presumably indicate unconscious perception when participants are instructed to create a novel word from a word stem, but persist in repeating a masked target word. We tested the validity of this paradigm by manipulating word stem length (one to three letters) along with target word duration (25 to 125 ms). If target words are unconsciously perceived, stem length should have little impact - the participant will be unable to exclude and will complete the stem with the displayed word. Exclusion failure effects varied as a function of stem length, with the largest rate changes across duration in the 2 and 3 letter stem conditions. Exclusion failure also occurred at relatively long stimulus durations, such as 75 ms and even with 100 ms targets. We conclude that exclusion failure is influenced by testing conditions and also by target displays that are consciously perceived (see Fisk & Haase, 2007).

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(3006)

**Exemplar-based and Norm-based Accounts of Face Adaptation.** DAVID A. ROSS, *Vanderbilt University*, M DEROCHE, *University of Maryland*, THOMAS J. PALMERI, *Vanderbilt University*—How are faces represented? Exemplar-based models assume that faces are represented by their similarity to previously experienced face exemplars (e.g., Lewis, 2004; Valentine, 1991). Norm-based models assume that faces are represented with respect to the direction and distance with which they deviate from the central tendency, or norm face (e.g., Rhodes & Jeffery, 2006). High-level visual aftereffects, induced by adaptation from brief exposure to a study face, have provided putative evidence for the norm-based encoding of faces (e.g., Leopold et al., 2001; Robbins et al., 2007). Despite what seems consensus, there have been few attempts to simulate norm- and exemplar-based models of face adaptation. Here we implemented both kinds of models, assuming both an idealized and a PCA-based perceptual front end. Contrary to many claims, exemplar-based face recognition models account for face adaptation effects. Whereas two-pool versions of norm-based models could account for face adaptation, traditional norm-based models could not.

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(3007)

**Red, White, & Blue: Does Background Color Affect Solving Anagrams?** KENNETH M. STEELE, CHRISTOPHER THORSTENSON, KRISTEN SUGG, ERIN GURGAINOUS, ANDREA STECHER and EVA PUTNAM, *Appalachian State University*—Mehta and Zhu (2009) reported that the colors, red and blue, induced different motivational states that affected performance across a series of cognitive tasks. Red was hypothesized to induce an avoidance motivational state and blue an approach

state. Mehta and Zhu presented participants with anagrams and reported that solution times were faster when the motivational meaning of the anagram matched the state induced by the color. Their procedure contained a methodological flaw, anagram-length was confounded motivational meaning. The purpose of our study was to replicate their procedure with length-balanced anagrams and confirm their results. Participants were exposed to 15 anagrams (5 of each type) on either red, white (neutral), or blue backgrounds. Solution times, accuracy, and speed-accuracy strategy were recorded. The results showed no significant effect of color on these measures. Additionally, a word valence effect was observed. Approach words were solved more quickly and avoidance words more slowly than neutral words.

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(3008)

**Representation of Dynamic Spatial Configurations in Visual Short-Term Memory.** FRANK PAPENMEIER, *Knowledge Media Research Center, Tübingen*, MARKUS HUFF, *University of Tübingen*, STEPHAN SCHWAN, *Knowledge Media Research Center, Tübingen*—Memory of the locations of multiple stationary objects is based on their global spatial configuration. Once objects move individually, they form a dynamic spatial configuration that changes continually over time. We present experimental evidence demonstrating that such dynamic spatial configurations are represented in visual short-term memory (VSTM). Our results indicate that this VSTM representation is inherently dynamic and that stationary and moving objects are encoded into a conjoint spatial configuration. We propose that static and dynamic spatial configurations are represented in the same system with static spatial configurations being a special case of dynamic spatial configurations. Participants memorized a scene with six moving and/or stationary objects. We probed for a location change of an individual object specified during the probing phase. We manipulated the presence of all, a part of, or none of the five non-probed objects in the probing phase. The presence of all non-probed objects resulted in the highest location change detection performance while the other conditions did not differ significantly from one another. This was true for static, dynamic and mixed scenes containing stationary and moving objects.

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(3009)

**Picture Memory from a Dynamic Stream.** RYAN FERGUSON, DONALD HOMA and LEILA SAED, *Arizona State University*—Picture memory is strikingly good. Typically, subjects view a random collection of pictures, followed by an immediate or delayed recognition test. In the present study, we investigated whether picture frames (40 ms) extracted from a continuous and connected stream (e.g., brief movie) could be later recognized at greater than chance levels. Subjects initially viewed three

5 minute film segments, each followed by a yes/no recognition test. The 'old' stimuli were 50 randomly selected frames from the viewed stream, intermixed with 50 foils that occurred temporally prior to or following the studied video segment. In addition, a condition was run in which the videos were temporally jumbled during presentation. Surprisingly, recognition accuracy was quite good (75-80%), with hits slightly lower than correct rejections and, overall, slightly higher for the connected video. These results suggest that the memory stream must be stored with sufficient dynamic fidelity to distinguish actual from similar foils.

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## ● ACTION AND PERCEPTION II ●

(3010)

**Posture, Hormones, and the Perception of Emotion.** CHRISTOPHER KOCH and MICHAEL BROUGHAL, *George Fox University*—Carney, Cuddy, and Yap (2010) found that one min poses in an expansive or high-power position can lead to an increase in testosterone while poses in a contractive or low-power position can lead to an increase in cortisol. The present study was conducted to replicate these findings and determine if the resulting neuroendocrine changes affect the perception of facial emotions. Two experiments were conducted. In Experiment 1, a within-subjects design was used. Participants completed an emotion identification task using facial emotions while posing in either an expansive or contractive position. A mixed design was used in Experiment 2. Participants posed in an expansive, contractive or neutral position. Pre- and post-test hormone levels were examined using saliva samples. The results show expansive poses resulted in slower but more accurate identifications of emotional expressions. However, no changes in hormone levels were associated with the different positions. Implications for everyday interactions are discussed.

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(3011)

**Using Threshold Theory to Model Psychometric Functions With Confidence Responses.** YUNG-FONG HSU, *National Taiwan University*—Psychometric functions from 2AFC of discrimination are often constructed from data collected using one of two methods. In one method the comparison stimulus 'c' could be set larger or smaller than the referent 'a', and the ordinate of the psychometric function is the subjective probability that 'c' is longer than 'a'. In the other method 'c' is always set no less than 'a' and the ordinate of the psychometric function is the probability of correct response to the interval in which 'c' has appeared. In both cases a single sigmoid function, such as Weibull and logistic, is commonly used to fit the data. However, this practice might not grasp the complexity of observed data, which are results of interplay of the sensory and decision processes. Following low-threshold theory (Krantz, 1969; Luce, 1963) we provide a framework to reconcile the two psychometric functions with confidence responses, and

show that observed data can be characterized as results of mixtures of confidence responses associated with the respective sensory states. Under the framework and using an algorithm that incorporates unforced choice into non-parametric adaptive methods for threshold estimation, we perform a series of simulation. The results will be discussed.

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(3012)

**The Effects of Altered Auditory Feedback (AAF) on Speech and Music Production.** TIMOTHY A. PRUITT and PETER Q. PFORDRESHER, *University at Buffalo SUNY*—Fluent production depends on the coordination of actions with appropriate auditory feedback and can be disrupted when feedback is altered. When AAF is asynchronous with actions, produced timing is disrupted, but the accuracy of sequencing is not. When the contents of AAF are altered (e.g., pitch in music production), accuracy is disrupted but not timing. This dissociation has been found for the production of musical sequences on the keyboard or by singing. We tested whether these disruptive effects are found in the speech production domain. We matched each pitch class to a unique consonant-vowel (CV) nonsense syllable to create structurally isomorphic melodic and speech sequences. On different trials, participants either sung melodies or spoke syllable sequences while experiencing manipulations of feedback synchrony or feedback contents. The results demonstrate these distinct disruptive effects generalize across musical and speech production, thus implicating action/perception associations are guided by similar abstract representations across domains.

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(3013)

**Watch Closely: Observed Tool Use Reduces Perceived Distance.** EMILY K. BLOESCH, *Washington University*, CHRISTOPHER C. DAVOLI, *University of Notre Dame*, NOAM ROTH, *Washington University*, JAMES R. BROCKMOLE, *University of Notre Dame*, RICHARD A. ABRAMS, *Washington University*—Recent research has shown that a direct or remote interaction with an object causes it to be perceived as being closer than objects that cannot be interacted with. In the present study, we examined whether that compression of perceived space would be experienced by one who simply observes such interactions by others. Participants judged the distance to targets after observing an actor reach to an otherwise unreachable target with a tool (Exp. 1) or illuminate a distant target with a laser pointer (Exp. 2). Observing either type of interaction caused the observer to perceive the target as closer compared to when the actor could not interact with the target. The results have implications for the importance of observation and the perceptual consequences of motor simulation, as well as the possible existence of a mirror-like system in humans similar to that seen in monkeys.

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(3014)

**Influence of Practice on the SRC Effect with Mixed Mappings.** BETH CREEKMUR and KIM-PHUONG L. VU, *California State Univ Long Beach*—The stimulus-response compatibility (SRC) effect refers to better performance with a compatible mapping of stimulus to response than an incompatible mapping. When the compatible and incompatible mappings are mixed within a task, the SRC effect is often eliminated. Three practice schedules were employed, where participants practice with the mixed-mapping task or one of its component tasks, to examine how practice changes response-selection processes in mixed mapping environments. The SRC effect was significantly reduced or eliminated in the mixed-mapping environments regardless of practice condition. Moreover, no performance advantage was found for the groups that practice with the component tasks compared to the whole, mixed-mapping task. For the group that practiced with the mixed-mapping task, there was a reduction in overall reaction time, but practice was unable to reinstate the SRC effect. Alternative hypotheses were examined to determine why the SRC effect was eliminated. Support was found for the suppression hypothesis, in which activation of the corresponding response was suppressed in mixed mapping environments, leading to the elimination of the SRC effect. Email: Kim-Phuong L. Vu, [kvu8@csulb.edu](mailto:kvu8@csulb.edu)

(3015)

**Social "Proffitt": Perceiving Another's Burden Influences Perceived Distance.** DAVID W. VINSON and J. SCOTT JORDAN, *Illinois State University*—Data indicate that participants perceive distances as being further when they carry a burden (e.g., a backpack) than when they do not (Proffitt, 2003). This increase in perceived distance is often accounted for in terms of Economy of Action, the idea being that perception takes place in terms of future behavioral energy costs (Proffitt, 2006). Data further indicate that the perception of another's behavior takes place in terms of the same planning dynamics underlying the generation of one's own behavior (Prinz, 1997, Jordan, 2003). The present study assessed whether social perception influences perceived distance. That is, does watching another carry a burden (i.e., carry a back pack) influence perceived distance? Results indicate greater perceived distance when the other (versus the self) carried the burden. Additional studies examine the conditions that are necessary and sufficient to elicit these social influences on perceived distance. Email: J. Scott Jordan, [jsjordea@ilstu.edu](mailto:jsjordea@ilstu.edu)

(3016)

**Rapid Identification of Emotional Expression in Faces.** STEVEN R. LIVINGSTONE, CAROLINE PALMER, MARCELO M. WANDERLEY and WILLIAM F. THOMPSON, *Macquarie University*—Identification tasks for facial expression often use static representations. We examined observers' identification of emotional expression

during the onset of facial expressions. Vocalists were recorded while speaking and singing statements with three emotions (happy, sad and neutral). Analyses of facial motion trajectories (lips, eyebrows and jaw) confirmed that facial movement differentiated emotions at 300-600ms prior to vocal onset. Participants rated silent videos of the vocalists' facial expressions in time regions prior to vocal onset, during vocal production, and after vocal offset. Participants identified the correct emotion better than chance for all regions, and were less accurate for the region prior to vocal onset and for neutral emotion. Motion analyses revealed that facial movements prior to vocal onset, and for neutral emotion, had reduced amplitude and duration, suggesting viewers were less accurate due to decreased visual-motor information. These results indicate that rapid-forming facial expressions accurately convey emotional information, prior to vocalization.

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### ● SPATIAL MEMORY ●

(3017)

**One Spatial Map Or Many? A VR Study of How We Encode Multiple Connected Environments.** XUE HAN and SUE BECKER, *McMaster University*—We investigated how humans encode multiple connected spatial environments using a virtual taxi game with two connected neighborhoods. We hypothesized that if the two neighborhoods were jointly explored, people would form a single integrated spatial representation of the town, whereas if the neighborhoods were first learned separately and later observed to be connected, there would be an accuracy cost when inferring directions from one neighborhood to the other. Interestingly, however, our data are more consistent with the formation of two separate local maps at a fine scale, and a global representation at a much coarser scale, regardless of whether the neighborhoods were learned together or separately. We also observed individual differences in the ability to orient across the two environments that related to differences on the Santa Barbara Sense of Direction Scale (SBSOD). We discuss how these data may be related to evidence from hippocampal place cell recordings in connected boxes. Email: Sue Becker, [becker@mcmaster.ca](mailto:becker@mcmaster.ca)

(3018)

**Environmental Cues to Reference Frame Selection: Room Axes and Surfaces.** JONATHAN W. KELLY, *Iowa State University*, BRADLEY R. STURZ, *Armstrong Atlantic State University*—Spatial memories are often organized around reference frames, and environmental shape provides a salient cue to reference frame selection. These experiments explored the relative influences of two aspects of environmental shape on reference frame selection – room axes and wall surface orientations. Participants learned object locations within either a rectangular or elliptical room. The rectangular room contained axes aligned with wall orientations. Although the elliptical room also



contained axes, straight walls were absent. Spatial memories acquired in the rectangular room were organized around a reference frame aligned with axes and walls. Spatial memories acquired in the elliptical room were also organized around a reference frame aligned with axes. These results indicate the influence of room axes on reference frame selection, even in the absence of straight wall surfaces. Subsequent experiments placed room axes in conflict with wall surface orientations to determine their relative contributions to reference frame selection.

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(3019)

**Older Adults Show a Reduced Tendency to Alternate Between Strategies in a Spatial Search Task.** KAITLIN M. VARNER and STEPHEN C. DOPKINS, *George Washington University*—Older mice show a clear reduction in spontaneous alternation in a T-maze task (Lalonde, 2002). We tested older and younger human subjects with a search task in which the goal was to locate a target object in an experimental chamber. Subjects completed this task from a chair at the center of the chamber, which rotated to pre-determined orientations at which subjects could view a portion of the room and make a determination about the target object. Subjects were asked to decide on a preferred direction (clockwise/counterclockwise) for each rotation. As compared with young subjects, older subjects showed a reduced tendency to alternate (clockwise vs. clockwise) in the search task. Older subjects also demonstrate poorer incidental memory for the spatial layout of the experimental chamber. The correlation between the pattern of alternation and incidental memory for the chamber was examined.

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(3020)

**The Influence of Existing Knowledge Structures on the Formation of Integrated Spatial Memories.** NATHAN M. GREENAUER, CATHERINE MELLO and MARIOS N. AVRAAMIDES, *University of Cyprus*, JONATHAN W. KELLY, *Iowa State University*—The current study examined the influence of an existing spatial memory on the integration of knowledge when new information about familiar environments is acquired from a novel perspective. In two experiments participants learned the locations of several objects before completing a perspective-taking task. Subsequently they studied the same objects as well as new objects from a novel perspective and completed a second perspective-taking task. Results indicated that when a limited number of new objects were added to a highly structured configuration, the new spatial information was assimilated into the existing memory. However, when the initial array possessed little structure and an equivalent amount of new information was subsequently encountered, results indicated that the formation of an integrated spatial memory was not influenced by the existing knowledge structure. Together, these findings suggest that assimilation and accommodation mechanisms in spatial memory may be differentially engaged depending on context.

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(3021)

**Towards a Definition of Intrinsic Axes: The Effect of Orthogonality and Symmetry on the Preferred Direction of Spatial Memory.** LAURENCE RICHARD and DAVID WALLER, *Miami University*—Mou, Zhao & McNamara (2007) proposed the “intrinsic model of human spatial memory”, which posits that a viewer’s memory of an array of objects will exhibit a preferred direction that is aligned with an intrinsic axis of the array. They defined intrinsic axes as salient axes created in part by the physical (geometric) properties of the array. To date, these geometric characteristics have received little research attention. We begin such an endeavor by evaluating the role of symmetry and orthogonality (i.e., number of right angles in the studied array of objects) in spatial memory. Results were consistent with greater reliance on egocentric reference frames than is common in the literature. Indeed, for only one array -- a highly orthogonal and symmetric one -- did participants respond non-egocentrically. We suggest that overuse of this array in the literature has led to an overestimation of the importance of allocentricity in spatial memory.

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(3022)

**Humans Assume Predictable "Default" Headings When Recalling Familiar Spaces.** STEVEN A. MARCHETTE, ASHOK YERRAMSETTI and AMY L. SHELTON, *Johns Hopkins University*—Orientation-dependence in spatial memory has often been interpreted in terms of accessibility: object locations are encoded relative to a reference orientation that provides a way to access the spatial memory. An open question, however, is whether people naturally use this orientation whenever recalling the space. We tested this question by asking participants to locate buildings on a familiar campus from various imagined locations, without specifying the heading to be assumed. We then used these pointing judgments to infer the approximate heading participants assumed at each location. Surprisingly, each location showed a unique ‘default heading’ that was consistent across participants and seemed to reflect episodic or visual properties of the space. This result suggests that although locations are encoded relative to a reference orientation, other factors may influence how people choose to access the stored information and whether they appeal to the long-term spatial memory or other more sensory-based stores.

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(3023)

**Categorical Bias in Enduring Representation Emerges from Object Movement.** TYLER THRASH and DAVID WALLER, *Miami University*—Several theories of spatial cognition have posited two distinct spatial processing systems: one that operates in real-time and another that stores representations in memory. The evidence supporting this distinction primarily consists of measures of precision/variance (Burgess, 2006); however, these two systems are also distinguishable in terms of categorical bias



(i.e., systematic displacement of responses towards a prototypical value; Huttenlocher, Hedges, & Duncan, 1991). In the present study, participants learned the locations of several objects in an immersive virtual environment that was divided into six invisible spatial regions (categories), each of which contained one moving object. Participants were instructed to point to the most recently seen location of each object before and after disorientation, and categorical bias was defined as displacement in response towards the average displayed location of each object. Results suggest that categorical bias in enduring representation can emerge from object movement in the absence of explicit geometric cues.

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### ● SOCIAL ASPECTS OF MEMORY ●

(3024)

**Identifying Oneself by Correctly Picking One's Own Pictures: A Newly Proposed Picture-Identification System and Corresponding Research Question.** ETSUKO T. HARADA, *University of Tsukuba*, SHINJI KITAGAMI, *Nagoya University*, KOZUE MIYASHIRO, *University of Tsukuba*, TOMOYO TAKAHASHI, *Nagoya University*, SATORU SUTO, *Shizuoka University*—Based on experiences from the 2011 Tohoku earthquake and tsunami, a proposal is now rapidly proceeding for a quick and cost-free person-identification system based on recognizing one's own pictures amongst dummy pictures. By recognizing one's own pictures registered on a cloud-network system, this system would allow individuals to identify themselves without the need for identification cards or documents. Requiring a small cognitive load, this system would be advantageous compared to typical identification methods requiring successful memorization and retrieval of complex passwords. However, many questions remain to be answered before this identification system can be realistically usable – e.g., are there differences in recognition performance between autobiographical and typical pictures? What is the most optimal way to create a set of dummy pictures to be presented along with clients' pictures at recognition test? A list of such questions and some preliminary data from a pilot study will be presented.

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(3025)

**Forgotten But Not Gone: Recovering Memories of Stories.** JUSTIN D. HANDY, GENNA ANGELLO, JEREMY H. NICHOLS and STEVEN M. SMITH, *Texas A&M University*—Laboratory methods for studying memory blocking and recovery include directed forgetting, retrieval-induced forgetting, and retrieval bias procedures. These methods primarily use word lists. For example reversible forgetting effects have been reported for both emotional (e.g., expletives) and non-emotional (e.g., tools) categorized lists of words (e.g., Smith & Moynan, 2008). The present study examined forgetting and recovery of richer, more episodic materials. Participants studied brief

narrative passages varying in emotional intensity, such as vignettes involving torture or abuse (emotional) vs. vignettes about cycling or insects (non-emotional). Free recall of the 1-word vignette titles (e.g., torture, cycling) showed a strong memory blocking effect, and the effect was eliminated on a subsequent cued recall test. In a second experiment, vignette-related pictures inserted into an incidental picture naming task triggered some recovery of initially forgotten vignettes, as shown on a post-test. Both emotional and non-emotional stories were susceptible to this reversible memory blocking effect.

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(3026)

**Social and Cognitive Influences on Adaptive Memory.** MICHAEL P. TOGLIA, ADAM M. WILDE and AARON D. LEEDY, *University of North Florida*—Nairne and colleagues have drawn attention to evolutionary aspects of memory. When rating words relative to survival relevance (stranded in grasslands), retention is superior to many semantic encoding techniques. Many have replicated their accuracy findings, but we and others have not, while also observing that survival processing of DRM lists increases false memory. One of the current experiments examined adaptive memory with DRM lists and DRM narratives processed in situations that we presently experience on a common basis. A scenario similar to the grasslands one was compared with two modern scenarios, one survival relevant (a job interview) and one survival irrelevant (giving driving directions). Items processed with a modern survival context were remembered less accurately, including showing more false memory than the other processing scenarios. A second study examined social anxiety influences on true and false memory with DRM lists. Only experimental groups studied lists while being videotaped. Memory performance was lower in videotaped conditions and extroversion levels were correlated with social anxiety influences on memory. Theoretical implications for the adaptive role of both veridical and false memory are discussed.

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(3027)

**Retelling Versus Recalling: The Effects of Rehearsal On Qualitative Aspects of Autobiographical Memory.** ANDREA N. ESLICK, *Colby College*, ELIZABETH J. MARSH, *Duke University* (Sponsored by David Rubin)—Retelling a story about an event has very different memorial consequences than recalling an event accurately. Conversational retellings may compromise accuracy in order to appeal to a certain audience, or to support a specific argument (Dudukovic et al., 2004; Tversky & Marsh, 2000). Such biased retellings can lead to bias in memory (Marsh, 2007). The current experiments examined how telling stories about personal autobiographical events influenced qualitative aspects of memory. In both experiments, participants rated qualitative aspects of memory both before and after rehearsing them. In the first experiment, some participants wrote entertaining stories, while others recalled

as accurately as possible. Regardless of the specific nature of retrieval, rehearsing autobiographical events changed qualitative characteristics of memories. A second experiment examined memorial changes associated with retelling general versus specific stories. Again, the nature of the rehearsal did not influence memory, but simply rehearsing a memory changed qualitative aspects of that memory.

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(3028)

**Adaptive Memory: Surviving the Pictures.** PEDRO B. ALBUQUERQUE, *University of Minho, Portugal*, PAULO F. CARVALHO, *Indiana University, USA*, HELENA OLIVEIRA, *Maia Institute of Higher Education, Portugal*, ANA M. CAPELOI, *University of Minho, Portugal*—Several studies have now demonstrated the mnemonic advantage of fitness processing in the survival processing survival paradigm (Nairne, Thompson & Pandeirada, 2007). However, most of the studies providing evidence that recall is improved by fitness processing were done using word lists as stimuli. Our memory is known to be better for images than words. This is especially relevant in the survival processing paradigm because word processing is more recent in human evolution than visual processing (Paivio, 2007). In this work we presented participants with lists of everyday objects and animals extracted from a larger dataset (Brady, Konkle, Alvarez, & Oliva, 2008). Participants' correct recall was higher for the survival condition than for the moving condition. These results provide, for the first time, evidence that the survival advantage can be obtained with images of single objects. Analysis for a possible congruity object-scenario effect in this experiment revealed that the survival advantage could be obtained even when only objects rated equally in both scenarios are considered. When only objects rated as more relevant in the moving condition are considered no difference between the two conditions on recall was found.

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(3029)

**A Mate Processing Effect on Memory for Facts about People.** JAMES A. KOLE and ALICE F. HEALY, *University of Colorado Boulder*—Several recent studies have demonstrated that processing information in terms of its survival value leads to improved retention compared to other modes of processing. The current experiment investigated whether memory for individuals is better when they are potential mates as opposed to potential friends. College students learned and were tested over fictitious facts about unfamiliar individuals. Subjects were told that these individuals were potential mates (mate processing condition) or potential friends (friend processing condition), or they were given no processing instructions (control condition). Following learning and testing, subjects in the mate and friend processing conditions selected the individual they would most likely date or befriend, respectively. During

learning, memory was better for the control condition relative to the mate and friend processing conditions. At learning and test, for the mate and friend processing conditions, memory was better for individuals who were ultimately selected as friends/mates than for those who were not, particularly in the mate processing condition. These results are interpreted in terms of the effects on memory of both survival processing and attentional narrowing.

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(3030)

**Threat Extends Implied Motion in Remembered Scenes.** MICHAEL GREENSTEIN and NANCY FRANKLIN, *Stony Brook University*, MARIANA MARTINS, *Columbia University*, MARKUS MAIER, *Ludwig-Maximilians-University, Munich*—When people encounter a threatening situation, their cognitive processing is adapted to prioritize information that is particularly relevant to survival. This has been demonstrated through visual search of static arrays, memory for items presented in lists, and memory accuracy for details of objects shown in static or dynamic scenes. The current work examined how people remember threatening situations using neutral visual stimuli (colored dots on a blank background) and the representational momentum paradigm. Participants were given a brief description that encouraged either a neutral or threat-oriented interpretation of an unfolding scene, and they were asked to indicate where the non-threatening or threatening dot was last seen. Both the neutral and threatening conditions produced representational momentum effects, with the magnitude of the effect greater for threat-oriented interpretations. The results suggest that threat processing leads to greater anticipation (measured by increased representational momentum) of another's actions than neutral processing does.

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(3031)

**A Test of the Survival Processing Advantage in Implicit Memory.** BRANDON J. THOMAS, DAWN M. MCBRIDE and CORINNE ZIMMERMAN, *Illinois State University*—Numerous studies have shown a survival processing advantage in explicit recall (e.g., Nairne, Thompson, & Pandeirada, 2007; Weinstein, Bugg, & Roediger, 2008). However, this survival processing advantage has yet to be extended to other forms of memory. Tse and Altarriba (2010) failed to find a survival advantage in two experiments involving implicit memory tests. The current study was conducted to further explore the survival advantage in implicit memory. An implicit stem completion test was given after subjects studied items in a survival, moving, or pleasantness study context. No implicit memory advantage was found for items studied in the survival context as compared with the moving or pleasantness contexts. The current results are consistent with those reported by Tse and Altarriba in failing to find a survival advantage in implicit memory.

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(3032)

**To Eat or Not to Eat: Whether 'tis Easier in the Mind to Categorize Survival-Relevant Objects.** JENNIFER H. COANE, ANNA B. CARON and JOSEF M. BRODER, *Colby College* (Sponsored by Martha Arterberry)—The survival processing advantage (Nairne et al., 2007) refers to the mnemonic benefit observed when participants encode words in terms of their relevance to surviving in the grasslands compared to other encoding strategies, such as pleasantness or self-reference rating. Such findings have been interpreted in the context of a functionalist agenda: Because memory evolved to enhance an organism's fitness, processing strategies that are consistent with the conditions present when such functions were selected are thought to activate relevant structures in long-term memory. We propose that humans exhibit the same specialized memory for survival information when categorizing. Participants categorized unfamiliar plantlike stimuli into categories. Participants who sorted stimuli into survival-relevant categories (i.e., edible and inedible) performed better than participants who categorized into non-survival-relevant categories (i.e., category A and category B). These findings suggest that processing information for its survival value enhances learning of novel categories.

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(3033)

**Can Processing Social Information Reduce or Eliminate Collaborative Inhibition?** MATTHEW R. KELLEY, *Lake Forest College*, MATTHEW B. REYSEN, *University of Mississippi*, KAYLA AHLSTRAND and CARLI PENTZ, *Lake Forest College*—Reysen et al. (in press) reported superior memory for social (vs. nonsocial) passages for both individuals and collaborative groups, yet this mnemonic advantage was not strong enough to counteract the deleterious effects of collaborative inhibition. The present study was designed to replicate and extend these findings using more tightly controlled materials. Specifically, a series of sentences were created in two nearly identical forms—one social (e.g., The frog sat next to Lily) and one nonsocial (e.g., The frog sat next to the lily); some with one target noun/name and others with two. Participants rated 16 sentences on a continuum ranging from very nonsocial to very social, completed a brief distracting activity, and then were surprised with a cued recall test. Consistent with previous research, social information was remembered better than nonsocial information for individuals and groups and collaborative inhibition was evident in all conditions.

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(3034)

**Social Contagion of Memory: Fact is More Contagious than Fiction.** RYAN A. RUSH and STEVEN E. CLARK, *University of California, Riverside*—Memories can be contagious. One person's memory can "infect" the memory of another person through their social interaction (Roediger, Meade, & Bergman, 2001). Social contagion effects raise

several questions: How accurate is the information that people are exposed to when they discuss an event with another person? To what extent do people incorporate correct versus incorrect information into their own recall following exposure? In three experiments pairs of participants recalled items from photographs of common household scenes, discussed their recall with each other, and then recalled the items again individually. The results showed that exposure information was accurate, although not as accurate as individuals' initial recall, and correct exposure items were recalled at a higher rate than incorrect exposure items. Comparison to two different non-discussion control groups showed that the discussion effects were not due to reminiscence effects or additional processing of self-recalled items in discussion groups.

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## ● RECOGNITION MEMORY ●

(3035)

**Strength-based Criterion Shifts Within a Single Test: How Flexible Are They?** JEFFREY J. STARNES, *University of Massachusetts Amherst*, JASON L. HICKS, *Louisiana State University*—There is considerable overlap in the amount of information retrieved for accurate and illusory memories, so memory researchers must understand how participants set and adjust their standards for accepting candidate memories. People require more evidence to accept an item as studied when they expect to have stronger memories for the studied items, and we explored the role of block size for these strength-based adjustments. Participants completed a recognition test with alternating blocks of weak targets (studied once) and strong targets (studied four times). Strength blocks switched every 4, 10, 20, or 40 items. Results showed that participants made strength-based adjustments only when the strength blocks were marked with different colors. Even in the marked condition, participants made adjustments only with 20- and 40-item blocks and not with any smaller block size, demonstrating that participants were unwilling or unable to quickly switch their retrieval standards.

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(3036)

**Tests of Trait-like Consistency in Recognition Memory Response Bias.** JUSTIN KANTNER and D. STEPHEN LINDSAY, *University of Victoria*—Substantial individual differences in recognition memory response bias often underlie group means. From a SDT perspective, these individual differences suggest that some people require more evidence of "oldness" than others before they endorse a test probe as old. Previous results from our laboratory suggest that bias is highly consistent within an individual across time, supporting its characterization as a cognitive "trait." In the present work, we examined the cross-situational consistency of recognition bias and its generalizability to other cognitive tasks in which an

evidence criterion might guide judgments. We measured whether the direction and magnitude of subjects' recognition-test bias predicted their use of report option in a test of general knowledge, tendency to recall critical lures in a DRM task, tendency to false alarm in an eyewitness suspect-identification task, and error rate in a go-no go task. We also explored the relationship of response bias to various personality traits.

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(3037)

**Response Dynamics Reveal Underlying Memory Strength.** MEGAN H. PAPESH and STEPHEN D. GOLDINGER, *Arizona State University*—Recognition memory is typically examined as a discrete end-state, describable by static variables, such as accuracy, response time, and confidence. In the present study, we combined real-time mouse-tracking with overt confidence estimates to examine the dynamic nature of memory decisions. By examining participants' streaming x-, y- mouse coordinates during recognition decisions, we observed that movement trajectories revealed underlying response confidence. More confident decisions were associated with faster decision times and linear response trajectories. Less confident decisions were made slowly, and with increased trajectory curvature. Statistical indices of curvature and decision times, including area-under-the-curve and time to maximum deviation, support the conclusion that memory strength influences behavioral response dynamics. Using mouse-tracking to examine the dynamic time-course of memory decisions, we provide evidence in favor of sequential sampling models of information accrual.

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(3038)

**The Recognition without Cued Recall Phenomenon: Support for a Feature-Matching Theory.** ANTHONY J. RYALS and ANNE M. CLEARY, *Colorado State University*—Recognition-without-cued-recall (RWCR) is discrimination between test cues that do and do not resemble studied items when the cues fail to elicit cued-recall. We hypothesized that whereas recognition with cued-recall is partly based on self-generated (i.e., recalled) studied information, RWCR results from a feature-matching process whereby cue features are matched with features in memory to produce a variable familiarity signal that increases with a greater match. We used nonword cues (e.g., foneheed) that potentially graphemically resembled studied words (e.g., forehead). In Experiments 1 and 2, features of studied words not reinstated in test cues themselves (concreteness and emotionality) affected recall and recognition with recall but not RWCR; recognition with and without recall differed significantly in their responses to these manipulations. In Experiment 3, RWCR was greater when there was a greater degree of match between the cue features and those in memory. Results support a feature-matching theory of RWCR.

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(3039)

**Flexible Fluency: Conceptual and Perceptual Fluency Can Be Used Interchangeably.** MEREDITH LANSKA, JUSTIN OLDS and DEANNE L. WESTERMAN, *Binghamton University*—On a recognition memory test, both perceptual and conceptual fluency can engender a sense of familiarity and elicit recognition memory illusions. To date, perceptual and conceptual fluency have been studied separately. But are they interchangeable? Three experiments investigated whether participants will interpret both fluency types the same way in the same recognition context. In Experiment 1, we found that on a standard recognition test, participants relied more on conceptual fluency. In Experiment 2, we found that if participants' attention was drawn to the physical features of words during study they relied more on perceptual fluency. In Experiment 3, the study phase was manipulated to draw attention to both conceptual and perceptual features. In this case, both perceptual and conceptual fluency led to an increase in positive recognition responses. The results show that both fluency types can be used interchangeably, however, both conceptual and perceptual features have to be attended to during study.

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(3040)

**A Simple Linguistic Analysis of the Justifications of Recognition Reports.** DIANA SELMECZY and IAN G. DOBBINS, *Washington University in St. Louis*—What thoughts accompany recognition decisions? Gardiner et al. (1998) explored this by having participants justify Remembering, Knowing, and Guessing (R/K/G). The justifications suggested Remember reports were supported by recovery of imagery and effortful encoding, unlike Knowing and Guessing. We reanalyzed these data, comparing single word frequency across subjective reports, finding several interesting patterns. For example, 'not' occurred more often during justification of K versus R reports, whereas the reverse occurred for 'remembered'. However, the explicit and extensive definition of R/K/G characteristics may have biased these justifications. We conducted a follow-up using confidence categories (high, medium, low) without mentioning their putative mental characteristics or the word 'remember'. The word 'not' occurred more often during justification of medium versus high confidence reports, whereas 'remember' occurred more often for high than medium confidence reports. Thus, remembering and its absence are used to parse confidence even when participants are naïve to the R/K/G procedure.

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(3041)

**More Isn't Always Less: Item-specific vs. Relational Generation Tasks in the DRM Paradigm.** MARK J. HUFF and GLEN E. BODNER, *University of Calgary*—Within the DRM paradigm, we compared item-specific and relational-processing versions of a generation task relative to a read control condition. Item-specific generation required solving an anagram of each list item. Relational generation was similar, except the anagrams on each list were presented with a related cue word. Both generation tasks increased correct recognition, but only the item-specific version decreased false recognition. Item-specific generation decreased the encoding of information about the critical items at study (i.e., impoverished relational encoding), whereas relational generation did not. Interestingly, both generation tasks increased monitoring processes at test (i.e., a distinctiveness heuristic), but increased monitoring was not successful following relational generation. Our findings suggest that deep levels-of-processing tasks will not necessarily produce a “more-is-less” pattern (i.e., increases in both correct and false recognition). Instead, whether the DRM illusion is reduced by an encoding task should depend on the type of processing required by that encoding task.  
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(3042)

**Influences On the Likelihood of Constrained Retrieval.** MICHAEL ALBAN and COLLEEN M. KELLEY, *Florida State University*—Mentally reinstating encoding operations at retrieval can improve access to memories; however, this may be a more effortful process than simply assessing familiarity. Mental context reinstatement has been dubbed constrained retrieval (Jacoby, Shimizu, Velanova, & Rhodes, 2005) and occurs more often in younger than in older adults. In the three experiments reported here, we used a memory-for-foils procedure to investigate conditions that eliminate and conditions that enhance the likelihood of constrained retrieval in younger adults.  
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(3043)

**The Use of Mouse-Tracking Performance to Measure the Quality of Memories in a Directed Forgetting Task.** MARK A. OAKES, PENNY L. YEE and JODI-ANN OSBORNE, *Hamilton College*—Directed forgetting (DF) researchers have investigated the quality of recognition memories by assessing how sensitive participants are to alterations made to stimulus details (e.g., font, size, case). We used a mouse-tracking task to further evaluate the quality of recognition memories. After receiving a list method DF manipulation, participants moved a cursor to response boxes to indicate whether or not a test word was identical to how it had been presented earlier. Compared to Remember participants, Forget participants exhibited a movement bias toward the incorrect response option when correctly rejecting a foil. This movement pattern suggests that Forget participants had a weaker memory trace for

correctly recognized items. Specifically, the forget instruction may have disrupted or delayed the binding of the detail features of the memory. This present findings support the idea that DF not only increases the number of items forgotten, but also affects the quality of those items remembered.

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(3044)

**The Role of Categorization in Memory.** W. MATTHEW COLLINS, LOGAN ARMSTRONG, KRISTIN BURGGRAF and LEANNE BOUCHER, *Nova Southeastern University*—A number of studies have examined the relationship between language and memory (Morris & Baker-Ward, 2007) but few have directly examined the relationship between categorization and memory. This experiment consisted of an initial learning phase, an exposure phase, a second learning phase and a recognition memory test. During initial learning, participants learned to categorize symbols. During the exposure phase, symbols were presented and participants were asked to draw them. Some symbols were new while some had been learned during the initial learning phase. The second learning phase involved learning more symbols, some of which had appeared during the exposure phase. Finally, on the recognition memory test, participants were tested on their recognition memory for symbols during the exposure phase. There was no recognition memory difference between symbols learned before or after exposure. However, participants were more likely to have source memory for symbols learned prior to exposure.

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(3045)

**Why is the Slope of the zROC Typically Less Than One? “Re”-test the Encoding Variability Account.** YOONHEE JANG, LAURA MICKES and JOHN T. WIXTED, *University of California, San Diego*—Wixted (2007) suggested that the greater variance of the target distribution in recognition memory judgments may arise because the different items on a study list receive different increments in memory strength during study. In an attempt to examine this interpretation, Koen and Yonelinas (2010, K&Y) performed three tests on the mixed-strength data (weak and strong targets together) and concluded that encoding variability does not explain why the slope of the zROC is typically less than one. However, we show that their tests have no bearing on the encoding variability account. Instead, they bear on the mixture-UVSD model that corresponds to their experimental design. Moreover, all three of the tests they performed contained errors. When those errors are corrected, the same three tests show that the data from 4 experiments (including K&Y's) support, rather than contradict, the mixture-UVSD model. Even so, the results have no bearing on the encoding variability hypothesis.

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(3046)

**Modeling Confidence Judgments in Associative Recognition and Perceptual Discrimination.** CHELSEA VOSKUILEN, VICTOR G. INTERMAGGIO and ROGER RATCLIFF, *The Ohio State University*—A new version of the Ratcliff & Starns (2009) diffusion model for confidence judgments is presented. The model has previously been fit to quantile reaction times and confidence judgments from item recognition memory experiments. Here, we explore recent applications of the model to associative recognition and to perceptual brightness discrimination tasks. Much of the research examining various models of memory has focused on differences in the locations and shapes of zROC curves across tasks. In an associative recognition task, our model was able to fit and explain a variety of zROC shapes as well as individual differences in these shapes. Additionally, the use of perceptual tasks allows us to add controllable and known variability to items and to test models based on this knowledge. Specifically, we are able to test whether, how, and how well the model can account for variance in latent distributions of evidence.

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(3047)

**Grapheme-Color Synaesthesia Benefits Rule-Based Category Learning.** MARCUS R. WATSON, *The University of British Columbia*, MARK R. BLAIR, *Simon Fraser University*, PAVEL KOZIK, *The University of British Columbia*, KATHLEEN A. AKINS, *Simon Fraser University*, JAMES T. ENNS, *The University of British Columbia*—Researchers have long suspected that grapheme-color synaesthesia is useful for learning, but research on its utility has so far focused primarily on episodic memory and perceptual discrimination. Here we ask whether synaesthesia can be harnessed when learning rule-based categories. Participants learned through trial and error to classify grapheme pairs that were organized into categories on the basis of their associated synaesthetic colors. The performance of synaesthetes was similar to non-synaesthetes viewing graphemes that were physically colored in the same way. Specifically, synaesthetes learned the category structure at a similar rate, they were able to transfer their learning to novel stimuli, and they falsely recognized grapheme-pair foils, all like non-synaesthetes viewing colored graphemes. These findings demonstrate that synaesthesia can be exploited when learning the kind of material taught in many classroom settings.

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(3048)

**Binary ROCs in Recognition Memory: Signal Detection, Multinomial Processing Tree, and Diffusion Models.** CHAD DUBE, JEFFREY J. STARNES and CAREN M. ROTELLO, *University of Massachusetts*, ROGER RATCLIFF, *Ohio State University*—A classic question in recognition research is whether retrieval is best described as a graded process consistent with signal detection theory

(SDT), or a threshold process consistent with multinomial processing tree (MPT) models. Because receiver operating characteristics (ROCs) based on confidence ratings are typically curved as predicted by SDT, this model has been preferred in many studies of recognition memory (Wixted, 2007). Recently, Bröder and Schütz (2009) argued that curvature in ratings ROCs may be produced by variability in scale usage; therefore, ratings ROCs are not diagnostic. They claimed that ROCs constructed via experimental manipulations of response bias are linear, consistent with the assumptions of MPT models. We compared SDT and the double high-threshold MPT model using bias ROCs differing in target strength. Results showed that the SDT model provided a superior account of both the ROC curvature and the effect of strength compared to the MPT model. Moreover, the bias manipulation produced differences in RT distributions that were well-described by the diffusion model (Ratcliff, 1978), a dynamic version of SDT.

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## ● COGNITIVE AGING I ●

(3049)

**Metacognitive Age Differences in Strategy Shift: Retrieval Avoidance or General Shift Reluctance?** DAVID J. FRANK and DAYNA R. TOURON, *University of North Carolina at Greensboro*, CHRISTOPHER HERTZOG, *Georgia Institute of Technology*—When learning involves a transition from an algorithmic strategy to a retrieval-based strategy, older adults' (OAs) shift is delayed following learning. This outcome is generally attributed to metacognitive factors such as memory confidence (Touron & Hertzog, 2004). However, it is unclear whether OAs are specifically retrieval-reluctant or have a more general reluctance or inability to shift strategies. Haider and Frensch's (1999) alphabet verification task (AVT) allows shift to a 'selective attention' (SA) strategy that does not involve retrieval. We adapted AVT to compare conditions in which shift to retrieval or SA was possible. OAs were retrieval-reluctant but shifted to selective attention more quickly than did YAs—suggesting that OAs' reluctance to shift strategies is retrieval-specific. In a condition with both options, strategy use resembled the retrieval condition (SA was infrequent); both age groups recognized the efficiency of retrieval. Self-reported strategy use was validated by performance and eye movement data.

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(3050)

**The Influence of Age On Distinctiveness in Memory.** ANDREW J. KELLY and ANDERSON D. SMITH, *Georgia Institute of Technology*—A common finding in the memory literature is that distinctive items are remembered with a higher probability than common or non-distinct information. Two studies assessed whether aging affects the distinctiveness effect. Previous research is mixed on whether

or not older adults can benefit from the presence of distinctive information. For example, Cimbalò and Brink (1982) did not find a distinctiveness effect with older adults. However, recent work by Geraci, et al., (2009) found that older adults showed superior memory for distinctive information, albeit to a smaller extent than younger adults. Older and younger adults, classified by medial-temporal lobe function (Glisky, et al., 1995), were assessed on primary (i.e., isolation effect) and secondary (i.e., orthographic) distinctiveness. After being shown a list of words to remember, participants completed a recognition test with Remember-Know judgments. Our results suggest that older adults show a memorial advantage for distinctive items, which is similar to younger adults. Also, recollection and familiarity estimates were greater for distinct items relative to non-distinct items suggesting both types of retrieval processes are critical for the distinctiveness effect.

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### (3051)

**The Role of Executive Function on the Age-Related Decline of Procedural and Declarative Learning.** JACQUELINE C. SHIN and GREGORY SIMMONS, *Indiana State University*—How do changes in executive function contribute to the decline in procedural and declarative learning with age? In children, executive function correlates with the learning of timing patterns in motor sequences (Shin, in press). This raises the possibility that certain types of complex procedural learning, like temporal pattern learning, might decline with age due to deteriorating executive function. Although executive function may support declarative learning, the effects of aging on procedural and declarative learning might be mediated by different components of executive function. These possibilities were investigated by comparing the performance of young and elderly adults on multiple tests of executive function, a verbal learning test, and a serial reaction time task that independently measured response order learning and temporal pattern learning. The correlational structure of scores on these tasks is discussed with respect to a computational analysis of age-related decrements in procedural and declarative learning.

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### (3052)

**Learning From Fiction: Error Detection in Younger and Older Adults.** SHARDA UMANATH and ELIZABETH J. MARSH, *Duke University*—We often encounter fictional stories containing errors (e.g. the Russian capital is St. Petersburg) that we may then consider as true. Of interest is how older adults deal with such errors. Prior work has shown that compared to younger adults, older adults are less likely to reproduce story-errors on later general knowledge tests. Currently, we investigated possible reasons for this finding, replicating previous research and extending it. While older adults show less suggestibility than younger adults following exposure to misinformation, they are

equally proficient at detecting errors when asked to mark them while reading. Both age groups benefit equally from the detection task, and detected errors are equally likely to persist. However, when exposed to misinformation, older adults are better able to recover and answer correctly, regardless of whether they initially detected the story-error. Thus, our results suggest that the strength of older adults' general knowledge protects them from suggestibility.

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### (3053)

**Effect of Physical Activity Level on Implicit Spatial Context Learning in Healthy Aging.** NOBUTAKA ENDO, *Kinki University*—Visual search performance is gradually improved when participants repeatedly experience the same spatial layout (contextual cueing). Contextual cueing suggests that participants implicitly learn to use the spatial context information as a cue of the target location. The present study examined whether physical activity levels influence the occurrence of contextual cueing in healthy aging. Forty-six older participants were divided into two groups (the high and the low groups) according to the score of the International Physical Activity Questionnaire. The results showed that contextual cueing occurred only in the high active group. However, there was no difference in search efficiencies between both groups. These results suggest that the occurrence of contextual cueing is affected by participants' physical activity level, and the regular physical activity has a benefit to use the learned context information.

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### (3054)

**Prospective Remembering With Focal and Nonfocal Cues: The Effects of Optimal Time of Day.** ALEXANDRA MOSER, GILLES O. EINSTEIN and HILLARY G. MULLETT, *Furman University*—In the present experiment, younger and older participants were tested either at their optimal or non optimal time of day on both focal and non focal prospective memory tasks. According to the multiprocess theory, non focal tasks require strategic monitoring processes for successful retrieval whereas focal tasks can be accomplished with spontaneous retrieval processes. Consistent with the multiprocess theory and with past research showing that age and being in synchrony with one's optimal time mainly affect performance on tasks that require controlled attention, the preliminary results indicate that both age and performing at one's optimal time of day mainly affect performance on non focal prospective memory tasks.

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(3055)

**Counterfactual Simulations Affect Memory Accuracy in Young and Older Adults.** KATHY D. GERLACH, DAVID W. DORNBLASER and DANIEL L. SCHACTER, *Harvard University*—In everyday life, people frequently engage in counterfactual thinking: mental simulation of alternative outcomes to past events. However, it is unknown whether counterfactual simulations of past events can affect memory for those events, and whether any such effects are influenced by aging. To address these issues, we developed a paradigm in which 24 younger and 24 older adults listened to recordings of scenarios while imagining themselves experiencing each scenario. Participants then imagined the same scenario again, engaged in no further simulation of a scenario, or imagined a counterfactual alternative outcome to a scenario. On a subsequent recognition test in which participants were instructed to respond “old” only to the initially imagined scenarios, participants were more likely to make false alarms to counterfactual lures than novel lures, suggesting that counterfactual thinking can cause source confusion based on self-generated misinformation. Older adults were more prone to these memory errors than younger adults.

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(3056)

**A Computer-Based Approach to Collaborative Memory in Older Adults: A Feasibility Study.** HELENA M. BLUMEN and YAAKOV STERN, *Columbia University*—Collaborating with others typically lowers individual contributions during group recall (collaborative inhibition, Weldon & Bellinger, 1997). We investigated the feasibility of a computer-based paradigm for collaborative memory in older adults. This paradigm involves simulated rather than actual group recall, offers fine-grained control of the collaborative recall process itself, and can be transferred to an fMRI environment. Older (60-85) adult participants studied a list of words and were later asked to repeatedly recall these words alone and/or in collaboration with a computer program. During individual and simulated group recall, participants were asked to recall as many words as they could in any order. During simulated group recall, participants were told that they were collaborating with two other participants that have completed the experiment previously, and that they could use their responses as cues to recall additional words. Results suggest that simulated group recall lowers individual contributions similar to actual group recall.

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(3057)

**Prior Task Experiences Influence Memory Performance for Older Adults.** MATTHEW L. HUGHES, TYLER M. MILLER and LISA GERACI, *Texas A&M University*—Research shows that holding negative beliefs about one’s memory can lead older adults to perform poorly on memory tests (e.g. Hess, Hinson, & Statham, 2004). However, few

studies have been able to effectively change these negative memory beliefs to improve performance. The current study was designed to improve older adults’ memory performance by giving them direct experience with a cognitive task to counter stereotypical performance expectations. Older adults were given a task that they could successfully complete (and the nature of this task was varied) prior to participating in an unrelated free recall memory experiment. Relative to those who had no prior task success, older adults in the task success conditions recalled significantly more words in the subsequent memory experiment. Results suggest that older adults’ memory performance is affected by prior experiences and expectations and that improving these expectations can improve memory performance.

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(3058)

**Directed Forgetting in Old and Very Old Age.** ALP ASLAN and KARL-HEINZ T. BÄUML, *Regensburg University*—Cuing participants to forget a previously studied item list before studying a second list typically impairs memory for the first list, and improves memory for the second. Such listwise directed forgetting [DF] has been attributed to executive control processes, reducing the temporary accessibility of the to-be-forgotten material. Older adults are assumed to suffer from a general decline in executive control and thus should show reduced DF. However, several previous studies challenged this prediction, reporting reliable DF in older adults. We replicated this prior work by finding efficient DF in young-old participants (60-74 years). Going beyond the prior work, we found inefficient DF in old-old participants (above 75 years). Furthermore, individuals’ DF was positively related to their working memory capacity, suggesting a role of (age-related) working memory decline for (age-related) changes in DF. The results support the proposal of a decline in executive control processes in very old age.

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## ● EXPLICIT MEMORY II ●

(3059)

**The Effect of Initial Errors: Interference Versus Pretesting Advantage.** WILLIAM B. LANDON and DANIEL R. KIMBALL, *University of Oklahoma*, MARTHA MANN, *University of Texas-Arlington*—The pretesting effect refers to memory improvement for correct items that follow generated errors compared to correct items learned in the absence of earlier errors. Our experiments addressed two extraneous variables in pretesting designs: the confounding of the occurrence of an error with its generation; and participants’ foreknowledge of which particular items will be tested. Experiment 1 unconfounded error occurrence and generation using a factorial design; results suggested an advantage due to error correction rather than pretesting. However, participants had foreknowledge of an item’s future testing only when there had been an error. In Experiment 2, there was test foreknowledge in all conditions; the error-induced advantage disappeared.

Experiment 3 instead eliminated test foreknowledge in all conditions; not only was there no error-induced advantage, but errors instead proactively interfered with the corrections. Thus, rather than enhancing memory for corrections, errors actually impaired memory through proactive interference; test foreknowledge counteracted the interference.

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(3060)

**Forward Association Strength and False Memory.** JASON ARNDT and ANDY HYATT, *Middlebury College*, DIVYA DETHIER, *Middlebury College*, EMILY WHITAKER, *Middlebury College*, NINA HOMMEL, *Middlebury College*, MARIAM BOXWALA, *Middlebury College*—Extensive empirical evidence suggests that false memories in the Deese-Roediger-McDermott (DRM) paradigm are driven by the association strength between study items and unstudied lure items, a variable known as backward association strength (BAS). However, BAS tends to be correlated with the association strength between lure items and study items (forward association strength, or FAS; Brainerd, Yang, Reyna, Howe, & Mills, 2008). Further, few studies have examined the influence of FAS on false memory while controlling for BAS (see Brainerd & Wright, 2005 for an exception). In the present study, we manipulated FAS while controlling BAS, and examined peoples' beliefs that lure items were studied in a specific source (Hicks & Hancock, 2002). Thus, high and low FAS stimulus sets were equated for BAS and were studied in one of two fonts. At test, participants were asked to judge whether lure items were studied in the font used to study its high FAS associates, its low FAS associates, or an unrelated font. Results suggested that FAS influences lure errors, particularly the likelihood participants attribute a lure to a specific visual source (font). Theoretical implications are discussed in terms of major theories of false memory.

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(3061)

**Increasing Retrieval-Induced Forgetting By Increasing Response Competition: Further Support for the Suppression Account.** ŞIRIN E. ERALTAN and ESRA MÜNGAN, *Bogazici University*—Retrieval practice of a subset of studied items from a category can cause forgetting of the remaining, unpracticed category items at final recall. This retrieval-induced forgetting (RIF) effect is typically lost if items are semantically integrated. In Experiment 1, presenting study items in a blocked rather than mixed fashion was sufficient to counteract the RIF effect even without any semantic integration instructions. In Experiment 2, stronger response competition was created during retrieval practice. Half of the categories consisted of pairs of items with the same initial letter (e.g., fruit - apple, fruit - apricot). During retrieval practice, only one of the two same-letter pairs were practiced (fruit - a---- ? ). As expected, RIF effects were stronger for categories that contained same-letter items than for those that did not. Results are discussed with reference to inhibition theory.

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(3062)

**Retrieval Practice and Feedback Effects On Front-end Versus Back-end Control in Recall.** RUTHANN C. THOMAS and MARK A. MCDANIEL, *Washington University*—The current experiments explored differences in cognitive control at retrieval to better understand the mechanisms underlying the powerful boost in recall of previously tested information. Memory retrieval may be optimized by early selection processes that constrain retrieval to relevant information or by late correction processes that monitor retrieval for incorrect candidates. In Experiment 1, prior retrieval practice with feedback improved participants' ability to constrain retrieval compared to restudy. However, post-retrieval monitoring processes did not differ between restudy and retrieval practice groups. In Experiment 2, we disentangled the effects of successful retrieval and feedback. Prior retrieval practice improved retrieval constraint, such that previously tested items were more directly accessed than were previously studied items. By contrast, corrective feedback during retrieval practice improved monitoring of retrieved candidates on final testing. Results revealed unique contributions of retrieval practice and feedback to early selection and late correction processes that optimize memory retrieval.

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(3063)

**Category-Sensitive Neural Oscillations Predict Recall Organization During Memory Search.** NEAL W. MORTON and SEAN M. POLYN, *Vanderbilt University*—When participants study items from distinct categories, neural activity patterns allow one to discriminate the categories during study, and detect the reinstatement of category representations as the participant searches memory (Polyn et al., 2005). However, the functional role of these category-related patterns remains unclear. Examining category-related oscillatory activity from intracranial and scalp EEG, we confirm predictions of the Context Maintenance and Retrieval model (Polyn et al., 2009) regarding the functional relevance of these category patterns for memory performance. During encoding, the fidelity of an item's category representation predicts both whether it will be recalled, and whether it will be clustered with same-category items during recall. Classifier performance increases as items from the same category are studied successively, and the rate of this increase relates to individual differences in category clustering. Finally, the strength of category-related activity during memory search correlates with periods of category clustering.

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(3064)

**A Causal Contiguity Effect in Probed Recall.** ASLI KILIC and AMY H. CRISS, *Syracuse University*, MARC W. HOWARD, *Syracuse University*—The contiguity effect in free recall is the tendency to recall an item from a nearby serial position with respect to the previously recalled item. Causal Models (SAM, Raaijmakers & Shiffrin, 1980, 1981; TCM, Howard & Kahana, 2002) suggest that recalling one item causes a change in the memory state and as a result causes recall for additional items from nearby study positions. On the other hand, Noncausal models (Davelaar et al., 2005; Grossberg & Pearson, 2008; Farrell & Lewandowsky, 2002) do not posit a change in the memory state as a result of retrieval. According to these models, contiguity effect occurs because of the correlated memory states at study and test. In this study, we developed a probed recall task in which the correlation between memory states at test and study was disrupted. The results showed a short-term and a long-term contiguity effect which would challenge the noncausal models.

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(3065)

**Item Strength Benefits Associative Encoding in Cued Recall.** WILLIAM R. AUE and AMY H. CRISS, *Syracuse University*—In cued recall, Aue, Criss, & Fischetti (under revision) observed an increased level of responding for word-face pairs that were composed of repeated items relative to pairs composed of items that were not repeated. That is, both correct responses and incorrect responses were higher when the studied pair was composed of repeated items, but the pair itself was studied just once. In the current experiments we investigated whether this increase is the result of better encoding of the pairs containing strong items, a more liberal response bias for strong cues, or both. Our data suggest that two processes contribute to performance. Correct responses seem to be determined primarily by improved encoding. We further hypothesize, based on the REM model, that stronger cues elicit longer searches and this is the primary factor determining the intrusion rates. These data places constraints on models of episodic memory.

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(3066)

**Negative Effects of Item Familiarity on Source Memory.** KYUNGMI KIM and MARCIA K. JOHNSON, *Yale University*—The current study explored how experience-based item familiarity modulates subsequent memories for new item-context associations. Using a 3-phase paradigm, we manipulated item familiarity by presenting line drawings a varying number of times in Phase 1. In Phase 2, each item was presented only once in a specific context (location or background color). In Phase 3, memory for the source (contextual detail in Phase 2) of each item was probed. Experiments 1 and 2 demonstrated and replicated a negative

effect of item familiarity on source memory accuracy and confidence. Source memory was reliably better for less familiar items when source interference was reduced (Experiment 3), and when encoding of source was intentional (Experiment 4). Source accuracy was not better for entirely novel items than items that had been previously presented once (Experiment 5). Overall, the findings are consistent with the idea that relative item novelty attracts attention that facilitates item-source binding.

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(3067)

**Involuntary Reinstatement of Episodic Content During Memory Retrieval.** JEFFREY D. JOHNSON, *University of Missouri*—Episodic memory retrieval is thought to involve reinstating the cognitive and neural processes that were engaged during encoding. Several fMRI studies have supported this hypothesis by demonstrating that overlap between the neural correlates of encoding and retrieval is selective for the specific content of episodes. It remains unclear, however, whether such reinstatement occurs involuntarily in response to an effective retrieval cue, or alternatively, it is a byproduct of strategic attempts to recollect episodic information. The present fMRI study addressed this issue by first having subjects study words with three distinct encoding tasks. Memory for the words was then tested with a source memory procedure that focused retrieval not on information directly related to the encoding tasks but instead on an orthogonal dimension. Multi-voxel pattern analysis (MVPA) was used for the fMRI data to discriminate between the three tasks and then provide an indication of the degree to which the discriminating information was present at retrieval. The results showed that task-related information was reinstated even when it was irrelevant to the retrieval goals, suggesting that reinstatement contributes involuntarily to episodic retrieval.

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(3068)

**Individual Differences in the Delayed-Execution of Prospective Memories.** HUNTER BALL, *Arizona State University*, MICHAEL R. DEWITT and JUSTIN B. KNIGHT, *University of Georgia*, GENE A. BREWER, *Arizona State University*—Previous research has suggested that working memory is necessary for actively maintaining, retrieving, and fulfilling prospective memories. In the current study we examined individual differences in prospective memory abilities between young adults with high versus low working memory capacity (WMC) in a delay-execute paradigm. In Experiments 1 and 2, high relative to low WMC individuals performed significantly better at both delay intervals under standard ongoing task conditions, and interestingly showed increased performance during the longer delay (Experiment 1). Furthermore, the inclusion of an interrupting task (Experiment 2) during the



longer delay significantly decreased performance relative to no interrupting task for low, but not high WMC individuals. These results suggest that prospective memory ability is generally impaired across all retention intervals in low WMC individuals, and that high WMC individuals may be better able to actively maintain or refresh intentions even when their attention is interrupted by secondary task demands.

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(3069)

**Task-Appropriate Processing and Context Change in Prospective Memory.** BENJAMIN A. MARTIN and JASON L. HICKS, *Louisiana State University*—Task-appropriate processing and context reinstatement have both been shown to enhance event-based prospective memory (PM) retrieval. Each of these factors was manipulated in separate experiments to examine their effect on task interference (i.e., ongoing task slowing) and on the preparatory attention parameter in a multinomial model of PM retrieval. Unexpectedly, task-appropriate processing conditions showed worse PM retrieval. This result occurred because task-inappropriate conditions promoted a high level of preparatory attention as indexed by task interference and by multinomial model fits. In a second experiment, PM cues promoted better retrieval when presented in the same color and font as when they were encoded. Interestingly, although task interference did not differ in the context-match vs. context-mismatch conditions, the preparatory attention parameter in a multinomial model was higher in the match condition. Thus, in this experiment two indexes of preparatory attention (or monitoring) did not agree. The effects in both experiments were more pronounced when a questionnaire about predicted difficulty of the ongoing task and of the PM task was given prior to the PM retrieval phase.

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(3070)

**Effects of Intention-Related Events on Ongoing Task Processing and Prospective Memory Performance.** JOANA S. LOURENCO and ELIZABETH A. MAYLOR, *University of Warwick UK*—A growing body of research on processes involved in prospective memory retrieval focuses on possible factors that can interfere with ongoing task processing. One approach has been to investigate the influence of material related to the prospective memory target events. The present study examines the relationship between intention-related stimuli and performance on both ongoing and prospective memory tasks. Presentation of intention-related material was systematically manipulated and task interference across the ongoing task was examined. Results suggest that prospective memory performance can be enhanced by intention-related stimuli at the cost of ongoing task processing. In addition, task interference on the ongoing task altered as a function of the presentation of intention-related material and prospective memory

success/failure. Finally, analyses of task interference were conducted according to the ongoing trials' proximity to the prospective memory targets.

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(3071)

**The Effects of Word Length and Phonological Similarity in an Order Reconstruction Task at Immediate and Delayed Retention Intervals.** MIYUKI TOGA, *Ritsumeikan University* (Sponsored by Tetsuya Fujita)—Two experiments investigated the effects of word length and phonological similarity, respectively, on order memory in a reconstruction task. In both experiments, participants reconstructed the order of six words that had been presented to them and order memory was tested at immediate and delayed retention intervals. The results of Experiment 1 showed that performance for short words was more accurate than that for long words at the immediate interval, whereas the effect of word length disappeared at the delayed interval. The results of Experiment 2 showed that performance for lists of phonological dissimilar items was more accurate than that for lists of phonological similar items at the immediate interval, whereas the effect of phonological similarity disappeared at the delayed interval. These results suggest that phonological information on order memory is rapidly forgotten.

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(3072)

**Overcoming Forgetting: Spacing Across Days can Improve Memory.** MARY A. PYC and DAVID A. BALOTA and KATHLEEN B. MCDERMOTT, *Washington University in St Louis*, TIM TULLY, *Dart Neuroscience*, HENRY L. ROEDIGER III, *Washington University in St Louis*—Although the memorial benefits of spaced practice have been demonstrated for over 100 years, the vast majority of this work has involved spacing within a single learning session, with final test performance as the primary measure of interest. Across two experiments we evaluated retention of information across a delayed interval with spacing manipulated within or between sessions. Participants learned items to a criterion of 70% during an initial learning phase, and then had one relearning trial with each item. For the short delay group, relearning occurred immediately after criterion was reached. For the long delay group, relearning occurred one day later. Both groups had a final test one day after relearning. Results from both experiments indicated that performance significantly decreased between relearning and the final test for the short delay group, but significantly increased between relearning and the final test for the long delay group.

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(3073)

**Reactivating Real-World Memories Using a Novel Museum Paradigm.** PEGGY L. ST. JACQUES and DANIEL L. SCHACTER, *Harvard University*—Reactivation enables memories to be enhanced and updated, supporting the dynamic and flexible nature of memory. We developed a novel paradigm to investigate reactivation-induced plasticity in memory for real-world events. Participants completed a museum tour while wearing a camera, which automatically takes photographs. 48 hours later they viewed photographs from museum events paired with a novel photograph taken from the same exhibit or not, and made relatedness judgments. We manipulated reactivation strength by changing the temporal order of actions within an event or the perspective of the photograph. In the final session 48 hours later, participants made recognition memory judgments on reactivated and unreactivated photographs showing actions conducted at the museum or not. Preliminary analysis suggests that reactivation of individual museum events increases both hits and false alarms. These results demonstrate the effectiveness of a new paradigm to reactivate individual real-world episodes and provide novel information concerning reactivation processes.

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#### ● METAMEMORY/METACOGNITION II ●

(3074)

**“This Will Be Tough(er)”: Influences of Metacognitive Predictions on Cue Monitoring in Event-Based Prospective Memory.** BEATRICE G. KUHLMANN, *University of North Carolina at Greensboro*, JAN RUMMEL, *University of Mannheim, Germany*, DAYNA R. TOURON, *University of North Carolina at Greensboro*—Event-based prospective memory (PM) is performing an intended response following a target cue. Usually, holding an intention interferes with other ongoing tasks, reflecting strategic monitoring for the cue. The level of monitoring depends on PM-task demands with participants engaging more monitoring (reflected by prolonged response times in an ongoing task) for non-focal than for focal cues. We tested whether people are aware of cue-focality differences before and after task experience and whether PM predictions influence monitoring level. We manipulated cue focality blockwise within participants, with some making predictions about their PM performance beforehand. Making PM predictions generally increased monitoring. Participants were only somewhat aware of cue-focality differences before task experience but postdictions were accurate. Individual differences in predictions for the focal and non-focal task influenced initial but not final level of monitoring. Thus, expectations influence initial cue monitoring but participants flexibly adjust their monitoring after task experience.

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(3075)

**Inflating Judgments of Learning With Video Context Reinstatement.** JEREMY H. NICHOLS and STEVEN M. SMITH, *Texas A&M University*—After studying a list of words, with each word superimposed over a 5-sec video scene, participants gave yes/no judgments of learning (JOLs) for each word on the study list. Each JOL was made for a target whose video context was either reinstated (the originally presented video scene), or different (a new video scene), a within-subjects variable. JOLs for words with reinstated contexts were more frequent than JOLs for words seen with different contexts. On a final free recall test, in which no video scenes were shown, there was no significant difference in recall for words whose JOLs had been made with reinstated contexts than for targets that had different contexts at JOL. Video context reinstatement, shown to serve as a powerful retrieval cue (Smith & Manzano, 2010), may have boosted target retrieval fluency, thereby inflating JOLs.

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(3076)

**This Poster Seems Strangely Familiar: Age Changes in Déjà Vu and Jamais Vu.** ALAN S. BROWN and KATHRYN CROFT, *Southern Methodist University*—An online retrospective survey evaluated the prevalence of two recognition anomalies – déjà vu (something objectively unfamiliar feels momentarily familiar) and jamais vu (something objectively familiar feels momentarily unfamiliar). 315 university alumni were sampled, evenly distributed across decades from those in their 20's through those in their 70's. Across different manifestations of déjà vu (5 items) involving dreams, settings, and activities, there was a consistent age-related decline in both the percentage of individuals endorsing the experience (experients), as well as the frequency of occurrence within these persons. Jamais vu experiences (6 items) involved settings, activities, acquaintances and words (alienation). About half as many persons endorsed jamais vu, and although age-related declines were again found they were not as strong or consistent as those found for déjà vu.

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(3077)

**Accessibility to Both Prior Knowledge and Experimentally Associated Information Influences Delayed JOL Sensitivity.** MYRA REID and DEBORAH K. EAKIN, *Mississippi State University*—Eakin, 2005 found a dissociation between metamemory and memory under retroactive interference using related cue-target word pairs, which she attributed to accessibility leading to higher predictions in the interference condition (two targets paired with one cue) than in the control condition. Consistent with Koriat's (1993) accessibility hypothesis, she suggested that people relied on the accessibility of prior knowledge that

arose because the cue-target pairs were semantically related. This study examined whether accessibility influenced the magnitude (sensitivity) of delayed JOLs when the amount of information related to a cue was experimentally, rather than pre-experimentally derived (unrelated cue-target pairs, unrelated competing targets). Regardless of relatedness condition, memory and metamemory were dissociated; memory was better for control than interference condition whereas dJOLs were higher for interference than control condition. Additional conditions testing cue familiarity versus accessibility provided additional support for the accessibility view.

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(3078)

**Performance Monitoring Offsets But Does Not Eliminate The Metacognitive Illusion That Errors Hurt Learning.** BARBIE HUELSE and JANET METCALFE, *Columbia University*—What do people believe about learning through errors? During learning, participants studied weakly associated word pairs by reading both words for 5s (Read short), 10s (Read long), or incorrectly guessing in response to the cue before learning the target (Error Generation). Following a brief delay, a between participants manipulation was introduced on the final cued recall test. The Control group completed the final test without an additional task. The Item-by-Item group was required to provide a confidence rating for each item on the final test (Item-by-Item). After completion of the final test, all participants made a subjective retrospective rating of performance for each learning condition. Though Error generation produced the best correct retention, both groups had underconfident retrospective performance estimates. However, the Item-by-Item group estimated Error generation performance 20 points higher than the Control group. Therefore, this metacognitive illusion was reduced, though not eliminated, through the use of performance monitoring.

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(3079)

**The Misuse of Inversion and Font Size When Making Judgments of Learning.** MICHAEL C. FRIEDMAN, VICTOR W. SUNGKHASETTEE and ALAN D. CASTEL, *UCLA*—The ability to accurately assess and monitor memory performance is essential for effective learning. Recent research has shown that when studying a list of inverted and upright words, people recall more inverted words but memory predictions do not reflect this benefit, even with task experience (Sungkhasettee, Friedman, & Castel, in press). However, it is unclear why people do not predict this benefit for inverted words. To examine this, we incorporated two separate manipulations: associative relatedness, which should impact both predictions and recall performance, and font size, which should impact predictions but not recall performance (Rhodes & Castel, 2008). We found that participants' memory predictions were sensitive to font size and associative relatedness, but were still

insensitive to word orientation. Thus, people's predictions are sometimes insensitive to cues that are diagnostic, even when these cues are salient.

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(3080)

**The Metacognitive Salience of Fluency Cues Depends on Their Serial Position Within a Text.** DAVID B. MIELE, *Columbia University*, LISA K. SON, *Barnard College*—The feelings of ease or fluency people experience while reading affect how they evaluate their own comprehension. In previous experiments, this was demonstrated by manipulating the overall levels of fluency associated with entire texts. Due to the coarseness of such manipulations, it is unclear how people process fluency cues when evaluating their learning over an extended period of time. Perhaps people base their judgments on how easy it was to process just the beginning or ending of a text (as opposed to some average level of fluency). To test this hypothesis, we manipulated the fluency of each paragraph in three different three-paragraph texts and then asked participants to make judgments of comprehension. The results showed that the magnitude of participants' judgments depended on which paragraph of the text (i.e., the first, second, or third) was the most difficult to process and how much time they spent reading the text.

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(3081)

**Feedback and Study-time Allocation in a Chinese Learning Task.** SARAH MEACHAM, JONATHAN J. BERRY, EMMA BARR, JOSHUA CASH, CAITLIN YOUNGBLOOD and JODI PRICE *University of Alabama in Huntsville*—Self-regulated learning includes the metacognitive decisions of which items to study, in which order, and how much time to allocate before selecting the next item (Metcalf & Kornell, 2005). We explored how item difficulty, point values, presentation order (easy to difficult or difficult to easy), and performance feedback influenced item selection and the allocation of study time across 2 trials in a self-regulated Chinese learning task. Results showed that participants (N = 203) selected items in a left-to-right pattern within the grids, studied the easier items longer when they were on the left, and that recall performance was similar across all conditions. Item difficulty and presentation order had significant influences over selection order and study time, while point values and feedback did not. This could be because the other manipulations overshadowed the point values and the broad nature of the feedback used in this experiment.

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(3082)

**Learners Fail To Appreciate Benefits of Longer Spacings Over Shorter Spacings in Repeated Practice.** MICHAEL S. COHEN, *University of California, Los Angeles*, VERED HALAMISH, *University of Haifa*, ROBERT A. BJORK, *University of California, Los Angeles*—Despite the clear long-term benefits of spaced practice, students and teachers often choose massed practice. It is unclear whether and in what contexts learners appreciate the benefits of spacing. Zechmeister and Shaugnessy (1980) found that judgments of learning for words were higher after massed than after spaced repetition, but recent studies have found that learners, when allowed to choose whether to mass or space, choose to space. In these studies, however, longer spacing was confounded with a shorter retention interval and participants chose between getting a spaced or truly massed repetition. In our research, we controlled final retention interval and asked participants to choose between re-studying word pairs after either a short (but not truly massed) interval or a longer interval. Participants showed a clear preference for shorter spacing of more difficult and more valuable items even when that was not, in fact, the most effective option.

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(3083)

**The Role of Motivation in Enhancing Metacognitive Accuracy.** SHANNON MCGILLIVRAY and ALAN D. CASTEL, *UCLA*—There are many situations in which judgments of learning (JOLs) are not accurate. In the present study, we examined how consequences can influence the accuracy of JOLs. One group of participants made standard JOLs, and were given feedback about the number of words recalled. Another group assigned point values to each word, and these values indicated how many points would be gained or lost if they recalled, or failed to recall, the word. Scores were determined by adding the number of points assigned to recalled words, and subtracting the number of points assigned to forgotten words. Both groups were given six lists to examine the role of task experience. Assigning point values lead to dramatic increases in calibration compared to making standard JOLs. This suggests that motivation, in the form of consequences associated with metacognitive judgments, may play an important role in individuals' ability to calibrate predictions with memory performance.

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(3084)

**Extreme Overconfidence: Judging Future Remembering Based on the Present.** NATE KORNELL, *Williams College*—People are overconfident in their memories. The research reported in this poster tested the limits of this overconfidence. Participants studied trivia question/answer pairs and predicted their ability to free-recall the answers a week in the future. Predicted recall (86%) was more than 70 percentage points higher than actual recall (13%), possibly

setting a record for metacognitive incompetence. This overconfidence appeared to stem from both a stability bias (i.e., discounting future forgetting) and a foresight bias (i.e., discounting changes in the cues that support remembering). These two biases share a core characteristic: Judgments about future remembering over-rely on one's ability to remember right now.

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(3085)

**Using Subjective Confidence To Improve Metacognitive Accuracy.** TYLER M. MILLER and LISA GERACI, *Texas A&M University*—People's predictions about their future performance are often inaccurate. Low performers are the least accurate, erring on the side of overconfidence. One theory is that low performers are doubly cursed—they lack the knowledge and the metacognitive insight to perform well (Kruger & Dunning, 1999). However, even though low performers make inaccurate performance predictions, they are less certain (they have lower subjective confidence) that their predictions are correct compared to high performers. This finding indicates that low performers have some metacognitive insight (Miller & Geraci, 2011). In the current study, we tested the hypothesis that low performers can use their subjective confidence as a guide to re-calibrate their metacognitive judgments. Results replicated the typical overconfidence effect for low performing students. But importantly, after participants were allowed to adjust their performance predictions with subjective confidence as a guide, there were no differences in metacognitive accuracy between performance groups.

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(3086)

**What's the Value of Massing and Spacing? Learners' Expectations About the Effect of Distributing Practice.** MATTHEW D. LITKE and THOMAS C. TOPPINO, *Villanova University*—When learners choose how to distribute practice, recent studies indicate they prefer spaced practice, especially for more difficult or more valuable items. This apparently strategic use of spacing suggests the possession of theory-based metacognitive knowledge of the advantage of spaced practice. To test this hypothesis directly, learners studied massed and spaced items in separate sublists, and later were tested on all items. Before studying the sublists, participants predicted recall on each sublist (Experiment 1) or decided the value (1 or 5 points) of items from each sublist on the final test (Experiment 2). In Experiment 1, learners' predictions did not differ significantly for the sublists but slightly favored massing. In Experiment 2, they assigned the higher point value significantly more often to the massed sublist. Thus, contrary to both our hypothesis and actual recall performance, learners seemed to believe that recall would be better for massed than for spaced practice.

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● HUMAN LEARNING AND INSTRUCTION II ●

(3087)

**Features of Text and Imagery that Facilitate Processing of Novel Concepts.** KIEL CHRISTIANSON and CASSIE PALMER-LANDRY, *University of Illinois, Urbana-Champaign*—To comprehend a dual-information display (text and imagery) with unfamiliar concepts (words) in the text, readers must be able to encode information from both images and text (Dual Coding Theory, Paivio, 1969). This study used consumer product-related texts and images to investigate effects of image features (product image vs. a related non-specific image) and information availability (new word definition present vs. no definition) to predict offline memory for the new concept. Eye-movement data support the conclusion that memory for the meaning of new words is facilitated when a) readers dwell longer on novel words, b) look at the imagery, and c) when the image is viewed and a definition is available. Higher feature congestion increases fixations when the image and new concept are closely related. Saccade data demonstrate that readers are more likely to make integrative saccades from definition to image when that image is of the product itself. Email: Kiel Christianson, [kziel@illinois.edu](mailto:kziel@illinois.edu)

(3088)

**Magnitude Assessment of Rational Numbers in Decimal and Fraction Formats.** MARGARET GROUNDS and MIRIAM BASSOK, *University of Washington*—Two experiments compared magnitude assessments of rational numbers presented in two formats: fractions (e.g.,  $3/4$ ) or decimals (e.g., .75). In Experiment 1, we found that magnitude assessments were significantly faster and less variable for decimals than for fractions. In Experiment 2, we found that the typical use of these two formats -- fractions with imperial measures (e.g.  $3/4$  foot) and decimals with metric measures (e.g., .75 meter) -- reduces but does not eliminate the relative processing advantage of decimals over fractions. We also found a significant advantage in speed and accuracy for magnitude assessments of metric over imperial measures. The relative advantage of the familiar base-10 system is consistent with the claim that people assess number magnitudes by mapping them onto a mental number line. Decimals, like whole numbers, can be mapped directly onto a number line, whereas fractions require mathematical transformation (division of numerator by denominator). Email: Miriam Bassok, [mbassok@u.washington.edu](mailto:mbassok@u.washington.edu)

(3089)

**Gesture Creates Learning That Improves Over Time.** SUSAN WAGNER COOK, *University of Iowa*, RYAN DUFFY and KIMBERLY M. FENN, *Michigan State University*—Children who see gesture while learning mathematics learn more and are more likely to maintain their learning three weeks later, compared with children who do not see gesture. To examine the potential role of sleep in

this learning, we explored the effect over a twenty-four hour period. Children watched videos of an instructor explaining mathematical equivalence that included gesture or did not. Children were tested immediately and twenty-four hours later. There was a significant main effect of gesture; children who saw gesture performed better than children who did not see gesture. Importantly, there was a condition by time interaction; the gesture group improved at twenty-four hours whereas the no gesture group did not. Thus, gesture directly affects how learning is maintained, and this effect can be observed as soon as one day later. These findings are consistent with the possibility that sleep helps to preferentially consolidate learning accompanied by gesture. Email: Kimberly M. Fenn, [kfenn@msu.edu](mailto:kfenn@msu.edu)

(3090)

**Creating Illusions of Knowledge: Learning Errors that Contradict Prior Knowledge.** LISA K. FAZIO, *Carnegie Mellon University*, SARAH J. BARBER, *University of Southern California*, SUPARNA RAJARAM, *Stony Brook University*, PETER A. ORNSTEIN, *University of North Carolina, Chapel Hill*, ELIZABETH J. MARSH, *Duke University*—Most people know that the Pacific is the largest ocean on Earth and that Edison invented the light bulb. Is this knowledge stable, or can it be easily altered? Critically, our question is whether people will incorporate errors into their knowledge bases, even if they have the correct knowledge stored in memory. To establish what individual subjects knew, they took a general knowledge test two weeks before reading short stories that contained incorrect information (e.g. Franklin invented the light bulb). On a later general knowledge test, subjects reproduced errors from the stories despite answering the same questions correctly two weeks earlier. This misinformation effect was found even for questions that were answered correctly with the highest level of confidence on the initial test. Illusions of knowledge do not depend upon ignorant learners; errors can enter the knowledge base even when learners have the knowledge necessary to catch the errors. Email: Lisa K. Fazio, [lkfazio@cmu.edu](mailto:lkfazio@cmu.edu)

(3091)

**Elaborative Studying with Concept Mapping: Relational and Item-Specific Processing.** PHILLIP J. GRIMALDI, LAUREL POSTON and JEFFREY D. KARPICKE, *Purdue University*—Concept mapping is a popular learning activity in which students create diagrams of the relations among the concepts within a set of materials (Karpicke & Blunt, 2011). Concept mapping may be assumed to promote relational encoding, but the exact nature of the processing afforded by concept mapping has not been directly examined. We investigated whether concept mapping enhances relational processing, item-specific processing, or both (Hunt & McDaniel, 1993). Subjects studied ad hoc and categorized word lists. They made pleasantness ratings for each word, sorted the words into categories, or created concept maps of the word lists. Subjects then took a free recall test. For



ad hoc lists, concept mapping produced the best recall, consistent with the assumption that concept mapping affords relational processing. Surprisingly, for categorized lists, the concept mapping and pleasantness rating tasks produced equivalent levels of recall. Concept mapping activities may enhance both relational and item-specific processing.

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(3092)

**Multiple-Choice Pretests Enhance Learning More Than Other Pre-Reading Activities.** JERI L. LITTLE and ELIZABETH LIGON BJORK, *UCLA*—Taking a cued-recall pretest (or studying facts) improves later learning of that information, perhaps by directing attention to its encoding during subsequent reading; consequently, however, attention may be directed away from the encoding of other competitive information contained in a text passage. Conversely, multiple-choice (MC) pretests may direct attention more broadly—to both tested information and information pertaining to the competitive incorrect alternatives on the pretest. In the present experiment, subjects read three passages: one preceded by a pretest (MC or cued-recall), one preceded by facts (containing the MC alternatives or not), and one receiving additional reading time. The type of test taken or the type of facts studied did not differentially affect later learning of the tested or studied information, respectively—but did improve learning over additional reading. Taking an MC pretest, however, improved subsequent learning of competitive information compared to taking a cued-recall pretest or studying facts (even facts including alternatives). Therefore, MC pretests seem to direct attention more broadly than do other pre-reading activities and thus improve overall learning.

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(3093)

**Examining the ERP Correlates of Recognition Memory Using a Testing Effect Paradigm.** NICOLE J. BIES-HERNANDEZ, JOEL S. SNYDER and DAVID E. COPELAND, *University of Nevada, Las Vegas*—In this study, we examined whether the ERP correlates of familiarity and recollection (Rugg & Curran, 2007) could be observed using a testing effect paradigm, and whether there would be a difference in the presence or size of the ERP correlates for practice testing compared to restudying. This was investigated using a standard testing effect paradigm consisting of: (1) encoding, (2) a distractor task, (3) testing or restudying, and (4) a delayed final test. Performance on the final test was significantly higher with testing than restudying (i.e., the testing effect). The ERP result from the final test showed a mid-frontal old/new effect (neural signature of familiarity) for the testing group but not the restudy group, while both groups demonstrated a parietal old/new effect (neural signature of recollection). The ERP results were consistent with the process estimates of familiarity and recollection derived using the dual-process signal detection model.

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(3094)

**Effect of the Medium on Learning Regulation under Time Pressure.** RAKEFET ACKERMAN, *Technion--Israel Institute of Technology*—People often attribute their reluctance to study from lengthy texts on screens to technology-related factors. However, Ackerman and Goldsmith (2011) have pointed to screen inferiority in the metacognitive regulation of learning. Time pressure may either hinder or improve learning regulation. Comparing screen and paper learning under time pressure among engineering undergraduates resulted in lower scores on screen. Learning regulation was examined by comparing studying under time pressure, free regulation and an interrupted condition, in which studying was unexpectedly halted after the time allotted under time pressure. The learners using paper improved their learning efficiency when the time constraints were known in advance and achieved scores equivalent to those achieved under the longer, free regulated, condition. In contrast, for the learners using screens, knowing the time constraints did not improve learning efficiency. The findings reinforce the screen inferiority in learning regulation and point to contextual cues that affect the accuracy-speed tradeoff in learning from texts.

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(3095)

**Attempting Free Recall Potentiates Subsequent Encoding.** KATHLEEN M. ARNOLD and KATHLEEN B. MCDERMOTT, *Washington University in St. Louis*—Test-potentiated learning is the phenomenon that taking an earlier test facilitates learning during a subsequent study episode. Although this effect was first identified in the late 1960s (Izawa, 1967), it has received little empirical attention. One reason for the inattention is because it is a difficult phenomenon to measure. Learning is known to occur during testing itself (e.g., Roediger & Karpicke, 2006), and therefore it is difficult to separate learning during testing from learning during subsequent encoding. Here we report a paradigm that successfully isolates learning during the study phase in a free recall experiment. By using four between-subject conditions, we demonstrate test potentiated learning and offer a way in which the phenomenon can be further explored.

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(3096)

**The Role of Morphological Complexity in the Acquisition and Durability of Novel Word Meanings.** STEPHEN M. BRUSNIGHAN and JOCELYN R. FOLK, *Kent State University*—Previous studies investigating incidental word learning during reading have demonstrated that readers are skilled at inferring meanings for novel words during reading and are able to retain those meanings after one exposure when tested immediately after the reading session. In the current study, we investigated the

durability of newly acquired word meanings and the role that the morphological complexity of novel words plays in the ease and durability of establishing word meaning. In our study, participants read sentence pairs containing novel English words that differed in morphological complexity (e.g., compound, derived, or simple) in informative sentence contexts while reading times were recorded. Following the reading session, participants completed a vocabulary test either immediately, after a delay of one hour, or after a delay of one day. Morphological complexity impacted incidental word learning. Results are discussed in terms of the role of morphological decomposition in word learning and retention.

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(3097)

**The Effect of Dialectical Interaction on Engagement and Learning.** TIMOTHY J. NOKES, JOHN M. LEVINE, DANIEL M. BELENKY and SONIYA GADGIL, *University of Pittsburgh*—Debate is often used as an educational activity because it is thought to promote student learning and engagement. However, relatively little experimental research has tested this idea and investigated which features of debate are associated with positive learning outcomes. In the current work we examined how student goals during the debate and the format of the debate affect learning and engagement. We conducted an experiment in which we manipulated student goals by changing the criterion upon which their arguments were evaluated (i.e., substance versus style) and manipulated the format by requiring students to take turns or not (i.e., alternating versus freeform). We derived measures of engagement from video and audio data, including vocal pitch, and assessed learning via an essay. The results showed that high student engagement was negatively associated with learning, but only for those students in the freeform condition who had the goal to argue with style.

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(3098)

**Explicit Causality Enhances Multimedia Learning.** FRANCESCA R. FLORES and MICHAEL J. SERRA, *Texas Tech University*, JESSECAE K. MARSH, *Lehigh University*—Compared to studying text alone, studying text passages with accompanying pictorial diagrams is known to increase learning (both retention and comprehension). Pictorial diagrams visually depict the actual processes described in the text, but they also implicitly depict the text's underlying causal structure. As such, the learning advantage of text with pictorial diagrams might stem from the diagrams' visual nature, their causal information, or both. To explore this issue, we had participants study a science passage as either text alone, text with pictorial diagrams, text with causal diagrams (diagrams that depict causal information but do not depict the actual processes from the text), or text with both pictorial and causal diagrams. The results suggest that pictorial diagrams

contribute minimal causal information to learning from text, as including both pictorial and causal diagrams with text resulted in the largest increase in learning.

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(3099)

**Differences in Working Memory Utilization in Category Learning: Evidence for Stimulus-Dependent Representation.** MICHAEL A. ERICKSON, *Hawaii Pacific University*, JUSTIN C. ESTEP, *University of California, Riverside*—Theories of category learning that posit stimulus-dependent representation hold that working memory capacity should be critical when people are shifting representations from trial to trial. This was investigated using assessments of individual differences in working memory capacity as predictors of both accuracy and the amount of interference induced by a secondary numerical Stroop (1935) task for subjects learning the Shepard, Hovland, and Jenkins (1961) category structures. By combining multiple measures of the role of working memory in category learning, the results provide converging evidence for a differential role of working memory among these category structures.

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(3100)

**Explanation drives the discovery of rules and themes in category learning.** JOSEPH J. WILLIAMS and TANIA LOMBROZO, *UC Berkeley*—Research in psychology and education has demonstrated that seeking and generating explanations has a powerful impact on learning, generalization, and conceptual change. Four experiments investigate the mechanisms underlying these effects and provide evidence that explaining does not produce all-purpose learning benefits – through a generalized increase in motivation, attention, or processing time – but rather exerts selective subsumptive constraints: Asking “Why?” constrains how people reason and learn so that they are driven to discover underlying patterns and subsuming generalizations. In the context of learning about categories, prompts to explain category membership were compared to control conditions requiring description, thinking aloud, and prediction. These revealed that explaining drove the discovery of underlying patterns, which fostered transfer and generalization. However, the presence of misleading patterns led to an explanation impairment effect, whereby explaining slowed learning and increased inaccuracy. The experiments provide insight into why explaining has a powerful effect on learning and generalization, as well as specifying conditions under which explaining can be detrimental.

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(3101)

**Structural Alignment Facilitates Graph Understanding.** LINSEY A. SMITH and DEDRE GENTNER, *Northwestern University*—Analogical comparison is a core cognitive process that supports relational learning. We investigated whether comparison can improve understanding of graphical representations. Graphs simultaneously convey spatial relations (one line above another) and conceptual relations (A exceeds B) (Carpenter & Shah, 1998). This duality contributes to difficulties understanding graphs (Booth Sweeney & Serman, 2000). We found evidence for two predictions of structure-mapping theory (Gentner, 1983, 2010): (1) comparing graphs during training led to better performance in a graph-understanding task than studying the same exemplars sequentially; and (2) comparing high-similarity (highly alignable) pairs led to better performance than comparing low-similarity (hard to align) pairs. Further, the responses of the high-similarity group emphasized relational information (e.g., “Inflow is higher than outflow”), whereas those of the low-similarity and sequential group emphasized surface features (e.g., “The graphs show red and blue lines”). We conclude that comparison—more specifically, structural alignment—can improve graphical reasoning.

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### ● SELECTIVE ATTENTION III ●

(3102)

**Working Memory Load and Capacity Modulate The Deployment of Unitary Vs. Divided Focal Attention.** LISA N. JEFFERIES and STEVEN YANTIS, *Johns Hopkins University*—We have previously reported that unitary focal attention induces a space-based processing mode whereas a divided focus induces an object-based mode. In three experiments we combined a task assessing the mode of attention with a working-memory load. Manipulating load set-size (1-4) and information type (spatial vs. object) allowed us to selectively and incrementally exhaust spatial or non-spatial processing resources. Small set-sizes resulted in the deployment of a unitary focus with a spatial load and a divided focus with an object load. Larger set-sizes exhausted the relevant resources, causing a switch in attentional mode (unitary to divided with a spatial load; divided to unitary with an object load). Since set-sizes were randomly intermixed, switches between unitary and divided attention occurred on a trial-to-trial basis. Critically, individual differences in working-memory capacity also influenced attentional deployment: low-capacity observers switched attentional mode when the set-size was 1-2 while high-capacity observers were able to delay the switch until set-sizes 3-4.

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(3103)

**Competing for Attentional Priority: Threats vs. Goals.** JULIA VOGT, JAN DE HOUWER and BAPTIST LIEFOOGHE, *Ghent University*—It is widely acknowledged that attention is biased towards threatening events. More recent evidence showed that attentional biases are not limited to biologically relevant events but can also be found for stimuli relevant to an individuals' current and temporary goals. However, no research so far tested how attention is deployed when both threatening and goal-relevant events are present. In order to test this hypothesis, we combined a cueing task with a separate task that induced a temporary goal. The results of Experiment 1 showed that attention was oriented to goal-relevant pictures when they were simultaneously presented with neutral or threatening pictures, even in a sample of high anxious individuals. Experiment 2 extended these results to signals of imminent threat (i.e., an aversive noise). These findings suggest that early attentional processes are influenced heavily by the current and temporary goals of an individual.

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(3104)

**It's All in Your Head: Congruency Effects Can Be Determined By Context Rather Than By Stimulus Identity.** ROTEM AVITAL, *Tel Aviv University*, YEHOOSHUA TSAL, *Tel Aviv University*—In several converging paradigms (e.g., flanker, attentional blink...) we investigated the role of top down factors in processing targets and distractors. We presented ambiguous characters that could be perceived as letters, digits or nonsense figures and found that congruency effects were completely determined by context and expectations and not by stimulus identity. Since only top-down information was manipulated whereas stimulus-driven data were kept constant, these findings challenge the view that congruency effects primarily reflect bottom up perceptual processing. The implications of the role of top down and bottom up factors in producing perceptual representations are discussed.

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(3105)

**Efficient Selection is Modulated by Target-Distractor Discriminability and not by Perceptual Load.** RICARDO MAX and YEHOOSHUA TSAL, *Tel Aviv University* (Sponsored by Daniel Algom)—Load theory predicts that the level of perceptual load within a display is inversely proportional to congruency effects observed (Lavie, 1995, 2005; Lavie & Tsal, 1994). We propose that perceptual load has typically been confounded with the discriminability between targets and distractors. In high load displays, targets and distractors are promptly distinguished by their sizes. That is, the distractor is a one-letter object whereas the target is embedded within a five-letters object. Conversely,

in low load displays the single target and the single distractor cannot be easily distinguished. In two experiments discriminability and load were jointly manipulated. Different types of discriminability modulated the size of the congruency effects irrespective of load levels. Results suggest that 1) congruency effects stem from the involuntary use of all visual information available to the perceiver, and 2) perceptual load is a poor predictor of efficient selection. Email: Ricardo Max, [ricardom@post.tau.ac.il](mailto:ricardom@post.tau.ac.il)

(3106)

**Examining the Influence of Various Conceptual Cues on Attentional Allocation and Target Detection.** MICHAEL D. DODD and MARK MILLS, *University of Nebraska - Lincoln*—Spatially nonpredictive stimuli (e.g. arrows, gaze cues) can facilitate target detection at locations consistent with the cue's directional meaning. With increasing evidence that these effects can extend to some stimuli that are less-intuitively spatial (e.g. numbers, heaven/hell) but not others (e.g., non-numerical ordinal sequences), it is important to determine how these cuing effects develop in addition to their boundary conditions. The present study examines the influence of a variety of spatially-relevant conceptual cues which are either a) learned in childhood and consistent across context (e.g., prefixes vs. suffixes), b) learned in early adulthood (e.g. the left-right distinction in politics), or c) can be altered by context (e.g. red/yellow/green which are only spatially relevant when related to a traffic light). The results provide important insight into the development of endogenous/exogenous interactions and when they are expressed (e.g. political cues influence attention in politically knowledgeable, but not politically unknowledgeable, subjects). Email: Michael D. Dodd, [mdodd2@unl.edu](mailto:mdodd2@unl.edu)

(3107)

**The Effect of Providing Context to Distractors in Visual Search.** JOSEPH D. CHISHOLM, *University of British Columbia*, WALTER F. BISCHOF, *University of Alberta*, ALAN KINGSTONE, *University of British Columbia*—We investigated the potential influence of top-down control on the automatic capture of attention. Participants were required to locate a unique color target followed by a manual response. A task irrelevant abrupt onset appeared on 50% of trials simultaneously with target onset. To manipulate top-down control participants were either told that the onset was irrelevant to the task and should be actively avoided, or they were made aware of the onset as just another display item, or participants were not informed of the presence of the abrupt onset. Our instruction manipulation revealed that being asked to explicitly ignore the abrupt onset was more detrimental to performance than simply being made aware of its possible presence. These results highlight the role of top-down factors in modulating the capture of attention. Email: Joseph D. Chisholm, [jchisholm@psych.ubc.ca](mailto:jchisholm@psych.ubc.ca)

(3108)

**The Attentional Blink Effect in Spider Phobia.** ARASH FARSHID, JEFFREY S. KATZ, F. DUDLEY MCGLYNN and LEWIS BARKER, *Auburn University*—Extant research suggests that individuals with spider phobia relative to non-anxious controls display a shorter attentional blink (AB) in response to spider-related target words. Common methodological limitations of such research have included the following: (1) target stimuli have not included affectively neutral words for comparison; (2) experimenters have not been blind to the anxiety status of participants; (3) initial screening measures have not properly disguised the purpose of the experiment; (4) sub-clinical spider phobia samples have been used; and (5) target words have not been matched in frequency of use to the distractor words. Accordingly, the present study addressed each of these limitations. Individuals with spider phobia (DSM-IV: 300.29) did indeed exhibit a reduced AB duration; however, the magnitude of the effect was considerably smaller relative to previous findings. The results highlight the sensitivity of the AB to the aforementioned limitations. Email: Arash Farshid, [azf0010@tigermail.auburn.edu](mailto:azf0010@tigermail.auburn.edu)

(3109)

**Attentional Selection in Uni-Dimensional and Multi-Dimensional Visual Search Tasks.** JOHN M. GASPAR, ALI JANNATI and JOHN J. MCDONALD, *Simon Fraser University*—Recent ERP findings indicate that colour singletons fail to capture attention when observers search for a less salient shape that remains fixed across trials. This is consistent with the dimensional weighting account, according to which signals on the relevant (shape) and irrelevant (colour) dimensions are enhanced and suppressed, respectively. Here, we asked whether more distraction would occur when competing singletons were defined on the same dimension (vs. different dimensions), and we examined ERPs to determine how the visual system deals with salient distractors in each case. More interference was found in the uni-dimensional condition than the cross-dimension condition (22 ms vs. 7 ms). In the uni-dimensional condition, the distractor elicited a Pd component (indexing suppression) while the target elicited an N2pc component (indexing selection) in the same time range. In the cross-dimensional condition, we found a target-elicited N2pc but no distractor-elicited Pd. These results indicate that when dimensional weighting is not a viable selection strategy, the visual system suppresses the location of the distractor while selectively processing the target. Email: John M. Gaspar, [jmg2@sfu.ca](mailto:jmg2@sfu.ca)



(3110)

**No Saliency-Driven Attention Capture in Fixed-Feature Visual Search.** ALI JANNATI, RICHARD D. WRIGHT and JOHN J. MCDONALD, *Simon Fraser University*—Salient distractors interfere with visual search even when the target is fixed across trials (fixed-feature search). This interference has been attributed to saliency-driven attention capture. To test this hypothesis, we recorded event-related potentials (ERPs) in two fixed-feature search experiments. Participants searched for a shape singleton in the presence of a more salient colour singleton (Experiment 1) or for a colour singleton in the presence of a less salient shape singleton (Experiment 2). The results were inconsistent with the saliency-driven capture hypothesis: (i) the salient colour distractor caused no more interference than did the shape distractor (8 vs. 6 ms; difference n.s.); (ii) the distractors failed to elicit the N2pc, an ERP index of attentional selection; (iii) neither the presence nor the relative position of the distractor influenced the timing of the target-elicited N2pc. Further analyses of lateralized ERP activities that preceded the N2pc revealed no evidence for capture.  
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(3111)

**Attention Allocated to Distractor Locations Is Based on Top Down Expectations.** AYA LAHAV and YEHOOSHUA TSAL, *Tel Aviv University* (Sponsored by R. E. Lubow)—Failures of selective attention may be explained by the attentional white bear (AWB) hypothesis (Tsal & Makovski, 2006) maintaining that prior knowledge of distractor location causes attentional allocation to it. The AWB is demonstrated by embedding infrequent trials of two simultaneous dots among flanker trials. The dot at the expected distractor location is perceived as appearing before the dot at the expected empty location, indicating attentional allocation to expected distractor locations. A major requirement of the AWB hypothesis is that it occurs in a top down manner due to expectations. We devised a variation of the original AWB experiment which enabled us to differentiate between the top down and bottom up contributions. The results show that top down expectancies, which are a critical part of the AWB characterization, occur independently of bottom up contributions.  
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(3112)

**On the Robustness of Value-Driven Attentional Capture.** BRIAN A. ANDERSON and PATRYK A. LAURENT, *Johns Hopkins University*, STEVEN YANTIS, *Johns Hopkins University*—It is well established that involuntary attentional capture depends on both physical stimulus saliency and ongoing perceptual priorities. Recently, we reported that stimuli associated with reward through learning later capture attention in extinction, independently of saliency and current search goals, a phenomenon we call value-driven attentional capture. In the present experiments,

we show that learned associations between a stimulus feature (color) and reward have an involuntary influence on attentional priority that transfers across tasks (from visual search to flankers) and stimuli (shapes to letters). Ongoing reward learning in a different task magnifies, rather than competes with, value-driven capture. Strikingly, value-driven attentional capture persists even several months after initial reward learning has taken place. Collectively, these results reveal a robust and persistent influence of learned value on involuntary attention allocation.  
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(3113)

**The Influence of Target-Distractor Spatial Proximity on Covert Competition and Overt Saccadic Selection.** CARLY J. LEONARD and STEVEN J. LUCK, *Center for Mind and Brain, University of California*—Previous studies have found that spatial proximity between a salient distractor and a target influences the amount of capture, with greater interference when the salient distractor is near the target. This distractor-distance effect could reflect spatially-mediated differences in covert competition or oculomotor capture to the distractor. To distinguish these possibilities, we monitored eye movements while observers performed a singleton search task. Salient distractors resulted in more oculomotor capture when they were near the target. For comparison, we also included trials in which no target was present and found more capture to a distractor singleton when there was no competition from a task-relevant target. Overall, the results suggest that both short-range and long-range competitive interactions between a target and a salient distractor mediate attentional allocation and saccadic decisions, and capture does not depend entirely on pure distractor saliency.  
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(3114)

**The Unique Impacts of Incentive Cueing and Incentive Feedback on Task-Switching.** ADAM C. SAVINE, JORDAN LIVINGSTON, TODD BRAVER, *Washington University in St. Louis*—Although consensus exists that motivation markedly impacts cognitive performance, it remains unclear if motivational cueing and reward feedback dissociably influence performance. We directly tested this question using an incentivized, cued task-switching paradigm. Participants worked to achieve one of two categories of incentive (earning money for self or partner) in a between-subject manipulation. Then, in separate within-subject sessions, participants either received feedback solely about their own performance or feedback about their performance plus that of a partner (creating a salient comparison of past performance). Incentive cueing successfully enhanced task-switching performance. Neither positive nor negative feedback about one's own performance influenced future performance, regardless of incentive category. However, obtaining both partner feedback and feedback of one's own performance



differentially influenced future performance in accordance with incentive category, and whether the partner performed better or worse than the participant. These results suggest unique roles of incentive cueing and feedback in motivated cognitive performance.

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### ● DISCOURSE PROCESSES I ●

(3115)

**The Detection of Event Shifts in Sequential Art.** KRIS GUNAWAN and DAVID E. COPELAND, *University of Nevada, Las Vegas*, PAUL J. SCHROEDER, *Air Force Research Laboratory*, NICOLE J. BIES-HERNANDEZ, *University of Nevada, Las Vegas*—When reading narratives, people construct mental representations of the described state of affairs known as situation models (Zwaan & Radvansky, 1998). According to the Event Indexing Model (Zwaan, Magliano, & Graesser, 1995), people monitor various event dimensions, such as space, time, entity, and goals, as situation models are formed. In this study, students read through comic books (also known as sequential art) in either a natural format (printed on paper) or on a computer. The task was to identify whether each panel consisted of a situational shift; judgment responses (i.e., the detection of event shifts) and response times were assessed. The findings supported the Event Indexing Model, demonstrating that people monitor various event dimensions simultaneously in a format using images and dialogues. Consistent with the rapid spatial updating view (Radvansky & Copeland, 2010), evidence of processing spatial shifts was present for judgments but not response times.

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(3116)

**The Impact of Verb Type on Explicit and Implicit Memory.** LESLIE CENTENO and MAYA M. KHANNA, *Creighton University*—We examined participants' comprehension as well as explicit and implicit memory for passages including complex or simple verbs. Past research using short-text tasks (e.g., picture-naming, sentence-generation, and spoken-verb retrieval) suggests that participants comprehend text with complex verbs (e.g., discuss) more than text with simple verbs (e.g., talk) because complex verbs are more semantically salient than simple verbs (Breedin, Saffran, & Schwartz, 1998). In the current examination, we asked participants to read relatively lengthy texts (i.e., modified TOEFL passages) including either complex or simple verbs, to then answer multiple-choice questions based on the text (explicit memory task), to complete a mathematics distracter task, and, finally, to complete a word fragment completion task (implicit memory task). In contrast to previous findings, our participants showed greater comprehension and explicit memory performance for passages including simple verbs than for those including complex verbs. We also found similar implicit memory performance for both passage types.

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(3117)

**The Effects of Working Memory and Ease of Generation on Bridging Inferences.** CATHERINE M. BOHN-GETTLER, *Wichita State University*, FRANCES K. DANIEL, *Indiana University Northwest*, MELINDA K. MUELLER and NATE J. MCGEE, *Wichita State University*—Although a wide range of experiments show that bridging inferences are generated at coherence breaks (e.g., Virtue et al., 1996), Daniel and Raney (2010) found that increased reading times also occur two words after a coherence break. This processing delay could be related to the ease of generating bridging inferences or could be related to automatic movement of the eyes during reading. To explore the cause of this processing delay, participants in the current experiment read several passages for comprehension. The ease of generating an inference was manipulated by gradually decreasing the explicitness of an action in a critical sentence. Reading times for target sentences that followed the critical sentences increased as explicitness decreased. In addition, this effect was more pronounced in readers with high working memory. This provides preliminary evidence that processing delays during bridging inference generation are affected by ease of generation.

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(3118)

**Integrating Scientific Information from Multiple Sources with Different Credibility.** RYUTA ISEKI and TAKASHI KUSUMI, *Kyoto University*—People know a variety of qualities of scientific information through diverse sources, which often differ in their credibility. We investigated how information sources with different credibility affect comprehension of a scientific topic. All participants read the same two texts that claimed inconsistent opinions about safety of genetically modified foods, but they were informed that the texts were written by expert or concerned layperson of the topic. The participants who thought to read texts by experts answered the question for intra-text comprehension better than the participants who thought to read by laypersons. Moreover, for inter-text comprehension, the order of source information had a substantial impact: The participants who receive layperson information first showed less integration of inter-text information. Additionally, presenting expert information first enhanced the inter-text comprehension. These results suggested that the source information is an important factor for science communication under the contemporary information environment.

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(3119)

**Judging and Recalling Arguments as a Function of Belief in the Argument.** MICHAEL B. W. WOLFE, CHRISTOPHER A. KURBY and ANDREW R. TAYLOR, *Grand Valley State University*—We examined subjects' ability to judge the validity of contentious one-sentence arguments as a function of whether they believe the argument. Subjects read sentences such as "Spanking is an effective means of discipline because methodologically sound studies have shown that spanking reduces aggression." All subjects completed a prescreening to assess whether they believe the claim made in the argument. In Experiment 1, subjects made judgments of whether there was a valid relationship between the reason given and the claim. Results indicated that subjects were biased in favor of accepting arguments that they believe, regardless of whether they are valid or not. Accuracy at identifying the validity of arguments did not vary as a function of subject beliefs in the arguments. In Experiment 2, recall of arguments did not differ as a function of beliefs, suggesting that the belief biases displayed in Experiment 1 do not result in differential memory for the arguments.

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(3120)

**Activation of Discourse Processing Brain Regions During Strategic Reading Comprehension.** JARROD MOSS, *Mississippi State University*—Prior neuroimaging studies of strategic reading comprehension have shown that there are at least two networks of brain regions that support strategic comprehension: a domain-general control network and a network of regions supporting coherence-building discourse comprehension processes. The present study was designed to further examine the neural correlates of strategic reading comprehension by including a randomized text control condition to better examine overlap between strategic reading comprehension and areas known to be involved in sentence and discourse comprehension. In addition, measures of reading ability and metacomprehension accuracy were included as covariates in analyses as an initial examination of individual differences in brain activation while performing reading strategies. The results replicate prior studies showing that strategic comprehension activates discourse processing regions including posterior cingulate cortex and the angular gyrus, and the results indicate that better readers have less activation in the anterior prefrontal cortex and temporal pole during strategic reading comprehension.

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(3121)

**When Do People Rely On Source Credibility? A Mixed-Methods Analysis.** JESSE R. SPARKS, PANAYIOTA KENDEOU, ANA M. SENIOR and DAVID N. RAPP, *Northwestern University*—Research has examined whether and how people use their knowledge of sources of information to inform their everyday understandings.

However, this work has mainly considered the effects of sources using offline memory methodologies. The current project investigated the impact of source credibility on moment-by-moment comprehension of unfolding text. Participants read stories containing descriptions of characters and their ostensible traits; subsequent text events provided the opportunity to generate inferences about characters' future behaviors. Reading time analyses revealed little reliance on credibility; participants' comprehension of unfolding events seemed uninfluenced by the trustworthiness of sources of text information. Think-aloud protocols, though, revealed varying degrees of reliance on credibility. While some participants disregarded source information, others carefully considered it as they read. These data suggest that particular methodologies might differentially encourage or discourage participants' reliance on source credibility. Mixed-methods analyses prove necessary for accurately accounting for when and how source effects emerge during comprehension.

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(3122)

**Eavesdropping on Friends and Strangers: The Influence of Perceived Familiarity on Overhearer Discourse Comprehension.** KRIS LIU and JEAN E. FOX TREE, *University of California Santa Cruz*—Undergraduates often learn from the discourse around them, whether working in small groups of their peers or listening to a lecturer answering another student's question. The influence of perceived familiarity between speakers is one understudied aspect of discourse comprehension. The current study suggests that perceived familiarity affects the type and extent of information learned from dialogue. Naturalistic instructional dialogues on journal articles were played to participants. Half were told the speakers were friends and half were told the speakers were strangers. Participants were tested on recall of details having to do with the dialogue itself (e.g. verbatim phrases, the gist of interruptions) and details on the article's content (e.g. methodology, conclusions drawn). What overhearers believed the relationship was between the speakers influenced how overhearers recalled information. Those in the friends condition were (1) less likely to recall information about the content of the article and (2) more likely to recall details of the dialogue than those in the strangers condition.

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(3123)

**Weird Emotions? Causal Inferences and Emotional Language.** CONNIE SHEARS, TAYLOR SORENSON, SONIKA UNG, JESSICA GREEN, MATTHEW BAKER and ERIN MCGOWAN, *Chapman University*—The majority of research on emotional language processing focuses on positive or negative language. However, some emotions can be processed as either positive or negative, such as pride. We examined how these 'weird'

emotions effect the formation of causal inferences. Shears, et al., (in submission) found that readers form causal inferences for text describing a character's emotion for positive texts. Here we report readers' inference processes across six emotions which resist simple categorization. Readers responded to sentence pairs, which either supported a causal inference or did not. If readers' perceived a valence as positive, we hypothesized that they would form causal inferences. This was measured by accuracy or response times to target words. Readers were faster when they rated 'weird' emotions as positive, which supported our hypotheses. All readers' process weird emotions and these findings aid our understanding of when causal inferences can be used to support comprehension.

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(3124)

**The Impact of Rapid Reading on Inference Generation.** FRANCES DANIEL, *Indiana University Northwest*, W. MATTHEW COLLINS, *Nova Southeastern University*, ANGELA PHILLIPS, *Indiana University Northwest*, STEFANIE MOCKLER, *Indiana University Northwest*, ANIL SAWH, *Nova Southeastern University*—Claims about how speed reading works are not consistent with reading comprehension research (Pollastek & Raney, 1998). Thus, it is not clear what type of reading strategies are used during speed reading. For instance, do speed readers generate inferences while they read? The purpose of this study was to explore whether correct inferences are generated as texts become less predictable when reading at rapid rates. Speed and normal readers read passages for comprehension while their ability to generate correct inferences was measured. Textual predictability was manipulated such that in some passages generating correct inferences was easy whereas in others generating correct inferences was more difficult. We found that speed readers generated less correct inferences regardless of predictability compared to normal readers. This suggests that reading at rapid rates is not an efficient reading strategy.

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## ● LANGUAGE PRODUCTION/WRITING I ●

(3125)

**Are there Cerebral Asymmetries in Generating Literal versus Figurative Meanings?** NATALIE A. KACINIK and RITA EL-HADDAD, *Brooklyn College and Graduate Center, CUNY*, ISABEL RODRIGUEZ, *Brooklyn College, CUNY*—The right hemisphere's (RH) preferential involvement in processing figurative language is unclear (Kacinik & Chiarello, 2007; Schmidt et al., 2010), but the majority of this research has been conducted with comprehension paradigms. The present study used visual half-field presentation and a word generation procedure to examine hemispheric differences in generating and producing literally versus figuratively related nouns in response to adjectives with a literal and figurative sense. A

typical overall RVF/LH advantage was found for reaction time but not accuracy. Contrary to expectations, but in accordance with previous work by Kacinik and colleagues (Kacinik & Chiarello, 2007; Kacinik et al., 2008) participants were NOT more likely to generate figuratively related words in the LVF/RH and literal responses in the RVF/LH. Hence, the RH does not seem to be preferentially involved in either the comprehension or generation of figurative meanings, but participants did tend to generate more high versus low imageability words to stimuli in the RVF/LH than the LVF/RH, respectively.

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(3126)

**Does Lexical Processing in Speech Production Require Central Or Domain-Specific Resources?** MADLEN PAUCKE, FRANK OPPERMAN and JÖRG D. JESCHENIAK, *University of Leipzig*—Using a novel dual-task paradigm, we investigated whether the retrieval of words during speech production requires central or domain-specific cognitive resources. Participants viewed two objects presented side-by-side. They named the left object (task 1) and decided on a property of the right object (task 2). The decision task was either conceptual (natural size, Experiment 1) or lexical (phonemic onset, Experiment 2). Thus, the overlap in lexical processing of task 1 and 2 was manipulated across experiments. The lexical processing demand of the to-be-named object was manipulated by varying the frequency of its name (while controlling for object recognition). In Experiment 1, the frequency effect was similarly sized in naming and conceptual decision. In Experiment 2, it was larger in phonological decision than in naming. This pattern is compatible with the view that lexical processing in speech production requires domain-specific resources.

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(3127)

**A Corpus Investigation of the Effects of Morphological Structure on Phonetic Duration.** NAOMI BERLOVE and ARIEL M. GOLDBERG, *Tufts University*—A number of studies have suggested that morphological structure influences the phonetic duration of multimorphemic words. Specifically, it has been suggested that suffixed words have longer rhyme duration than homophonic monomorphemic words (e.g., [pes] is longer in PACED than PASTE; Sugahara & Turk, 2009) and that suffix phonemes are longer in duration than non-morphemic phonemes (e.g., [t] is longer in PACED than PASTE; Losiewicz 1995, Walsh & Parker 1983). While these studies are convincing, they suffer from a variety of drawbacks including small numbers of subjects and items and an experimental procedure that may encourage participants to artificially introduce a contrast between mono- and multimorphemic stimuli. We conducted an analysis of a corpus of spontaneous speech

collected from 40 speakers. Mixed-effects regressions were used to control for factors known to affect duration. Results and theories of how morphological structure can influence phonetic processes will be discussed.

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(3128)

**Lexical Selection in the Picture-Picture Interference Paradigm.** JINGYI GENG and TATIANA SCHNUR, *Rice University*—During speech, we select the syntactic form of words either based on the words' appropriateness (activation) in comparison to other active words (e.g., Roelofs, 1992) or alternatively we select words using a non-competitive process (Mahon et al., 2007; Response Exclusion Hypothesis). To address this issue, we used a Picture-Picture Interference paradigm where participants named pictures while ignoring distractor pictures. Distractor pictures were either categorically related or unrelated to target pictures. If selection is by competition, picture naming response times should be slower in the presence of categorically vs. unrelated distractors (interference). If selection is non-competitive, picture naming should be faster because without lexical competition, categorically related distractors prime selection of the target via semantic links at the conceptual level. We found that picture naming was faster in the context of categorically related vs. unrelated distractor pictures, consistent with the Response Exclusion Hypothesis.

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(3129)

**Semantic Category Moderates Phonological Priming of Proper Name Retrieval.** KATHERINE K. WHITE and ELIZABETH A. FRAME, *Rhodes College*, LISE ABRAMS, *University of Florida*—This research investigated how phonology and semantics interact to influence word retrieval, specifically tip-of-the-tongue (TOT) resolution of proper names. Questions prompted participants to retrieve proper name targets (e.g., Joe Montana, Elton John) from various semantic categories (e.g., musician). Following a TOT, the next question included a prime name that shared the target's first name (Joe Namath), first syllable (Elvis Presley), or was phonologically unrelated. Phonological primes were from the same or different semantic category as the target. Participants then reattempted target retrieval. Independent of semantic category, first-name primes facilitated TOT resolution relative to unrelated names. In contrast, first-syllable primes facilitated TOT resolution only if the prime was in a different semantic category, not in the same semantic category. These results demonstrate that semantic overlap increases competition from phonologically-related names when there is incomplete phonological input, allowing an alternative name to prevent TOT resolution.

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(3130)

**Last But Not Least: Last Names Prime TOT Resolution for Famous Names.** MEAGAN T. FARRELL and LISE ABRAMS, *University of Florida*, KATHERINE K. WHITE, *Rhodes College*—Research on tip-of-the-tongue (TOT) states for low-frequency words demonstrates increased TOT resolution following phonologically-related primes, but only when the prime contains the same first syllable as the target, not later syllables. We investigated whether similar phonological sequencing constraints occur when retrieving proper names, which contain two separate lexical representations (first/last names). Participants read questions whose target answers were famous names. Following TOTs, the next question contained a prime with the target's first or last name, a prime with the first syllable of the target's first or last name, or an unrelated name. Although both types of first-name primes facilitated TOT resolution, last-name primes only increased resolution when the full last name was provided, not its first syllable. Theoretically, the results are indicative of proper names' dissociation from the rest of the lexicon since their activation is less restricted by phonological sequencing rules when sufficient phonological information is provided.

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(3131)

**The Loci of Contrastive Saliency When Producing Phonetically Similar Words.** ALAN H. KAWAMOTO, QIANG LIU and BRIAN VON MOOS, *Univ. of California at Santa Cruz*—We examined whether speakers increase the saliency of contrast in the production of CVC(C) monosyllabic words with phonetically similar initial segments that differed along the dimensions of Voicing, Manner, and Place of articulation. Initial segment and vowel durations increased as the degree of similarity increased, but coda duration measurements were relatively unaffected. A possible explanation of these results is that (1) initial segment duration effects might reflect the efforts by speakers to increase the saliency of contrast in the acoustic event of the initial segment, and (2) vowel duration might reflect increases in the extent of backward coarticulation of the initial segment and the vowel. This explanation is based on the notion that perceptually useful information of a segment is not restricted to the confines of its acoustic boundaries, but it is also distributed across neighboring segments. Possible implications and alternative explanations are discussed.

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(3132)

**Long and Short Term Transfer of Cumulative Structural Priming Effects.** TIMOTHY J. KUTTA and MICHAEL P. KASCHAK, *Florida State University*—We present several experiments examining cumulative structural priming effects (i.e., structural priming effects that accumulate across many utterances). Four of these



experiments investigated whether cumulative priming effects would transfer between language production tasks in a single experimental session. The remaining experiments tested for transfer across two experimental sessions separated by one week. Our data suggest that cumulative structural priming effects do transfer across language production tasks (e.g., from written production to picture description, and from picture description to written production), but only when both tasks are presented in the same experimental session. The transfer of the cumulative priming effects across production tasks was not observed when the experimental phases were separated by one week. Thus, the persistence of the cumulative priming effects over the course of a week was dependent upon the same language production task being used.

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(3133)

**Object Identification for Naming Multiple Objects: Semantic Access Is Serial.** ELIZABETH R. SCHOTTER, VICTOR FERREIRA and KEITH RAYNER, *UCSD*—Previous research suggests that two objects are processed in parallel when being named (Morgan & Meyer, 2005; Schotter, Ferreira & Rayner, 2009). Only Schotter et al. (2009) tested the timing this processing by briefly presenting a preview in the location of the next-to-be-named object that changed to the target object during the saccade toward it. They found faster processing when the preview was identical to the target than when it was unrelated at all SOAs (50ms, 250ms and 450ms), suggesting the two objects were continuously processed in parallel. The present study employs Schotter et al.'s paradigm to test whether semantic information is processed completely in parallel or only after a delay. We found faster processing in a semantically related (different picture of the same object) condition only at a late SOA, suggesting that semantic processing of the next-to-be-named object occurs after some processing on the current object has transpired (serially).

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(3134)

**The Influence of Phonological Neighborhood on Phonetic Convergence in Shadowed Speech.** JENNIFER S. PARDO, KELLY JORDAN, ROLLIENE MALLARI, CAITLIN SCANLON, EVA LEWANDOWSKI and CATHERINE ODE, *Montclair State University*—Previous studies have found that characteristics of phonological neighbors influence both the perception and production of words. In particular, words that are high in neighbor density/frequency are processed more slowly and less accurately, but are produced more quickly and with greater reduction. The current study examined the influence of phonological neighborhood on perception and production in tandem, by assessing both latency and fidelity in a speech shadowing task. If words with dense, high frequency neighbors require greater phonetic resolution during perception, then shadowed tokens from such neighborhoods

should show greater phonetic convergence. A set of talkers produced target words that varied in frequency and frequency-weighted neighbor density independently. Another set of talkers produced baseline and shadowed tokens of the target words produced by the first set of talkers. Separate listeners judged the perceptual similarity of shadowed to model tokens in an AXB task designed to assess phonetic convergence. The results were analyzed to reveal relationships between lexical and indexical influences on speech perception and production.

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## ● JUDGMENT/DECISION MAKING I ●

(3135)

**How Body Balance Influences Size and Quantity Estimates.** ANITA EERLAND and ROLF A. ZWAAN, *Erasmus University Rotterdam, Rotterdam, the Netherlands*—Does leaning to the left make the Eiffel Tower seem smaller compared to leaning to the right? In two experiments, we investigated whether body posture influences people's estimates of quantities, heights, and percentages of entities in the world. According to an influential theory, people mentally represent numbers along a line with small numbers on the left and large numbers on the right. We hypothesized that surreptitiously making people lean to the right or left would affect their estimates. Participants answered estimation questions (e.g., How many lakes are there in Finland?, How much does an adult elephant weigh?) while standing on the Wii™ Balance Board. Posture was manipulated within subjects, so that participants answered some questions while leaning slightly to the left, slightly to the right, or while standing upright. Crucially, participants were not aware of this manipulation. Subjects' estimates were significantly smaller when they leaned to the left than when they leaned to the right. For example, they estimated the Eiffel Tower to be 12 meters shorter when leaning to the left than when leaning to the right.

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(3136)

**Planning and Search in Multi-Stage Risky Decision Making.** JARED HOTALING, JERRY BUSEMEYER and RICHARD SHIFFRIN, *Indiana University*—Risky decision-making research traditionally presents individuals with choices that provide an immediate reward or punishment based on the outcome of a single random event. Decisions are typically made in isolation, independent of previous or subsequent choices. Everyday decision-making is more complex, often involving multiple interdependent choices and several uncertain events. Our research incorporates some of the complexities of real world choices by requiring planning ahead with knowledge of successive choices that may or may not occur with varying degrees of certainty. The trials are represented as branching decision trees. A decision nodes, participants chose which path



to take through the tree. At chance nodes, a random event determined the path. Crucially, participants had the option to use some of the points earned on previous trials to reduce their uncertainty by purchasing information about chance nodes. The data show individual differences in the ways that individuals incorporate factors like risk, information search cost, and degree of uncertainty when forming plans for multistage decision scenarios. A comparison of multiple competing models is used to elucidate the cognitive processes at work.

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(3137)

**Decorative Photos Produce a Truth Bias for Unfamiliar Positive Judgments.** ROBERT B. MICHAEL and ERYN J. NEWMAN, *Victoria University of Wellington, New Zealand*, JUSTIN KANTNER, *University of Victoria*, DANIEL M. BERNSTEIN, *Kwantlen Polytechnic University*, D. STEPHEN LINDSAY, *University of Victoria* MARYANNE GARRY *Victoria University of Wellington, New Zealand*—When people make unpracticed judgments about others, can decorative photos—that provide no diagnostic utility—affect those judgments? We showed subjects a series of celebrity names, normed for familiarity. Half the names appeared with a photo of the celebrity. For each celebrity, subjects responded true or false to the claim “This famous person is an overestimator,” or the claim “This famous person is an underestimator.” Across 4 experiments, photos biased subjects to respond true—but only to the overestimator claim. Followup surveys revealed that people preferred to be overestimators, suggesting that the biasing effect of photos might be limited to claims about positive characteristics. Decorative photos may have increased cognitive availability of thoughts relating to overestimators—an experience that made the overestimation claim ring true. We examine whether differences in valence and concreteness can explain why photos affect claims about overestimators, but not underestimators.

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(3138)

**A Dual-Process Account of Decision Making: Memory and Anchoring.** SHAW L. KETELS, ALICE F. HEALY, CHRISTOPHER D. WICKENS, CAROLYN J. BUCK-GENGLER and LYLE E. BOURNE, JR., *University of Colorado Boulder*—A series of 3 experiments was conducted to examine the degree to which end-of-sequence decisions are influenced by memory for the items in the sequence, collectively and individually. Subjects made decisions about item concentration (centroid judgments) based on the 7 unique locations of 7 red squares presented in a 10 x10 matrix, and then recalled, in either serial or free order, those 7 locations. Initial items were remembered better and had more influence on decisions than final items. The full set of results requires a dual-processing account, such that decisions are based in part on memory for individual items and in part on an anchoring-and-adjustment

heuristic, in which the initial items serve as an anchor for the gradual accumulation of an overall impression or belief that might include no representation of individual items.

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(3139)

**Hindsight Bias Magnitude Depends On Task-Execution Strategy.** JULIA GROSS and UTE J. BAYEN, *Heinrich-Heine-University Düsseldorf*—When asked to recall an estimate given before learning about an outcome, people oftentimes distort this recalled estimate towards the outcome information. This phenomenon is called hindsight bias. Several strategies can be used to recall one’s estimate in the hindsight bias memory design, including recollection and reconstruction strategies. This study investigated the intentional use of the correct solution and thus a strategy that is allocated temporally before attempts to recollect or reconstruct one’s earlier estimate. Forty-eight participants provided numerical estimates to 96 difficult general knowledge questions. After a retention interval, all 96 estimates had to be recalled. One third of the questions each appeared without solution (control items), along with the solution (experimental items), or upon request only (choice items). Multinomial analyses revealed that the probability of a reconstruction bias is twice as high for solution “users” as compared to “non-users”. Implications for future research are discussed.

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(3140)

**How Cognitive Load Can Improve Judgment Processes.** JANINA HOFFMANN, BETTINA VON HELVERSEN and JÖRG RIESKAMP, *University of Basel*—Frequently limited cognitive capacity leads to deficits in performance. However, in judgment tasks the effect of cognitive load may depend on the cognitive process people use to solve the task. To the extent that people rely on automatic processes such as exemplar memory, cognitive load may not harm performance. Indeed, in non-linear tasks cognitive load may even lead to better judgments by promoting a switch from rule-based (i.e. cue abstraction) to exemplar-based processes. In our study, participants learnt to judge the criterion values of several objects based on multiple cues while solving an easy, difficult or no memory task. Under cognitive load, learning was not impaired. Instead, in a subsequent test phase participants under load judged new objects more accurately than participants under no load. Cognitive modeling showed that participants under cognitive load relied more on exemplar-based processes, whereas, without cognitive load, a linear additive model best described a considerable minority of participants. This suggests that when cognitive capacity is limited people may switch to exemplar-based processes, which can prove useful in tasks that are not solvable by linear models.

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(3141)

**Cortical, but not Subcortical, Representations of Game Outcomes are Context-specific.** TIMOTHY J. VICKERY, MATTHEW R. KLEINMAN, ZHIHAO ZHANG, DAEYEOL LEE, and MARVIN M. CHUN, *Yale University*—Choices during competitive games are often influenced by previous choices and outcomes, and it is essential to track reward in a context-specific manner. To investigate the mechanisms underlying context-specific reward tracking, we had participants play repeated matching-pennies games against two different interleaved virtual opponents during fMRI. Opponents repeated following “same-opponent,” but not “different-opponent” trials. We decoded outcomes from each volume in the sequence using multivoxel pattern analysis, separately for same- and different-opponent trials. Many brain regions reliably decoded outcomes, but this signal depended on opponent identity in several cortical regions (e.g., superior frontal and parietal). These regions robustly represented outcomes through the beginning of the next trial on same-opponent trials, but classification performance declined sharply following opponent cues on different-opponent trials. Subcortical regions (e.g., accumbens) showed no opponent-specific modulation of outcome signals. Thus, cortical regions maintain context-dependent reward representations to guide decision-making, whereas subcortical regions appear less context-sensitive. Email: Timothy J. Vickery, [tim.vickery@gmail.com](mailto:tim.vickery@gmail.com)

(3142)

**Eye Movements: A Gateway to Dynamic Decision Making.** FRANCOIS VACHON, GUILLAUME HERVET and SEBASTIEN TREMBLAY, *Université Laval*—By combining different eye-tracking and behavioral measures we wish to pinpoint the sources of error in dynamic decision-making (DDM). In the context of a computer-controlled simulation of radar-based risk assessment, we monitored eye movements and extracted metrics relative to 1) scanpath (measures of search), 2) eye fixations (measures of processing), and 3) pupillary response (measures of cognitive load) in order to characterize DDM during the process of risk assessment. Participants played the role of a tactical coordinator onboard a ship who must classify aircraft displayed on a radar screen according to their level of threat. Incorrect classifications were associated to 1) longer-lasting and longer scanpaths that are assumed to indicate less efficient information search, 2) longer and more frequent fixations on key attributes, revealing difficulties in making sense of critical information, and 3) smaller pupil size, often indicative of a low level of cognitive load. These findings altogether illustrate how dynamic, event-based measures of eye movement can capture various aspects of the ongoing cognitive processing in complex dynamic situations.

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(3143)

**Executive Function and Iowa Gambling Task Performance.** MELISSA J. HAWTHORNE and KARIN TOCHKOV, *Texas A&M University-Commerce*—The Iowa Gambling Task (IGT) is considered to be a measure of emotional/intuitive learning and decision making. Although a number of studies have used the IGT, to date little research has examined the role of executive functions (i.e., updating and inhibition) in IGT performance. In the present study, we examined how disrupting these functions affected IGT performance. Participants were required to engage in a task that places a cognitive load on updating and inhibition functions (i.e., random number generation) while completing the IGT. We found that in the dual-task condition, participants failed to develop the normal IGT learning pattern. These results indicate that executive functions may be important for the development of emotional/intuitive decision making.

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(3144)

**Exploration of the Differences Between Understanding and Agreeing: Do People Understand Before Agree or Disagree?** YASUHIRO OZURU, GIULIA KAUFMAN and JUSTIN DOGGETT, *University of Alaska Anchorage*—Two studies explored the differences and similarities underlying two types of verbal response: “agree” and “understand.” In experiment 1, participants made judgments on which of these responses (agree, disagree, understand, do-not-understand) is most appropriate to each of the 126 simple one sentence statements. The results indicated that people tend to respond with agree/disagree as opposed to understand/do-not-understand, and the reaction time tended to be faster when their response was agree/disagree. Experiment 2 presented the same stimuli twice to each participant; participants indicated the extent to which they “agree” and then “understand” using four level scales. The order of the “agree” and “understand” task was counter-balanced. The finding indicated people tend to be slower when deciding level of agreement compared to level of understanding. In addition, it was found that people often strongly disagree with the information that they claim not to understand at all.

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(3145)

**Testing Inter-Rater Agreement.** DENIS COUSINEAU, *Université de Ottawa*, LOUIS LAURENCELLE, *Université du Québec à Trois-Rivières*—We present different tests to determine whether two raters are agreeing when classifying cases into different categories: three Chi-square-type tests and a binomial test. The Chi-square statistics are computed as a subset of the customary Chi-square test of independence for a  $k \times k$  contingency table and, when exceeding their critical value, signify greater-than-chance agreement in the  $k$  categories, whereas the binomial test, to which Cohen’s kappa coefficient is related, compares the observed total number of agreements to its expected counterpart. The tests’

statistical properties are summarily explored in term of power and specificity; then they are compared to one well-known alternative.

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(3146)

**Neuronal Correlates of Judgment Strategies.** BETTINA VON HELVERSEN, *University of Basel*, LINNEA KARLSSON, *University of Umeå*, BJÖRN RASCH, *University of Zürich*, JÖRG RIESKAMP, *University of Basel*—Many areas of cognitive psychology assume a multi-system approach to cognition. Accordingly, humans rely on different cognitive processes that they select depending on the characteristics of the task. In this vein, research in multiple-cue judgment suggests that people use exemplar and rule-based processes. To examine the validity of the multi-system approach we conducted a study relying on functional magnetic response imaging. In the study participants were instructed to follow an exemplar or a rule-based process to solve two judgment tasks, respectively. The results show that the two judgment processes lead to different brain activations, supporting a multi-systems approach. The results are partly consistent with previous imaging studies in categorization research, in which participants were also instructed to rely on exemplar or rule-based processes. While we found that the areas involved in multiple-cue judgments were similar to the areas implied in categorization research, the activation patterns of the strategies differed. This suggests that rule and exemplar-based processes may recruit different brain areas if they are used in a judgment than if they are used in a categorization task.

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(3147)

**A Drift-Diffusion Account of Response Times in Retrospective Temporal Decision-Making.** FUAT BALCI, *Koç University, Istanbul, Turkey*, PATRICK SIMEN and LAURA DESOUSA, *Princeton University, NJ, USA* (Sponsored by Ilke Oztekin)—In the temporal bisection task, participants retrospectively categorize experienced time intervals as short or long based on their perceived similarity to two reference intervals. Researchers have historically assumed a comparator mechanism for such decisions, but have rarely examined the dynamics of the mechanism's operation or the response times it predicts. The drift-diffusion model of two-choice perceptual decisions may provide a framework for modeling retrospective temporal decision-making that can reveal these dynamics. To explore this possibility, we tested 35 human participants on the temporal bisection task with multiple sets of test intervals over multiple sessions. We fit response time and choice data with multiple drift-diffusion process models that varied in model complexity. The operation of each model was assumed to be initiated by the offset of the probe stimulus. Fits demonstrated that model parameters were related to probe durations in a manner consistent with reward rate maximization by a bounded diffusion process. We further extended this analysis to the time-left procedure.

Results support an extension of the drift-diffusion model of two-choice decision making to the domain of retrospective temporal decisions.

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(3148)

**Sex and the Money: Do Gender Stereotypes Modulate Economic Decision-Making?** EVE F. FABRE, FRANCESCA PESCIARELLI and CRISTINA CACCIARI, *Dept. of Biomedical Sciences*—In the Ultimatum Game (UG) paradigm, a proposer offers to split a fixed amount of money (e.g., 10 €) to a responder. Both get their share only if the responder accepts the offer. Typically offers lower than half of the sum are rejected. Ten female and ten male participants were offered 1, 3 or 5 € by proposers presented using role nouns conveying male-oriented (e.g., engineer) or female-oriented (e.g. babysitter) gender stereotypes followed by masculine or feminine proper names. Participants accepted each of the three offers significantly more often when the proposers were introduced by female-oriented gender stereotyped role nouns than male-oriented ones. Intermediate offers (3 €) were significantly more accepted if proposed by female individuals. Females accepted 5 € more often if proposed by females than by males whereas males do not show this solidarity effect. Preliminary analyses of the ERPs suggest that gender-stereotypes indeed affected economic-decision making.

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(3149)

**Distribution of Confidence Ratings for a Simple Perceptual Task.** JOEL LACHTER, *San Jose State University*, GREG S. CORRADO, *Google Research*, JAMES C. JOHNSTON, *NASA Ames Research Center*, JAMES L. MCCLELLAND, *Stanford University* (Sponsored by Ruth Maki)—In traditional perceptual decision-making experiments, two pieces of data are collected on each trial: response time and accuracy. We asked participants for a continuous response corresponding to the likelihood that that one of two dot patches contained more dots. Responses were made by moving a cursor along a sliding scale between a 100% certain left response and a 100% certain right response. The response distributions of most participants contained very few responses near the center (indicating 50-50 odds), and two peaks, a “less certain” peak and a “more certain” peak. Five difficulty conditions were intermixed. Within each difficulty condition, participants were more accurate on trials where they responded with greater certainty. As difficulty decreased, the peaks shifted toward greater certainty and the proportion of trials in the “more certain” peak increased. The bearing of these data on theories of decision making will be discussed.

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(3150-3154)

**Grant Funding Agencies.** Information about various grant funding agencies is available. Representatives will be available throughout the conference.

## POSTER SESSION IV

Saturday Noon

Convention Cener Ballroom 6 ABC

Viewing 10:00 a.m.-1:30 p.m., Author Present 12:00-1:30 p.m.

## ● ACTION AND PERCEPTION III ●

(4001)

**Syntactic Constraints on Embodied Language Processing.** LISA VANDEBERG, ROLF A. ZWAAN, *Erasmus University Rotterdam* (Sponsored by Ingmar H.A. Franken)—Research has demonstrated that visual experience affects language processing. Here we ask more specifically what type of information is impacted in different linguistic constructions. Dutch participants were presented with a picture of an object in a certain shape or orientation, after which they used key presses to read a sentence about that object phrase by phrase. Both a prepositional phrase (PP: on the location of the object) and a verb phrase (VP: on the action that was performed to the object) contained disambiguating information that either matched or mismatched with the object's visual properties. The order of presentation of these critical phrases was systematically varied in agreement with Dutch syntax. The data show significant match-mismatch effects on the PPs but not on the VPs. These results suggest that visual experience influences (a) reading about locations, but not actions and (b) that different syntactic constructions do not moderate this effect. Email: Lisa Vandenberg, [vandenberg@fsw.eur.nl](mailto:vandenberg@fsw.eur.nl)

(4002)

**When Humanoid Robots Become Human-Like Interaction Partners.** ROMAN LIEPELT and ANNA STENZEL, *Westfälische Wilhelms-University, Münster, Germany*, ERIS CHINELLATO, MARIA A. TIRADO BOU and ÁNGEL P. DEL POBIL, *University Jaume I, Castellón, Spain*, MARKUS LAPPE, *Westfälische Wilhelms-University, Münster, Germany*—In human-human interactions action co-representation is crucial to successfully adjust and coordinate both partners actions. Action co-representation is assumed to be restricted to biological agents. In the present study, we investigated whether action co-representation, as measured by the Social Simon Effect (SSE), is present when interacting with a real humanoid robot. Further, we tested if action co-representation can be modulated by participant's belief about the robot's functional principle. The robot was either described as functioning in a biologically inspired, human-like way or in a purely deterministic way. A SSE was present only when the robot was described as human-like. The present findings suggest that action co-representation can also occur for non-biological, robotic agents when participants perceived the agent as human-like. This points to the role of the actor's belief about the partner's animacy in modulating the amount of action co-representation in a top-down manner. Email: Roman Liepelt, [roman.liepelt@uni-muenster.de](mailto:roman.liepelt@uni-muenster.de)

(4003)

**You Don't See What You Expect To See: Blindness to Learned Action Effects.** ROLAND PFISTER, MARKUS JANCZYK and ALEXANDER HEINEMANN, *University of Wuerzburg*, ROLAND THOMASCHKE, *University Regensburg*, ANDREA KIESEL, *University of Wuerzburg*—If a prepared action shares one or more features with an action-irrelevant stimulus in the environment, accurate perception and identification of the stimulus are impaired. This phenomenon (known as Action-Effect-Blindness, AEB) was demonstrated with overlapping proximal action features (e.g., left vs. right key presses) and features of distal stimuli (e.g., arrowheads). The present study expands the AEB phenomenon to learned action effects which are assumed to become endogenously activated as part of ideomotor action control. We show that the anticipation of an action effect shields its representation from other processes – impairing reactions to this stimulus if it is presented exogenously. This finding indicates that AEB is not due to interference of mere physical stimulus and response features but plays a functional role for perception in action.

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(4004)

**Time Perception of Action-Specific Time Intervals.** CAROLA HAERING, SOPHIE NOLDEN, ANDREA KIESEL, *University of Wuerzburg* (Sponsored by Marco Steinhauser)—If an action reliably produces an effect after a short time interval, the action and the effect are perceived shifted toward each other compared to time judgements of a passive haptic stimulation of the finger and a stimulus identical to the effect (e.g. Wohlschläger, Engbert, & Haggard, 2003). This bias in time perception is attributed to an intentional binding process that binds effect stimuli to preceding actions. We explore whether similar results emerge for the perceived duration of action-specific action-effect intervals by applying a psychophysical method for time judgements. Participants actively pressed one of two keys or experienced haptic stimulation of one of two fingers. This was followed by a visual stimulus that occurred action-specifically / finger-specifically after 250 ms or after 600 ms. We observed action-effect specific intentional binding as action-effect intervals of 600 ms were perceived shorter than intervals after passive haptic stimulation.

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(4005)

**How Does Task Structure Affect Hick/Hyman Law?** TIM WIFALL and ELIOT HAZELTINE, *University of Iowa* (Sponsored by Jonathan Mordkoff)—Hick/Hyman Law (HHL; Hick, 1952; Hyman, 1953) holds that reaction time increases linearly with the log of the number of stimulus-response alternatives. We examined how task structure affects HHL by manipulating the input and output modality pairings. Three experiments followed the same general method. Participants trained with 8 stimuli mapped to 8 responses (8:8) after which they were transferred to a 4:4 and 2:2 mapping for sessions 7 and 9 (order counterbalanced across participants). In Experiment 1, all stimuli were visual and all responses were manual. In Experiment 2 four of the stimuli required vocal responses and the other four stimuli required manual responses. In Experiment 3 four of the stimuli were presented aurally, the other four stimuli were presented visually. The slope of HHL critically depended on how the modality of the stimuli and modality of the responses overlapped. We discuss the implications for theories of response selection.

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(4006)

**Effects of a Co-Actor's Focus of Attention on Performance.** ANNE BOECKLER, GUENTHER KNOBLICH and NATALIE SEBANZ, *Radboud University Nijmegen, Donders Institute* (Sponsored by Natalie Sebanz)—When attending to an object or scene from different perspectives, people take a co-actor's perspective into account. The present experiments investigated whether a co-actor's focus on local or global stimulus features is also taken into account. Participants performed a two-choice Navon task next to each other, responding to the small letters that formed a big letter (local) or to the big letter comprised of small letters (global). The two participants had either the same focus (both local or both global) or they had a different focus. The results revealed a significant slowdown of responses when participants held a different focus compared to when they held the same focus. An EEG-study revealed that components related to attentional processing (P1, N2, P3) were modulated by the co-actor's focus. Taken together, the findings indicate that co-actors represented each other's attentional focus, which induced a conflict in the selection of their own focus.

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(4007)

**Influence of Name-Identity on Physical Same-Different Letter Matching.** JING CHEN and ROBERT W. PROCTOR, *Purdue University*—Participants performed same-different matching tasks, with physical-identity instructions, on letter pairs composed from B, b, and p. The letters in a pair were presented simultaneously or sequentially, with the experiments differing in whether a) the letters could appear in 2 or 4 positions and b) 2 or 5 SOAs were used. We replicated a finding by Lupyan et al.

(2010) that, with sequential presentation, different RTs were longer when the letters had the same name (Bb; within-category pair) than when they did not (Bp; between-category pair). However, this within-between category disparity was also evident with simultaneous presentation. Moreover, on simultaneous trials, the size of the within-between category disparity increased across the RT distribution, whereas the same-different disparity (benefit for same responses) decreased. The results are predicted by a response competition account: The name match of Bb activates the same response, producing more competition with the correct different response than Bp produces. They are inconsistent with Lupyan et al.'s conceptual penetration of perception account, which predicts that the within-between category disparity should be restricted to sequential presentation.

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(4008)

**Are Arrows More Like Locations or Words? A Correlative Analysis of Spatial Compatibility Effects.** JAMES D. MILES, *California State University Long Beach*, ROBERT W. PROCTOR, *Purdue University*—Responses are more efficient when their spatial mapping with features of targets is compatible compared to when it is incompatible, even when these features are irrelevant to task performance. A debate exists as to whether spatial compatibility effects for different stimulus modes are due to the same or different underlying cognitive processes. We examined compatibility effects for the most commonly used spatial stimulus modes – arrows, locations, and location words – using correlations of the effects between each of these modes at different segments of their response time distributions. When spatial information was irrelevant to task performance (the Simon task), the compatibility effects elicited by arrows and words were related to each other and both were unrelated to those of locations. When spatial information was task-relevant [the stimulus-response compatibility (SRC) task], compatibility effects between arrows and locations were related and both were unrelated to the effect elicited by words. We suggest that these changing relations between stimulus modes depend on the strategy that is used to encode the spatial information and show that this view is consistent with previous related research.

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## ● SPATIAL COGNITION III ●

(4009)

**Analyzing Distances in a Fronto-Parallel Plane.** STEPHEN C. DOPKINS and HYOUN K. PYOUN, *George Washington University*—The direct distance between two points in a fronto-parallel plane is thought to be understood in terms of the visual angle between the points, and, by implication, in terms of a polar coordinate system. The vertical or horizontal distance between the points implies a rectangular coordinate system. How is the vertical or horizontal distance between two points extracted from the



direct distance between them. We present results from priming, memory, absolute distance judgment and relative distance judgment tasks, suggesting that, under speeded conditions, the visual system estimates the visual or horizontal distance between two points by assessing the direct distance between the points, in terms of a polar coordinate system, after weighting the dimension of interest more heavily than the other dimension, in terms of a rectangular coordinate system.

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(4010)

**Conceptual Cues for Visual Attention.** DAVOOD G. GOZLI, ALISON L. CHASTEEN and JAY PRATT, *University of Toronto*—Previous work suggests that both concrete (e.g., hat vs. shoes) and abstract (e.g., god vs. devil) concepts with prototypical spatial associations engage attentional mechanisms, affecting subsequent target processing above or below fixation. Interestingly, both facilitatory (Chasteen et al., 2010) and inhibitory (Estes et al., 2008) effects have been reported as consequences of the compatibility between target location and the meaning of the activated concept. To determine the necessary conditions for obtaining these disparate effects, we varied the task (detection vs. discrimination), SOA, and concept type (abstract vs. concrete) across a series of experiments. Results suggest that the nature of the concepts underlies the different attentional effects. On the one hand, abstract concepts facilitated target processing across tasks and SOAs. On the other hand, concrete concepts inhibited target processing only during the discrimination task and for short SOAs. Thus, the particular perceptual and metaphorical associations of a concept mediate their subsequent effects on visual target processing.

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(4011)

**A Corpus of Spatial Descriptions for the Development of Human-Driven Spatial Language Robot Algorithms.** LAURA A. CARLSON, *University of Notre Dame*, MARJORIE SKUBIC, *University of Missouri*, JARED MILLER, *University of Notre Dame*, ZHIYU HUO, *University of Missouri*, XIAO OU LI, *University of Notre Dame*—This study presents a corpus of spatial language descriptions that forms the basis for designing robot comprehension and production algorithms for human-robot interaction. The scenario is a virtual home in which an elderly resident has misplaced an object, and an assistive robot offers a set of natural spatial descriptions that enable the resident to find the object. The spatial descriptions are generated via human-driven spatial language algorithms that build on a corpus of natural descriptions, collected from naïve participants who explored a three-room virtual home, looking for particular objects and describing their locations. Key manipulations were the type of addressee (robot or human), whether the speaker and addressee were aligned; and whether the speaker was instructed to describe where

the object was versus how to find it. Systematic differences were observed in perspective taking, the number of spatial phrases and their sequencing, the use of hedges, and the types of reference objects and spatial terms selected. Incorporating these features will enable these human-driven spatial language algorithms to support assistive capabilities in unstructured environments occupied by people, such as an eldercare scenario.

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(4012)

**Space in the Workplace: How Perspective and Valence of Anticipated Information Matter.** TEENIE MATLOCK and JUSTIN L. MATTHEWS, *University of California, Merced*—Spatial thinking is linked to reasoning about social relationships, including relationship status (Matthews & Matlock, 2010). This work investigates the conceptualization of physical distance between an employer and an employee in a simulated work environment, and how it varies depending on expected content of a future interaction (positive or negative information). After imagining being an employer or an employee in an upcoming meeting about salary adjustments, participants in our study depicted themselves (as employer or employee) in an office scene. When taking the employee's perspective, participants depicted themselves reliably closer to their employers when expecting to discuss a pay raise, and farther away when expecting to discuss a pay cut. No distance differences were found when participants took the employer's perspective. These results suggest that spatial thinking, work status, and valence of information interact. The work has valuable implications for social distance and attitude in the work place.

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(4013)

**Heading in the Right Direction: Initial Heading Direction and Spatial Memory Flexibility.** TAD T. BRUNYE, STEPHANIE A. GAGNON and AARON GARDONY, *Tufts University & US Army NSRDEC*, MATTHIJS L. NOORDZIJ, *University of Twente*, CAROLINE R. MAHONEY, *Tufts University & US Army NSRDEC*, HOLLY A. TAYLOR *Tufts University*—When entering an environment for the first time, navigators can have one of multiple heading directions relative to world-centered coordinate axes (NSEW). If navigators spontaneously develop mental maps of environments, then aligning their navigating body axes with world-centered coordinates should facilitate environmental learning. In contrast, if navigators solely maintain perspective-invariant egocentric representations, then this type of alignment should not affect environmental learning. We tested these hypotheses in two experiments, one using spatial descriptions and the second using virtual environments. Experiment 1 demonstrated faster route sentence reading times after entering an environment on a northward relative to any other heading direction, accompanied by high spatial

memory flexibility during perspective-switching tasks. Experiment 2 demonstrated similar effects on pointing and perspective-switching tasks following virtual navigation. Supporting some recent theories of spatial memory, we provide evidence that individuals may spontaneously build map-like mental images online during first-person environmental learning, and these representations support the ultimate perspective-flexibility of spatial memory. Email: Tad T Brunye, [tbrunye01@tufts.edu](mailto:tbrunye01@tufts.edu)

## ● ASSOCIATIVE LEARNING ●

(4014)

**The Role of Semantic Information in Visual Statistical Learning Using Line Drawing Objects.** SACHIO OTSUKA, *Kyoto University*, MEGUMI NISHIYAMA, *Nagoya University*, FUMITAKA NAKAHARA, JUN KAWAGUCHI, *Nagoya University*—In this research, we examined whether the representation was flexible in visual statistical learning (VSL), based on the semantic information of line drawing objects. In the familiarization phase, participants viewed a sequence of line drawings and detected repetitions of objects. The sequence of objects consisted of temporal triplets in which the same three objects always appeared in the same order (e.g., ABCGHIDEFABC...). In the following test phase, based on the familiarization phase, participants judged which of two subsets of word stimuli representing the line drawings statistically related (ABC) versus unrelated (AEI) was more familiar. We used the backward CBA triplets as well as the forward ABC triplets in the test phase. Our results showed greater than chance familiarity both for the forward and backward triplets. These results suggest that the representation is flexible in VSL based on the semantic information.

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(4015)

**Spatial Learning and Memory Impairment in a Mouse Model of Alzheimer's Disease.** JENNIFER M. WALKER, STEPHANIE W. FOWLER, AGNES SIMONYI and TODD R. SCHACHTMAN, *University of Missouri*—TgCRND8 mice, an amyloid precursor protein transgenic model of Alzheimer's disease, were assessed for their performance on a spatial Barnes maze task as well as irritability and locomotion behavior. Tg mice displayed poor spatial learning using errors and latencies during acquisition and a 2-week retest. Tg mice also showed increased locomotion and older Tg mice showed higher irritability.

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(4016)

**Incidental Sequence Learning: Dissociating Effects of Repetition Lag and Serial Order.** DENNIS RÜNGER, *UC Santa Barbara*, ROBERT GASCHLER, *Humboldt-Universität zu Berlin*, F. GREGORY ASHBY, *UC Santa Barbara*—Individuals are sensitive to multiple statistical

constraints inherent in sequentially structured stimulus material. In this study, we distinguish between learning about repetition lag (i.e., the number of trials between two occurrences of the same stimulus) and serial order. With probabilistic stimulus material, learning is evidenced by increased response times (RTs) to low-probability (LP) stimuli that violate the sequence, compared to high-probability (HP) stimuli that conform to the sequence. However, LP and HP stimuli also differ in mean repetition lag. We show that the same lag difference leads to comparable RT effects with pseudo-random stimulus material, indicating that the effect of LP stimuli in the sequenced condition is attributable to violations of lag expectancies, not serial order. Supplemental analyses suggest that both types of statistical constraint are learned during incidental sequence learning.

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(4017)

**The (In)-Flexibility of Auditory Versus Visual Sequential Learning.** ANNE M. WALK and CHRISTOPHER M. CONWAY, *Saint Louis University*—The ability to learn sequential structure from auditory stimuli is necessary for language acquisition and processing (Conway, Bauernschmidt, Huang, & Pisoni, 2010; Saffran, 2001). A substantial body of work has shown that humans are capable of learning complex patterns in multiple modalities, across the lifespan (e.g., Conway & Christiansen, 2005; Saffran, Aslin, & Newport, 1996). However, the flexibility of such learning is less well explored (Turk-Browne & Scholl, 2009). In the present study, we examined adult participants' ability to flexibly transfer learned auditory and visual associations to reverse instantiations of the same patterns. Preliminary findings revealed that the auditory modality showed a relative lack of ability to transfer to the backward patterns, which was not observed in the visual modality. These results suggest that auditory sequence learning may be relatively inflexible (i.e., exquisitely sensitive to serial order information), a characteristic that may be well suited for language learning.

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(4018)

**Not all Relations are Created Equal: Functional vs. Categorical Relations in Picture-Pair Memory.** ELAN BARENHOLTZ and VANESSA HEINE, *Florida Atlantic University*—How are associations among objects encoded in memory? We investigated memory of pairs of pictures that were either 'categorically' related (e.g. a baseball and a football), 'functionally' related (e.g. a hammer and a nail) or unrelated. During learning, subjects were presented with 100 pairs of photographs of objects (25 functional, 25 categorical and 50 unrelated); in the test phase, subjects were shown three objects including a base object, its true pair and an equivalently related distractor (i.e. categorically, functionally or unrelated to the base object). Subjects had to choose which object had been paired with the base object

during learning. Overall, we found that when the test phase immediately followed learning, both categorically related and functionally related pairs were remembered better than unrelated pairs. At longer durations (>10 min.) however, memory for functionally related pairs remained strong while memory for categorically related pairs declined. Overall, these results suggest that while general relatedness enhances memory in the near-term, robust long-term memory of object relations depends on encoding a functional 'unit' that is based on the interaction between objects.

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#### (4019)

**Early-Life Stress Effects on Behavioral Persistence.** TARA K. PATTERSON, *UCLA*, STEPHAN STEVENS, *University of Giessen*, BRUCE D. NALIBOFF, MICHELLE G. CRASKE, MICHAEL S. FANSELOW and BARBARA J. KNOWLTON, *UCLA*—Early-life stress is associated with a variety of negative health outcomes, but the cognitive processes behind these outcomes are poorly understood. We examined the impact of early-life stress on the partial reinforcement extinction effect, the tendency to persist in performing a previously rewarded behavior under extinction following partial reinforcement. Participants were rewarded for entering correct button-press sequences on a continuous reinforcement schedule (100%) or a partial reinforcement schedule (50%). This acquisition phase was followed by a period of extinction during which no rewards were delivered. Multiple regression analysis revealed a three-way interaction effect of early-life stress, neuroticism, and reinforcement schedule on the number of goal responses entered in extinction. Simple effects tests indicated that the partial reinforcement extinction effect is reduced in people who are high on neuroticism and have experienced early-life stressors. This lack of behavioral persistence may contribute to the poor health outcomes observed in this population.

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#### (4020)

**Preventing Life Script Events Eliminates the Bump.** BERIVAN ECE-USTA and SAMI GULGOZ, *Koc University*—The fate of the reminiscence bump was investigated as a function of preventing the most frequent life script events. Seventy one (36 males and 35 females) adults completed the cultural life script task. Participants were asked to write events from a typical life excluding those from a list of ten events (e. g., marriage, first job). Exclusion of the most typical life script events eliminated the reminiscence bump. The proportion of events reported from periods prior to and following the bump period was not any different than the bump period. Furthermore, events corresponding to the bump period (15-30) were rated as significantly less important and emotionally intense than the events out of the bump period. There was no significant difference between the bump and non-bump events regarding emotional valence. Results indicated that characteristics of the events reported for the bump may be critical in the emergence of the reminiscence bump.

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### ● FACE PROCESSING AND MEMORY ●

#### (4021)

**The Effect of Multiple Own-Group Dimensions on Face Recognition: Evidence for an Additive Effect.** DARLINE M. GARRETT, *Sam Houston State University*, CHRISTINA N. STANFORD, *Texas State University*, JENNIFER M. SANDERS and JEFFREY S. ANASTASI, *Sam Houston State University*—In the current study, we evaluated the impact of manipulating more than one in-group/out-group dimension on face recognition accuracy. Both Black and White participants evaluated same- and other-race students and professors in Experiment 1 and same- and other-race student and police officer faces in Experiment 2. In Experiment 3, both race and age were manipulated for in-group and out-group status. Results showed an additive effect of dimensions such that discriminability was predicted by the number of in-group dimensions shared by participants and faces. Specifically, higher discriminability was found when participants shared both dimensions with the faces (e.g., same-race student faces) and the lowest discriminability when the faces were out-group on both dimensions (e.g., other-race professors or other-race police officers). Results are discussed in terms of Sporer's (2001) in-group/out-group model (IOM) of facial processing and categorization. IOM has been successful in explaining the own-race bias when only a single social dimension has been manipulated. However, it is less clear when more than one social category is manipulated. The current study discusses modifications to Sporer's IOM model to explain multiple dimensions.

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#### (4022)

**The Cross Race Effect: The Influence of Stereotypicality On Memory Errors.** LESLIE KNUYCKY, SARAH CAVRAK and HEATHER M. KLEIDER, *Georgia State University*—In eyewitness identification cases, suspect misidentification is the leading factor attributed to wrongful convictions (Scheck, Neufeld, & Dwyer, 2000), thus, it is of applied importance to identify factors that contribute to the false recollection of faces. One potential factor addressed in the current study is whether cross-race face memory and subsequent identifications for Black faces is biased by the degree to which a target face possesses facial features associated with ethnic identity. In Experiment 1, preliminary data found that viewing a stereotypical Black perpetrator lead to more lineup misidentifications (79%) than viewing a non-stereotypical Black perpetrator (0%) suggesting that face-type influences false identifications. In Experiment 2, Individual differences in level of processing (global, local) and prejudice were tested as potential mechanisms contributing to biased judgments. A standard face recognition task revealed that prejudice, level of processing, and face-type interacted to predict recognition bias.

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(4023)

**The Role of Faces in Item Method Directed Forgetting.** CHELSEA K. QUINLAN and TRACY L. TAYLOR, *Dalhousie University*—This series of experiments explored the role of emotional faces on the item-method directed forgetting effect. In each experiment, faces (Angry, Neutral, or Happy) were presented one at a time, each followed by either a Remember or Forget memory instruction. Following the study phase, memory performance was measured using a yes/no recognition test. Although there was a significant directed forgetting effect for Neutral faces across all experiments, this was not the case for emotional faces (Angry and Happy faces). Critically, when processing time was decreased, there was no effect of emotion on the directed forgetting effect, whereas when the processing time was increased, there was an effect of emotion on the directed forgetting effect. These findings are discussed in terms of processing time as well as valence and arousal, and how these two factors modulate the effect of emotion on the directed forgetting effect.

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(4024)

**Same Faces, Different Labels: Generating the Cross-Race Effect in Face Memory with Social Category Information.** KATHLEEN L. HOURIHAN, SCOTT H. FRAUNDORF and AARON S. BENJAMIN, *University of Illinois at Urbana-Champaign*—Recognition of own-race faces is superior to recognition of other-race faces. In the present experiments, we explore the role of top-down social information in the encoding and recognition of racially ambiguous faces. Hispanic and African-American participants studied and were tested on a single set of computer-generated, ambiguous-race faces (composed of 50% Hispanic and 50% African-American features; MacLin & Malpass, 2001). In Experiment 1, faces were randomly assigned to two study blocks. In each block, a group label was provided that indicated that those faces belonged to African-American or Hispanic individuals. Both participant groups exhibited superior memory for faces studied in the block with the own-race label. In Experiment 2, faces were studied in a single block with no labels, but tested in two blocks in which labels were provided. Neither hits nor false alarms varied with the labelled race at test. Taken together, these results confirm the claim that purely top-down information can yield the well documented cross-race effect in recognition, and additionally suggest that the bias takes place at encoding rather than testing.

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(4025)

**Effect of Familiar Faces On the Attentional Blink.** JEFFREY ANDRE and JULIE NIZIURSKI, *James Madison University*—The present study tested the possible use of the attentional blink paradigm (AB) in a concealed knowledge test (CKT). The AB is the inability to detect a target (T2) when presented within 300-500 msec of another

target (T1) during a rapid presentation of neutral items. Concealed knowledge (guilty knowledge) is any information that a person is withholding from an investigator. This study investigated whether familiar faces can affect the characteristics of the AB. Thirty participants completed 200 trials in which they looked for the same familiar target (T2; the actor Brad Pitt) that was intermixed with neutral face stimuli and one other familiar face (T1; the actor George Clooney). In previously known studies, T2 had been neutral. T1 represented concealed knowledge as participants who were familiar with T1 would be distracted by his unannounced presence and would demonstrate an AB. Despite all participants being familiar with T2, an AB still occurred, but with higher T2 accuracy rates than previously published. This supports the use of the AB paradigm with the CKT. However, a possible countermeasure to the AB is making T2 familiar as eight of the 21 people who recognized T1 had 100% T2 accuracy rates on AB trials.

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(4026)

**Negative Face Advantage? Don't Count On It!** ELISABETH BLAGROVE and DERRICK G. WATSON, *University of Warwick*—Previous work has shown that search for a single negatively valenced face (e.g., sad or angry) among neutral distractors is much more efficient than for a positively valenced face (e.g., Eastwood, Smilek & Merikle, 2001), possibly due to ecologically-driven advantages in early threat detection. We used an enumeration task to examine whether a similar advantage arises for detecting/tagging multiple stimuli. Experiments 1 and 2 found that, in the absence of distractors, there was no difference in the efficiency of enumerating multiple negative or positive faces. Experiment 3 showed that, when neutral face distractors were also present, enumerating negative targets was faster overall, but only more efficient for small numbers of items. The findings suggest that there is a weak advantage for tagging a small number of negative stimuli and only under conditions of attentional competition.

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(4027)

**Automaticity of the Identification of Familiar and Unfamiliar Faces.** KYUNGHUN JUNG, NICHOLAS GASPELIN, JULIA KELLER and ERIC RUTHRUFF, *University of New Mexico*—Facial identification is important because it informs us regarding how best to react to an approaching person, who might be friend or foe. Consequently, this perceptual judgment, although a complicated one involving multiple features, might have evolved into a module that can operate simultaneously with other demanding mental tasks (i.e., automatically). We addressed this issue using locus-of-slack logic in a Psychological Refractory Period paradigm. Task 1 was a speeded tone pitch judgment (low/high) and Task 2 was a speeded facial identity judgment. On half the trials, we slowed facial identification by morphing the target face with another face. The effect of this Task-2 difficulty



manipulation virtually disappeared at short stimulus onset asynchronies (an underadditive interaction) when we presented faces of highly familiar celebrities. With unfamiliar faces, however, the interaction was only partially underadditive. Based on locus-of-slack logic, we conclude that familiar faces were identified automatically, but unfamiliar faces were not.

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(4028)

**Eye Can't Look Away: Dissociating Automatic and Volitional Contributions To Orienting To the Eyes.** KAITLIN LAIDLAW, *University of British Columbia*, EVAN F. RISK, *Arizona State University*, ALAN KINGSTONE, *University of British Columbia*—To investigate the contributions of volitional and automatic orienting to the bias to attend to the eyes of another, we developed the 'Don't Look' task. Eye movements were recorded while participants viewed upright or inverted faces under free viewing or 'Don't Look' instructions. Half of the participants were told to not look at the eyes, while for comparison, half were told not to look at the mouth. In general, participants were able to reduce fixations to the 'Don't Look' region, but when faces were upright, those told to avoid the eyes were less successful (i.e., looked more at the to-be-avoided region) than those told to avoid the mouth. Both groups performed equally well when faces were inverted. Our results suggest that attention to the eyes is not entirely under volitional control and that the automatic component of the bias to look at the eyes is related to holistic face processes.

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## ● EXPLICIT MEMORY II ●

(4029)

**An Inhibition-of-Return-Like Effect in Reflective Attention in Older Adults.** JULIE A. HIGGINS, MATTHEW R. JOHNSON and MARCIA K. JOHNSON, *Yale University*—In young adults, briefly thinking of (i.e., refreshing) a just-seen word impairs immediate (100ms delay) subsequent perception, but enhances long-term memory, of that word compared to words that were not refreshed (MR Johnson et al., 2011, May). In the current study, older adults (OAs) saw two words presented simultaneously and were then cued to think of and say aloud one of the just-seen words. Following a variable delay (100ms vs. 500ms), participants then read aloud the refreshed, the non-refreshed, or a novel word. OAs were significantly slower to read the refreshed vs. the non-refreshed word after the 500ms but not the 100ms delay, consistent with evidence of slowed inhibition in OAs (Gazzaley et al., 2008). Also, OAs showed better long-term memory for refreshed than unrefreshed items that had been probed after 500ms but not after 100ms, suggesting that the critical time window for encoding and inhibition effects are related.

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(4030)

**Is Memory Aid Use Correlated with Students' Actual or Perceived Workload?** MELANIE CARY, *University of Wisconsin - La Crosse*—Undergraduates rated how frequently they used each of several different memory aids in their everyday lives. Some of these memory aids were internal aids (e.g., mental rehearsal) and some were external aids (e.g., chore chart). For the external memory aids, participants evaluated both non-electronic aids (e.g., paper planner) and electronic aids (e.g., electronic planner). Participants also rated each memory aid that they reported using on ease of use and accuracy. Additionally, measures of participants' actual and perceived workload were assessed. The analyses will examine participants' rated frequency of use and perceptions of three categories of memory aids (internal, external-electronic, external-non-electronic), as well as the nature of the relationships, if any, between actual workload, perceived workload, and participants' use of each of the three different types of memory aids. Preliminary analyses indicate that perceived, but not actual, workload is positively correlated with how frequently participants' use internal and external memory aids.

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(4031)

**Proactive Effects of Memory: The Role of Reminders.** CHRISTOPHER N. WAHLHEIM and LARRY L. JACOBY, *Washington University in St. Louis*—In three experiments, we examined the role of reminders in proactive effects of memory. A-B, A-D paradigms were used to explore the effects of reminders on memory performance and the factors that affect the production of reminders. Reminders produced proactive facilitation, whereas proactive interference was obtained when reminders did not occur. Increasing memory for an initial list increased the occurrence of reminders in a subsequent list, which enhanced memory performance for the latter. Additional study time was given to items for which reminders were thought to occur, indicating awareness of their occurrence. The provision of a reminder during recall did not enhance memory performance, whereas self-generated reminders did so. Finally, individual differences indicated that reminders are different from general memory ability and that they can be cognitively controlled. Our results show that reminders facilitate memory performance and that controlled and automatic processes both play a role in their production.

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(4032)

**Decorative Photos Lead People To Claim That They Performed Very Recent Actions.** BRITTANY A. CARDWELL, ERYN J. NEWMAN and JEFFREY L. FOSTER, *Victoria University*, LINDA A. HENKEL, *Fairfield University*, MARYANNE GARRY, *Victoria University*—Can decorative photos lead people to falsely claim they performed very recent actions? We asked



subjects to play a computer game where they either fed or refrained from feeding unfamiliar animals. After a short filler task, we showed subjects those animals again—either with or without a photo of the animal. For each animal, subjects quickly responded true or false to the claim that they fed (or, for other subjects, did not feed) the animal. Photos had a different effect depending on the claim people evaluated: photos biased people to agree with the claim that they fed animals, but biased them to disagree with the claim that they had not fed animals. In short, decorative photos signaled action, rather than restraint. Although these photos were non-diagnostic, they may have influenced people's judgments by helping springboard the qualitative characteristics that signal action.

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(4033)

**Short-term Distortion of Autobiographical Memory.** STEPHANIE A. BERGER, *College of Mount Saint Vincent*—Studies of autobiographical memory find an overwhelming bias towards recalling positive events and distorting negative events. Bahrick et al. (1996) found positive distortion of high school grades with retention intervals between 1 and 4 years. One purpose of the present study was to examine accuracy and distortion of everyday autobiographical memory over relatively shorter retention intervals of 1 to 8 weeks. The second purpose was to determine whether distortion of memory for grades on exams led to incorrect expectations of higher course grades, especially in weaker students. Beginning in the 12th week of the semester, 120 undergraduates recalled their grades on exams, assignments and their midterm course grade in one class. Students recalled .71 of exam grades and .83 of course midterm grades. High grades were recalled more accurately than low grades and grade on the exam or assignment was the best predictor of accuracy and distortion.

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(4034)

**The Judgments of Learning Improve Memory: Examinations on Intentionality of Learning and Familiarity of Words.** TETSUYA FUJITA, *Hosei University*—In the present study, I examined the effect of making judgments of learning (JOL) on Japanese words. In Exp.1 and 2, I compared the memory performance of participants when they made JOL to when they made semantic and physical judgments on the levels of processing. Participants learned high-familiarity words incidentally in Exp.1 and intentionally in Exp.2. The results of both experiments revealed that participants who made JOL showed better performance for free recall than those who made physical judgments and that they performed equally to participants who made semantic judgments. In Exp.3, I replicated these results using middle-familiarity words. These findings showed that making JOL was beneficial for memory, which was consistent with the results of Fujita (2010).

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(4035)

**Effects of Others' Knowledge States On Metacognitive Control of Recall.** SCOTT H. FRAUNDORF and AARON S. BENJAMIN, *University of Illinois at Urbana-Champaign*—Impressions about others' performance are frequently available in educational settings (e.g., how quickly peers complete an exam). We investigated how such information influences memory in a word-retrieval task. Participants studied easy (semantically associated) and difficult (unrelated) word pairs. During a subsequent cued-recall test, participants saw a putative opponent's performance on each item; this information was actually experimentally manipulated. Recall was enhanced when the opponent's performance mismatched the item difficulty (that is, easy items that the opponent missed and hard items that the opponent got wrong). A subsequent experiment suggested that the source of this benefit was that the mismatch conditions led participants to consider additional possible responses. These results demonstrate that others' knowledge states can be integrated into metacognitive planning of how to approach a cognitive task and so benefit recall.

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(4036)

**Sometimes Order Matters: Order of Presentation Influences Semantic Memory But Not Phonological Illusions.** LUDMILA D. NUNES, *University of Lisbon*, MITCHELL S. SOMMERS, *Washington University in St. Louis*, LEONEL R. GARCIA-MARQUES, *University of Lisbon*, PEDRO R. MARQUES, *ISCTE-University Institute of Lisbon*—It has been suggested that, despite similar levels of false recognition, semantic and phonological memory errors of commission are based on different mechanisms (Ballou & Sommers, 2008). To further investigate these mechanisms, we presented participants with identical lists of semantic and phonological associates of a non-presented critical item, but varied presentation order. For half of the lists, associates were presented in descending order based on backward associative strength and for the other half the order was reversed (ascending). Results showed a decrement in false recognition of the critical associate when word presentation was ascending, compared with descending but only for semantic lists. For phonological lists there were no differences between orders of presentation. These data point to the idea that false semantic recognition reflects the extraction of a gist, being influenced by order of presentation, whereas false phonological recognition may reflect solely spreading of perceptually-based activation, showing no order effects.

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(4037)

**Subjective Experiences Accompanying Memory Conformity.** TANJEEM AZAD, D. STEPHEN LINDSAY and C. A. ELIZABETH BRIMACOMBE, *University of Victoria* (Sponsored by Michael Masson)—We explored the subjective experiences accompanying erroneous memory reports of misleading details learned during co-witness

discussion. Subject pairs viewed slightly different videos using the MORI technique. Some critical details were visible to both subjects, some to only one or the other, and other details were visible to neither of the subjects. Contrary to prior research, delay did not increase source misattributions of suggested details; however, delay increased the proportion of illusory remembering of misattributed details. Subjects with illusory memories often correctly attributed suggested details to the co-witness. Ongoing follow-up research examines the role of prior commitment in increasing the likelihood of illusory remembering. Subjects are encouraged to endorse critical details on two cued-recall tests separated over a two-day period prior to making a final memory judgment about whether or not unseen details were actually witnessed. Findings are discussed in terms of the source monitoring framework.

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(4038)

**The Nature of Costs From Prospective Memories: How To Avoid Non-functional Cost Components.** JAN RUMMEL and THORSTEN MEISER, *University of Mannheim* (Sponsored by Edgar Erdfelder)—Holding an intention usually results in costs to ongoing tasks, which have been interpreted as strategic monitoring necessary for intention realization. We argue that such costs from prospective memory (PM) are only partly functional for PM and that non-functional costs arise from incorrect anticipations about PM-task demands. In two experiments we manipulated anticipated PM-task demands, while holding actual task demands constant. In Experiment 1, costs from a PM task with a highly salient cue were significantly reduced without impeding PM performance when participants were informed about the low PM-task demands. Using a PM task with non-salient cues in Experiment 2, anticipated task demands (high vs. low) again influenced the level of costs beyond changes in the PM-performance level. These findings provide original evidence that costs partly reflect anticipations about PM-task demands and that non-functional cost components can be avoided by providing explicit information about the to-be-expected demands.

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(4039)

**The Relationship Between Pattern Separation and Recollection.** KATHERINE M. INGRAM, VIVIAN HWE, JOHANNA MCELFFRESH and JOHN T. WIXTED, *UC San Diego* (Sponsored by Timothy Rickard)—Pattern separation refers to the ability to form distinct representations of highly similar experiences, and it said to occur when the presentation of a retrieval cue leads to the precise reinstatement of an existing representation (which can then be compared to a nearly identical stimulus that has been presented for a recognition decision). A typical pattern separation task involves presenting a series of pictures some of which are exact repetitions of previously presented

pictures ("Old"), some of which are very similar to previously presented pictures ("Similar"), and some of which are novel ("New"). Correctly recognizing a similar picture as similar constitutes pattern separation. What is the relationship between pattern separation and recollection? We combined a standard pattern separation task with the Remember/Know procedure to ask whether high-confidence pattern separation is exclusively associated with the state of Remembering or whether it is also sometimes associated with the state of Knowing.

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(4040)

**List-Method Directed Forgetting: How the Forget Cue Affects Items' Serial Position Curves.** BERNHARD PASTÖTTER and KARL-HEINZ T. BÄUML, *Regensburg University*—In list-method directed forgetting, participants are cued to forget a previously studied list (List 1) before studying a second list (List 2). Compared with remember-cued participants, forget-cued participants typically show impaired recall of List 1 and improved recall of List 2, referred to as List 1 forgetting and List 2 enhancement. In a series of experiments, we analyzed serial position curves in this form of directed forgetting. Across experiments, we varied amount of postcue encoding, the two lists' output order, and the degree of selectivity of the forgetting. The results show several dissociations between List 1 forgetting and List 2 enhancement. On the basis of these dissociations, we suggest a two-mechanism account of directed forgetting, according to which the one mechanism affects both List 1 forgetting and List 2 enhancement, whereas the other mechanism affects List 2 enhancement only.

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(4041)

**No Evidence of Testing Effect in Autobiographical Memory.** JULIEN ELOWE, CÉLIA MAM-LAM-FOOK, FABRICE BERNA, ELISABETH BACON and PIERRE VIDAILHET, *Centre Hospitalier Régional de Strasbourg*—The testing effect is the finding that retrieval practice for previously presented material improves later episodic memory performance for that material compared with only restudying it. To our knowledge, this phenomenon has not yet been explored in autobiographical memory. We used a diary methodology (3 weeks, 2 events per day) in 22 healthy subjects who were assigned to one of two conditions: testing (cued recall of half of the events) or rereading (half of the events). The test was taken 3 weeks later and consisted in a recognition test based on the Remember/Know procedure. Emotional parameters were also assessed both at encoding and test. Testing did not improve recognition or remember performance as measured by Hits, neither compared to reread memories, nor compared to non-tested memories. By contrast, FA for non-tested items were enhanced. In this study, we were unable to show a testing effect for autobiographical memories.

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(4042)

**How Durable is the Production Effect?** ANGELA C. JONES, *John Carroll University*, MARY A. PYC, *Washington University in St. Louis*—The production effect, referring to the benefit for information studied aloud as opposed to silently, has been considered a simple and powerful tool to enhance explicit memory (e.g., MacLeod, Gopie, Mourihan, Meary, & Ozubko, 2010). However, this production effect has only been demonstrated in immediate tests of recognition memory. In the current study, we test the durability of this effect with immediate and delayed tests of recognition and recall memory. The current results suggest that the production effect is a durable memory aid, not only confined to immediate tests of recognition memory.  
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(4043)

**The Incorporation of Autobiographical Memories Into Dreams: A Link To Memory Consolidation.** CAROLINE L. HORTON, *Leeds Metropolitan University*—Neuroscientific and experimental data demonstrate processes of preferential memory consolidation during sleep. The present study aimed to explore behaviourally these processes of memory consolidation of autobiographical memories (AMs) in sleep for the first time. 40 participants kept dream and waking event diaries for two weeks. The research team investigated the continuity between waking events and dreams in terms of the incorporation of the former into the latter. Personalised recall and recognition tasks were later administered, predicting that AMs incorporated into dreams would be better recalled and recognised after two weeks (implying consolidation), compared to non-incorporated AMs. We use these data to explore the mutually informative relationship between dream science and memory theory, with particular emphasis upon the methodological challenges involved in sampling comparable experiences from wake and sleep, out of the lab. We support and outline the contributions of dreams science to cognitive science.  
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(4044)

**Time Perception While Swimming: On The Impact of Long Term Memory.** SIMON TOBIN and SIMON GRONDIN, *Université Laval*—Through repetitive training, elite swimmers should have acquired knowledge about the time it takes to swim various distances. Such knowledge is referred to as semantic memory of time (SMT). In two experiments the influence of SMT on time perception was investigated with swimmers. In Experiment 1, 28 swimmers had to estimate the time it would take to swim a given distance using two different strokes for which they had different SMT levels. The swimmers estimated duration more accurately and with less uncertainty in the high-SMT condition than in the low one. In Experiment 2, 26 swimmers had to swim for 36s in various contexts that altered the retrieval of the information in SMT, with and without a secondary task. When swimmers could not rely on their SMT, their productions were more affected by the

secondary task. These converging experiments show that SMT is strongly involved in time perception.

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## ● WORKING MEMORY II ●

(4045)

**Interference within the Focus of Attention: Working Memory Tasks Reflect more than Temporary Maintenance.** ZACH SHIPSTEAD and RANDALL W. ENGLE, *Georgia Tech*—Several studies conducted via the visual arrays task have concluded that the average human can actively maintain 3-5 items in working memory. The present study challenges the assumption that this estimate strictly reflects maintenance by demonstrating that performance on the visual arrays task is subject to time-related factors that are traditionally associated with retrieval from long term memory. Specifically, the critical experiment involved a manipulation of temporal discriminability in which the ratio of the inter-trial interval (time between trials) to inter-stimulus interval (duration of maintenance) was varied. The intent was to influence the difficulty of successful retrieval from long term memory. We found that estimates of attentional capacity decreased significantly when two trials were compressed in time. Conversely, estimates of attentional capacity increased when two trials were temporally separated. Thus it was concluded that measures of focal attention contain a component based on retrieval from secondary memory.

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(4046)

**Declarative and Procedural Working Memory – Two Separate Systems?** MIRIAM GADE, MICHEL D. DRUEY, KLAUS OBERAUER, *University of Zuerich*—Oberauer (2010) proposed a two-fold working memory system underlying the human ability to pursue goal-directed actions: a declarative working memory and a procedural one. Whereas the declarative part is thought to maintain and ensure access to representations of goal-relevant objects, the procedural part contains the representations of goal-relevant operations. Capacity limits in declarative working memory have been studied in the working-memory literature. Capacity limits on procedural working memory have been revealed by research on action control, showing that people can hold only one task set available for ongoing action. The question of our research is whether the two systems have separate capacity limits or must share a common capacity. We combined classical tasks from both research areas in a dual-task experiment: letter recognition with varying memory set size served to manipulate declarative load, and digit classification with varying number of stimulus-response rules served to manipulate procedural load. The data suggest that declarative and procedural working memory operate independently. Two control experiments show that loading either one system with two tasks creates interference due to the irrelevant tasks.

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(4047)

**N-back Assessment Performance: Analysis and Model.**

SHARONA M. ATKINS, J. ISIAH HARBISON and MICHAEL R. DOUGHERTY, *University of Maryland*—The n-back task is commonly used both for working memory assessment and for working memory training. We performed a detailed analysis of data from an assessment version of the n-back task with an n of 4 and found the same pattern of accuracy and response time results recently obtained from a training version of the task. Specifically, this analysis contrasted three types of trials: target trials where the current stimulus matches the one shown n stimuli prior, filler trials where the current stimulus does not match any recent stimuli, and lure trials where the current stimulus matches a recently shown stimulus but do not the one shown n stimuli prior. The pattern of results is consistent is a two-stage, familiarity and recollection account of n-back performance and predicted by a computational model developed based on the training data.

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(4048)

**The Roles of Attention, Forgetting, and Interference in Working Memory and Fluid Intelligence.** LINDSEY DAVIES, JOEL MYERSON and SANDRA HALE, *Washington University in St. Louis*—If a specific ability underlies the correlation between working memory (WM) and fluid intelligence (gF), then increasing demands on that ability should increase the correlation. Therefore, the current study manipulated the demand on three abilities related to WM: attentional capacity, resistance to forgetting, and resistance to proactive interference (PI). Specifically, participants performed a counting span task in which the similarity of targets and lures was manipulated, a counting span task in which the number of to-be-counted shapes was manipulated, and an operation span task in which the buildup of PI was manipulated. All three manipulations significantly decreased WM performance, but only increasing PI produced a significant increase in the correlation between WM and gF. This suggests that PI resistance plays a more important role than attentional capacity or resistance to forgetting, but the reason why performance on the counting span tasks correlates with gF remains unexplained.

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(4049)

**Working Memory Capacity and Resolving Stimulus-Stimulus Versus Stimulus-Response Conflict.**

MATTHEW E. MEIER and MICHAEL J. KANE, *University of North Carolina at Greensboro*—Kornblum (1990) posited that cognitive conflict tasks can be differentiated based on whether relevant or irrelevant features of stimuli and/or responses overlap. Following from Kornblum's dimensional overlap model, and from prior demonstrations of working memory capacity (WMC) measures predicting attention-control capabilities (e.g., Kane

& Engle, 2003), we investigated whether individual differences in WMC are associated with the ability to resolve stimulus-stimulus (S-S) conflict, stimulus-response (S-R) conflict, or both. Participants completed three complex span tasks to estimate WMC and then completed a combined spatial Stroop-Simon task with arrow stimuli (Liu, Banich, Jacobsen, & Tanabe, 2004). The spatial Stroop-Simon task allowed us to compare conflict resolution processes for the Stroop (S-S) and Simon (S-R) trials while keeping the goal of the two trial types constant. WMC predicted the resolution of S-S, but not S-R, conflict, suggesting that WMC exerts influence on performance during the stimulus identification or response selection stages but not during response execution.

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(4050)

**Influences of Task-Demand and Strategy on the Focus of Attention.**

ALEXANDRA B. MORRISON, *Temple University*, ANDREW RA CONWAY, *Princeton University*, JASON M. CHEIN, *Temple University*—An ongoing debate concerns how many distinct mental representations can be maintained in the focus of attention. Superior performance for the most recently presented item in short-term memory tasks, such as item-recognition and judgment of recency, has been interpreted as evidence for a single item focus of attention. The current set of experiments was designed to investigate how task-demands and strategy influence the focus of attention. Performance and self reported strategy were measured in two tasks (judgment of recency, judgment of primacy), in two domains (verbal, spatial). Overall, results show faster reaction times for the last item presented, replicating the importance of recency. However, there is also evidence of primacy in both tasks, particularly in judgment of primacy and for subjects who reported using a proactive strategy. The results demonstrate that cognitive control strategies (proactive, retroactive) and interference among representations must be considered when assessing the focus of attention.

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(4051)

**The Roles of Attention, Forgetting, and Interference in Working Memory and Fluid Intelligence.**

LINDSEY DAVIES, JOEL MYERSON and SANDRA HALE, *Washington University in St. Louis*—If a specific ability underlies the correlation between working memory (WM) and fluid intelligence (gF), then increasing demands on that ability should increase the correlation. Therefore, the current study manipulated the demand on three abilities related to WM: attentional capacity, resistance to forgetting, and resistance to proactive interference (PI). Specifically, participants performed a counting span task in which the similarity of targets and lures was manipulated, a counting span task in which the number of to-be-counted shapes was manipulated, and an operation span task in which the buildup of PI was manipulated. All three manipulations



significantly decreased WM performance, but only increasing PI produced a significant increase in the correlation between WM and gF. This suggests that PI resistance plays a more important role than attentional capacity or resistance to forgetting, but the reason why performance on the counting span tasks correlates with gF remains unexplained.

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#### (4052)

**The Interaction of Co-Speech Gestures with Higher-Level Executive Processes.** LARS MARSTALLER and HANA BURIANOVÁ, *Macquarie University Sydney* (Sponsored by Veronika Coltheart)—Co-speech gestures are defined as hand movements that accompany spoken language. Beyond their communicative function, studies show that co-speech gesturing improves working memory (WM) performance (e.g., Goldin-Meadow et al., 2001). The objective of this study was to examine individual WM differences due to gesturing. 46 individuals participated in three WM tasks (simple letter span, operation span, and visual WM task), as well as in a dual gesture/WM task in which the participants explained mathematical equations under different memory loads. Our findings show that (1) individuals with high scores on the dual gesture/WM task and (2) individuals with low letter-span capacity benefited from co-speech gesturing, resulting in increased WM performance (accuracy). Our results suggest that gestures facilitate WM only under specific circumstances. We speculate that the critical factor in effective application of individual WM strategies is the interaction between gesturing and higher-level executive processes.

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#### (4053)

**Anxiety and Updating: Worry is Related to Selection During Deletion.** DANIEL E. GUSTAVSON and AKIRA MIYAKE, *University of Colorado, Boulder* (Sponsored by James Koe)—This research investigates the effects of trait worry, a thought-based component of anxiety disorders, on the process of deleting irrelevant information from working memory. A growing body of research has identified associations between trait anxiety and two major executive functions: inhibition and switching. Another important executive function, working memory updating, has not been linked with trait anxiety in non-stressful circumstances. Specifically, the deletion of irrelevant information from working memory, an important aspect of the updating process, has not yet been studied in this context. In this study, 96 subjects completed a non-affective removal of irrelevant information task and measures of trait anxiety (worry and anxious arousal). Results indicate that, while neither the worry nor anxious arousal components of trait anxiety predicted performance on trials measuring working memory span, trait worry was independently associated with slow reaction times for the deletion component of the task. These findings support the view that trait anxiety is related

to working memory updating in non-threatening situations because high trait worriers have difficulty quickly and efficiently selecting which information to act on.

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#### (4054)

**Individual Differences in Working Memory Capacity, Automatic Activation, and Dieting Predict Food-Related Distraction.** LEIGH E. ALEXANDER and AKIRA MIYAKE, *University of Colorado* (Sponsored by Lewis O. Harvey Jr.)—This study examined the contribution of individual differences in working memory capacity (WMC) and automatic food activation (AFA) to food-related distraction in dieters. Dieters have been shown to have increased automatic thoughts about food, and WMC has been shown to moderate the effects of automatic food associations in normal eaters. AFA was measured with a word stem completion task where participants typed in the missing letter. All stems had more than one valid response. A subset of stems could be completed with food or neutral words. AFA was the number of stems completed as food words. WMC was measured with a letter-rotation span task (Shah & Miyake, 1996), and food-related distraction was measured with a food Stroop task. Regression analysis revealed a significant three-way interaction where WMC moderated the interaction of AFA and dieting on food-related distraction, controlling for the effects of hunger. Dieters with high AFA and low WMC demonstrated increased food distraction, while dieters with high AFA and high WMC were able to overcome food distraction. Implications are that dieters with lower self-regulation abilities may be more susceptible to the influence of food-rich environments.

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#### (4055)

**Acoustic Similarity Influences the “Phonological” Similarity Effect.** JINGYUAN HUANG and LORI L. HOLT, *Carnegie Mellon University*—The phonological similarity effect (PSE) is believed to support the abstract phonological nature of short-term memory: immediate serial recall of phonologically-similar items (e.g. b, d, g, t, c) is poorer than that of dissimilar items (f, q, r, h, y; Conrad, 1964). Here, we use the PSE to investigate the existence of more graded auditory information in short-term memory. In experiment 1, perceptually-ambiguous vowels appeared in word contexts so that although acoustic information was constant, phonological information varied. Recall of items with acoustically-identical, but phonologically distinct vowels was poorer than recall of the same items with acoustically-distinct vowels. In experiment 2, six-item lists were composed of words possessing either three acoustically similar (/æ/, /e/ or /ʌ/) or dissimilar (/u/, /i/ or /a/) categories. Recall was better for acoustically-dissimilar lists although each had three phonological categories. The results indicate that acoustic similarity is sufficient to elicit a “PSE” for phonologically-equivalent items (Experiment 1) and



phonological similarity is not necessary for the effect (Experiment 2). The results suggest detailed acoustic information is preserved in auditory short-term memory. Email: Jingyuan Huang, [jingyuan@andrew.cmu.edu](mailto:jingyuan@andrew.cmu.edu)

(4056)

**Will Working Your Working Memory Improve Untrained Cognitive Abilities?** CHANDRAMALLIKA BASAK, DEBSHILA BASU MALLICK and FERNANDA PIERRE, *Rice University*—Less than 10 hours of training in memory updating tasks, the N-back task in particular, has been shown to increase the capacity of the core focus of working memory from a single item to 4 (Verhaeghen, Cerella & Basak, 2004), but not in randomized memory updating tasks (Basak, 2006; Oberauer, 2006). In this experiment, we either trained young adults (ages 18 to 22 years) on a new memory updating paradigm, a predictable N-match task, for 5 hours, or did not (n=11 in each group). This task, unlike the N-back task, involved both switch and non-switch trials, which allowed us to assess the practice effects on the object switch cost. The study's goal is a) to determine whether practice in a predictable memory updating paradigm increases the capacity of the focus, and b) whether training in this paradigm improves performance on a set of untrained, higher-level cognitive abilities such as multi-tasking, working memory capacity and fluid intelligence. Results support our previous results: focus expanded from 1 to 4. Also, the training group improved significantly in a set of untrained tasks, including fluid intelligence, suggesting that working memory training increases not only the core focus but also complex cognition.

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### ● METAMEMORY/METACOGNITION III ●

(4057)

**Effect of JOL Framing On Learners' Utilization of Task-Relevant Information.** BENJAMIN D. ENGLAND and MICHAEL J. SERRA, *Texas Tech University* (Sponsored by Roman Taraban)—Recent research has demonstrated that changing the frame of the prompt for people's judgments of learning (JOLs) from being about the likelihood of remembering to being about the likelihood of forgetting can affect the magnitude and accuracy of these judgments. Presumably, this occurs because changing the frame of the judgment affects the type of information that people use to make the judgment. To further examine this possibility, we provided participants with explicit information about the learning task such as (a) the task is very easy/difficult or (b) repeated study trials help/hurt learning. Participants incorporated this information into their remember-framed JOLs (e.g., providing higher/lower JOLs when told the task was supposedly easy/difficult), but did not incorporate it into their forget-framed JOLs. These results provide further evidence that people make judgments of remembering and forgetting differently, specifically by incorporating different information into their judgments depending on the frame. Email: Michael J. Serra, [michael.serra@ttu.edu](mailto:michael.serra@ttu.edu)

(4058)

**The Effects of Task Experience on Strategy Shifts in the Allocation of Study Time.** ROBERT ARIEL, *Kent State University* (Sponsored by Christopher Was)—The value associated with learning an item determines the utility of committing that item to memory. The current experiments evaluated whether learners' study allocation decisions are sensitive to statistical regularities in the testing environment that signal what information is valuable to learn. In 3 experiments, participants studied English-English and Swahili-English paired associates across 4 study-test trials. However, on each trial, they were tested on only one type of item (e.g. only Swahili-English pairs), and hence, only one type of item was valuable for learning. In Experiment 1, some participants were cued to which information was valuable and other participants had to learn from task experience. In Experiments 2 and 3, the effects of performance incentives and various individual difference factors on allocation decisions were examined. Findings indicated that many learners failed to adapt their study decisions with task experience in that they continued to study non-valued items across trials.

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(4059)

**Effects of Dual Task Performance on Hindsight Bias.** PATRICIA I. COBURN and DANIEL M. BERNSTEIN, *Kwantlen Polytechnic University* (Sponsored by Geoffrey Loftus)—We manipulated cognitive load to examine the role of executive function (EF) in Hindsight Bias (HB). Participants performed a non-verbal tapping distraction while performing verbal, visual, and auditory HB tasks. We used two standard tasks to measure verbal and visual HB. We devised a new task to assess auditory HB: During baseline, participants identified five familiar but distorted songs. During recall participants indicated at which point in the song they had correctly identified each song during the baseline condition. Auditory HB occurred when participants stopped the song during recall sooner than they had identified it during baseline. Between-subjects distraction measures assessed inhibition, switching and updating, three components of EF. A no-distraction condition and a general, non-EF distraction condition served as distraction controls. We found robust HB on all three HB tasks; however, distraction did not affect HB. We conclude that HB does not rely on inhibition, switching or updating.

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(4060)

**Creating Self-Efficacy By Changing Perceptual Fluency.** KOU MURAYAMA, *University of Munich*, SHINJI KITAGAMI, *Nagoya University*—Self-efficacy is an individual's confidence that he or she possesses the ability to or will be able to accomplish a task. Previous literature has indicated that self-efficacy is linked to persistence on a difficult and challenging task. Herein, we showed that the manipulation of perceptual fluency increased the self-

efficacy beliefs, and even changed the behavioral persistence to a challenging task. In Study 1, we manipulated perceptual fluency by changing the figure-ground contrast of an intelligence task. The results indicated that the high contrast task increased self-efficacy relative to the low contrast task. In Study 2, we examined the effect of perceptual fluency on behavioral persistence using an unsolvable intelligence task. The results showed that participants worked on the unsolvable task significantly longer in the high contrast condition than in the low contrast condition.

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(4061)

**Reducing Illusions of Comprehension from Illustrated Text.** ALLISON J. JAEGER and JENNIFER WILEY, *University of Illinois at Chicago*—Students generally tend to have poor metacomprehension accuracy when learning from expository text, meaning they are not able to monitor their own understanding of what they have read. Initial results have suggested that adding illustrations to expository science texts can decrease metacomprehension accuracy even further. One hypothesis to account for this is that readers use intuitions that illustrations should help learning as a basis for their judgments instead of using more valid cues based in the quality of their situation models. The current study tested whether providing students with a self-explanation instruction improves their metacomprehension for illustrated text. Results indicated that when students were instructed to self-explain while reading, metacomprehension accuracy improved, but only when the images were conceptual in nature. These findings suggest that different types of images may influence the way readers process text. Further methods for improving metacomprehension accuracy from illustrated text are being explored.

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(4062)

**Memory for Cheaters and Cooperators in Social Contract Contexts.** DAN CHIAPPE, *California State University, Long Beach*—Social Contract Theory predicts that humans have evolved a cheater detection module in order to solve the free rider problem. It thus predicts that cheaters should be more memorable than cooperators in social exchange situations. We tested this claim by showing participants faces of males and females that they had to categorize as either cheaters, cooperators, or as having opted out of a social exchange. We then tested participants for implicit and explicit memory of the faces, as well as their memory for the social contract status of the individuals. Contrary to Social Contract Theory, we found cheaters and cooperators to be equally memorable. This suggests that we have mechanisms for tracking social contract status more broadly than originally envisioned by evolutionary psychology.

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(4063)

**Dissociating Performance and Uncertainty Monitoring from Reinforcement in Humans.** JOSEPH BOOMER and JUSTIN J. COUCHMAN, *University at Buffalo, SUNY*, MICHAEL J. BERAN, *Georgia State University*, J. D. SMITH, *University at Buffalo, SUNY*—Humans frequently learn in unsupervised conditions without immediate reinforcement. They seem to base judgments of uncertainty on their own subjective impression of tasks rather than on reward contingencies. A series of experiments investigated people's ability to learn tasks in which they either never received trial-by-trial feedback, or were given incorrect feedback. We also examined their uncertainty responding in both tasks. We found that people were able to both learn the tasks and correctly monitor their uncertainty in the face of inadequate or even misleading feedback. These results are discussed in terms of theories about the level of cognitive processing mediating uncertainty responding.

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(4064)

**Photos can Increase the Truthiness of Predictions about the Future.** ERYN J. NEWMAN, *Victoria University of Wellington*, TANJEEM AZAD, *University of Victoria*, MARYANNE GARRY, *Victoria University of Wellington*, D. STEPHEN LINDSAY, *University of Victoria*, GINA GRIMSHAW, *Victoria University of Wellington*—We examined whether a brief exposure to a tangentially related photo would facilitate future thinking and influence people's estimates of future events. Subjects predicted how commodity values would change over time by quickly responding true or false to the assertion that commodities would increase (or, for other subjects, decrease) in price. Half of the commodity names appeared with a photo depicting the commodity. For the claim that commodities would increase in price, photos biased people to say true suggesting that photographs might convey value. But photos had a different effect when we examined commodities with low imagery ratings (e.g., Benzene)—they led people to agree with both positive ("Increase in price") and negative ("Decrease in price") future claims. Our results suggest that these tangentially related photos do not simply communicate future value; they may also scaffold imagery of commodities, making claims about future scenarios seem more likely.

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(4065)

**When Disfluency is not a Desirable Difficulty: The Influence of Typeface Clarity on Metacognitive Judgments and Memory.** CAROLE L. YUE, ROBERT A. BJORK, ALAN D. CASTEL and ELIZABETH LIGON BJORK, *UCLA*—Previous research has shown that metacognitive judgments of learning (JOLs) are generally higher for fluent (i.e., easily processed) items than for disfluent items, whereas actual recall may be unaffected (Rhodes & Castel, 2008) or even higher for disfluent items

(e.g., Diemand-Yauman, Oppenheimer, & Vaughan, 2010). To examine further how disfluency can act as a desirable difficulty—a learning condition that hampers encoding but engages processes that improve memory (Bjork, 1994)—we presented participants with words in either clear (fluent) or blurred (disfluent) font. Consistent with prior studies, participants gave significantly higher item-level JOLs to clear versus blurred words, but clear words were also better free-recalled (Experiment 1) and recognized (Experiment 2). That a blurred typeface impairs later memory, whereas unusual (Diemand-Yauman et al.) or inverted (Sungkhassetee, Friedman, & Castel, 2011) font enhances memory, suggests that mnemonic effects of perceptual disfluency depend on complex interactions of perception, memory, and metacognition.

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#### ● SELECTIVE ATTENTION IV ●

(4066)

**Electrophysiological Evidence for the Failure of Salient Stimuli to Capture Attention, Even When Presented Rarely.** MEI-CHING LIEN and BIRKEN NOESEN, *Oregon State University*, ERIC RUTHRUFF, *University of New Mexico*—Some studies suggest that attention can be captured by irrelevant, salient objects when they appear rarely. We addressed this issue using the N2pc effect, a lateralized, negative voltage spike in the brain potentials in parietal cortex, thought to reflect attentional allocation. A cue display was followed by a target display where participants identified the letter in a specific color. Experiment 1 examined rare, irrelevant color singleton cues (10% of the trials for one color, 10% for the other color, and 80% with no singleton). Despite being rare and salient, these singleton cues produced very little N2pc effect and cue validity effect, indicating little or no attentional capture. Experiment 2 pitted a rare, irrelevant, abrupt onset (appearing on only 20% of the trials) against a target-relevant color cue (appearing on 100% of the trials). Overall, this "relevant" color cue produced N2pc effect and cue validity effects. Most importantly, these effects persisted even when the relevant color cue had to compete with a salient, simultaneous abrupt onset. We argue that salient, irrelevant objects do not necessarily capture attention even when they occur rarely.

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(4067)

**Reward Modulates Stroop Conflict By Priming Colour Representations.** CLAYTON HICKEY, ERIK VAN DER BURG and JAN THEEUWES, *Vrije Universiteit Amsterdam*—Neuroscientific theories of reinforcement suggest that reward primes perceptual processing of reward-related environmental stimuli. Primed perceptual features become salient and attention-drawing, ensuring that the information they convey gains preferential access to higher-level cognitive operations like decision-making and

response selection. Here we investigate the possibility that this kind of priming can modulate cognitive conflict created during a reverse Stroop task. We find that conflict is reduced when a reward-primed colour is repeated on the task-relevant input dimension, or when reward is received and a colour is repeated on the task-irrelevant input dimension. Reward thus primes the attended colour representation and suppresses the ignored colour representation. This does not appear to reflect a strategic effect: our experimental design provides no opportunity for participants to develop an attentional set for a specific colour. Reward seems to give a low-level, non-strategic competitive advantage to the attended colour during competition for behavioural control.

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(4068)

**Contingent Capture by a Conjunction Set.** JAMIE NAYLOR and MEI-CHING LIEN, *Oregon State University, USA*, JESSICA IRONS and ROGER REMINGTON, *University of Queensland, Australia*—Spatial cuing studies have shown that attention capture is contingent on attentional control settings induced by task demands. In these studies, participants are typically asked to search for a single feature of target (e.g., red letter), with cuing effects observed only when the cue shares the target feature. The present study investigated whether attention could be set for the conjunction of features in a single object when targets were defined by that conjunction (i.e., a red-rotating or red-dotted letter). Cues consisted of either the target conjunction (red-rotating or red-dotted) or single features of the conjunction set (red, rotating, or dotted). Cues were 25% valid, 75% invalid. Color-motion conjunctions (red-rotating) produced validity effects for all red cues, suggesting a set for red. Color-line conjunctions (red-dotted) produced robust validity effects for the conjunction cue and relatively small effects for either of the target features, suggesting a set for the conjunction.

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(4069)

**Switching in the Cocktail Party: Exploring Intentional Control of Auditory Selective Attention.** IRING KOCH, VERA LAWO, JANINA FELS and MICHAEL VORLÄNDER, *RWTH Aachen University*—Using a dichotic listening paradigm, we examined the dynamic control of auditory selective attention. Our subjects responded to one of two simultaneously presented stimuli (number words), always spoken by a female and a male speaker, by performing a numerical size categorization. A visual cue indicated the gender of the task-relevant speaker. We isolated auditory gender switch costs from visual cue priming by using two cues for each gender, so that gender repetition could be indicated by a changed cue. This revealed clear auditory switch costs, but also visual cue priming benefits. Importantly, varying the cuing interval did not affect auditory switch costs but only visual cue priming.

Moreover, incongruent competing stimuli produced substantially increased error rates, suggesting continued processing of task-irrelevant information. Together, the data show clear limitations in advance preparation of auditory attention switches and suggest a considerable degree of inertia in intentional control of auditory selection criteria.

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(4070)

**Contents of the Attentional Set Revealed by the Negative Spatial Cueing Effect.** YOUNG EUN PARK, HAEIN JUNG and YANG SEOK CHO, *Korea University*—Using a variant of spatial cueing paradigm (Folk et al. 1992), we previously reported a negative cueing effect produced by color-singleton cues during selective search for an onset target (Park & Cho, 2010). The present study investigated whether an attentional set for a specific target-property (a bright, white onset) led to facilitation of the color cues' background elements sharing that property. "White" background elements were facilitated relative to the color singleton when participants searched for a "white" onset target while ignoring a "red" one, but "red" background elements were not when the target was a "red" onset. This suggests that participants relied on a large luminance change, rather than color, to detect an onset target. However, when the target was a red singleton among white items, the negative cueing effect emerged for the white-singleton cues. The findings indicate that attentional set is flexibly adjusted to promote selection of relevant information.

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(4071)

**Varying Attentional Demands in the Image-Based Affective Parity Task.** VERONICA C. LLAMAS and PAUL HAERICH, *Loma Linda University*—The parity task requires subjects to determine whether two digits match (or mismatch) in being odd or even. Digits are presented left and right of (or above and below) a central, potentially interfering, non-task-relevant stimulus. The image-based parity task produces robust interference associated with the normed-arousal value of the images which persists across blocks of trials. It is postulated that some individuals (e.g., those with psychopathy) display a deficit in attending to and processing affective information which is peripheral to a current goal or task. We, therefore, examined a variant of the image-based parity task in which the target digits were displayed in the lower-middle portion of the image. Although, this display configuration (1) produces a higher perceptual density (load) than the standard task and (2) doesn't require the image to be included in the visually perceived field, characteristics which could attenuate image interference, significant reaction time interference was nonetheless observed.

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(4072)

**Effects of Task-Switching On T1 performance in the Attentional Blink.** JUAN BOTELLA, *Autonomous University of Madrid*, JESUS PRIVADO, JULIO LILLO, *Complutense University of Madrid*, and MANUEL SUERO, *Autonomous University of Madrid*—In Attentional Blink (AB) studies, much attention has been directed to explaining the deficit in reporting the second of two targets (T2), but less effort has been directed to explaining deficits in reporting first target (T1). In a series of experiments using streams of colored letters, observers reported the identity of two target letters appearing in the same color (no task-switching) or different colors (task-switching). T1 identification decrements were found in the task-switching condition, as compared to the no task-switching condition, and the effect did not depend on T1-T2 lag. The decrement disappears when there is no reconfiguration, as reflected in the results of an experiment where the colors of the targets were unpredictable. This impairment probably results from a cost due to losing the identity of T1 while the system is under the process of reconfiguration associated with the switch. The consequences of this effect for assessing the dynamic of the AB are discussed.

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(4073)

**Over Time, Implied Social Presence Is Worth Another Look.** ELENi NASIOPOULOS, *University of British Columbia*, TOM FOULSHAM, *University of Essex*, EVAN F. RISKo, *Arizona State University*, ALAN KINGSTONE, *University of British Columbia*—We recently reported that wearing an eyetracker can affect eye movement behaviour: people avoid looking at a sexy swimsuit calendar if they think that their eyes are being tracked. In the present study we asked if people eventually habituate to wearing an eyetracker. We discovered that after wearing an eyetracker for a short period of time people will begin to look at the provocative stimulus, suggesting that they do habituate to the eyetracker. Interestingly, this habituation was unexpectedly quick. Methodologically, our result has implications for real-world attention research, as people wearing eyetrackers appear to quickly adopt normal looking behaviour. Our result also has important theoretical implications, as it suggests that people quickly adapt to the implied social presence of being monitored.

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(4074)

**Reward-based Transfer from Bottom-up to Top-Down Attention.** JEONGMI LEE and SARAH SHOMSTEIN, *George Washington University*—Much of the recent evidence suggests that value and reward modulate bottom-up as well as top-down attentional guidance. Of particular



interest, this modulation lingers even when reward contingency is no longer relevant. Here, we investigate whether reward-based contingency learned within a context of a bottom-up search task is transferred to a subsequent top-down search task. Results showed that a biased reward schedule modulated search efficiency in a feature search task, and that this modulation effect was transferred to a conjunction search task with an unbiased reward schedule. Compared to baseline, search for a target that contains a feature that was previously associated with higher reward became more efficient. Additionally, the magnitude of reward effect in the feature search task was positively correlated with that in the conjunction search task. These results suggest that an integrated saliency map based on reward contingencies guides both top-down and bottom-up attention.

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(4075)

**Input-Output Modality Compatibility and Congruence Effects in Task Switching.** DENISE N. STEPHAN and IRING KOCH, *RWTH Aachen University*—In our study, we examined input-output (I-O) modality specific influences in task switching. In each trial, an auditory and visual spatial stimulus was presented. Participants had to locate either the auditory or the visual stimulus and responded either vocally (i.e., say "left" or "right") or manually. By combining these I-O modalities, modality compatible (auditory-vocal and visual-manual) and incompatible (auditory-manual and visual-vocal) mappings are created. Modality compatibility is defined as the similarity of stimulus modality and modality of response-related sensory consequences (Stephan & Koch, 2010). In previous studies we used only univalent (i.e., unimodal) stimuli, but in the present study we used bivalent (i.e., bimodal) stimuli that require selective attention to ignore stimuli in the task-irrelevant modality. These task-irrelevant stimuli cause spatial congruency effects. We found increased spatial congruency effects and switch costs with the modality incompatible tasks. This suggests that switching between modality incompatible tasks led to confusion of the required response modality, based on deficient separation of the active task-sets.

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(4076)

**Music-Induced State Anxiety, Selective Attention, and Reaction Time Distributional Analyses.** CHI-SHING TSE, WAI-SHING TSE and FUNG-YING SIU, *The Chinese University of Hong Kong*—By inducing adolescents with an anxious or neutral mood via a musical mood induction procedure immediately before they perform a Simon task, the current study examined the short-term effect of state anxiety on performance in a selective attention task. To tease apart the influence of state anxiety on goal maintenance vs. conflict resolution in an attentional control framework (Balota & Faust, 2001), we used ex-Gaussian analyses to capture the characteristics of reaction-time distributions for each participant, which afforded three components: mu and sigma (mean and standard deviation of

the modal portion of the distribution) and tau (the tail of the distribution). The extent to which anxious and frustrated mood ratings were altered by anxious-mood induction were associated with the tail size of the distribution, rather than a shift of the distribution, providing evidence for the role of goal maintenance in the negative effect of state anxiety on selective attention performance.

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(4077)

**Attentional Capture Increases During Attentional Awakening.** TOMOE INUKAI, *Chukyo University*, JUN I. KAWAHARA, *National Institute of Advanced Industrial Science and Technology*—Target identification improves when an item appears later in a stream of rapidly presented nontargets, as compared to when it appears early in the stream (attentional awakening). This phenomenon is said to occur because attentional processes develop gradually while viewing the stream. The present study examined whether attentional awakening interacts with attentional capture deficits induced by peripheral distractors. Participants identified a target letter, defined by a color oddball, embedded in a stream while ignoring the peripheral distractors. Baseline accuracy (no peripheral distractors) increased as the target appeared later in the stream, replicating earlier findings. Critically, attentional capture was also observed only when the target appeared late in the stream. A control experiment revealed that this interaction was not due to a floor effect. These results suggest a common mechanism underlying attentional awakening and attentional capture.

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(4078)

**Negative Cuing Effects Are NOT a Signature of Attentional Capture or Disengagement.** BRIAN A. ANDERSON, *Johns Hopkins University*, CHARLES L. FOLK, *Villanova University*—Some argue that top-down attentional control settings determine which stimuli capture attention, while others argue that they instead influence the speed of disengagement following salience-driven selection. In support of the disengagement account, recent spatial cuing studies have shown that cues associated with a "no-go" property produce negative cuing effects, with a speeding of RT on invalid trials (interpreted as capture followed by rapid disengagement) and a slowing of RT on valid trials (interpreted as the consequent application of location-specific inhibition). In the present studies, we replicate these negative cuing effects in the context of color-defined targets paired with no-go color cues. We then show conditions under which no-go cues produce slowed response times on valid cue trials with no speeding of responses on invalid cue trials. This pattern is inconsistent with the disengagement hypothesis, but can be explained by a model in which attention allocation occurs independently of the application of location-specific inhibition.

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(4079)

**Hemispheric Effects of Irrelevant Singleton in Visual Search Task.** KAO YAMAOKA and CHIKASHI MICHIMATA, *Sophia University*—Participants searched for a target and responded to the direction of the line inside. In half of the trials, stimulus contained one salient distractor (singleton). The target and the singleton visual fields, and the line congruency of these two stimuli were manipulated. Results showed that when the target was presented to the left visual field (LVF), the singleton visual field by the line congruency interaction was significant; the incongruent condition produced longer reaction time for the right visual field (RVF) singleton condition than for the LVF singleton condition, but congruent condition produced equivalent reaction times for both LVF and RVF singleton conditions. No significant interaction was observed for the RVF target condition. Implication about the hemispheric contributions to the spatial attention was discussed.

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(4080)

**Attentional-Set Adjustment Based on Past Experience in Exogenous Orienting.** SANG-A LEE, BO YOUNG KIM and YANG SEOK CHO, *Korea University*—It has been found that exogenous orienting is mediated by top-down task set. The present study examined whether exogenous orienting is modulated by the cue validity on the previous trial. An exogenous color cue or an abrupt onset cue appeared briefly followed by a red target among white distractors in Experiment 1 and an abrupt onset target in Experiment 2. Participants were asked to respond to the identity of the target. When the property of the cue matched that of the target, a smaller cue-validity effect was obtained after invalid than valid trials in both experiments. However, when there was no match between the cue and target properties, no such modulation was obtained. These findings demonstrate that our cognitive system adaptively adjusts the top-down task set based on the past experience and that the cue sharing features with a current top-down task set captures attention.

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(4081)

**Reading Without Spatial Attention: What Is So Special About Stroop?** MATTHEW THOMAS, SEMEON RISOM and MEI-CHING LIEN, *Oregon State University*, ERIC RUTHRUFF, *University of New Mexico*, JOEL LACHTER, *San Jose State University*—Over the last decade, numerous studies have shown no visual word identification without focal visual attention (e.g., Lachter, Forster, & Ruthruff, 2004; Risko, Stolz, & Besner, 2005). The rare exceptions seem to come from the Stroop paradigm (e.g., Brown, Gore, & Carr, 2002; Lachter, Ruthruff, Lien, & McCann, 2008). What is special about the Stroop paradigm that can explain this puzzling discrepancy? One hypothesis is that Stroop is simply more sensitive, because the distractor-response association (naming the color word) is much stronger than the target-response association (naming the ink color). Another hypothesis is that when words other than the

distractor are presented on a trial (e.g., the target in lexical decision tasks) they inhibit or degrade processing of the distractor. The present series of experiments tested these hypotheses. Implications of the findings for the relationship between spatial attention and word recognition are discussed.

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(4082)

**How do Attention and Distinctive Colors affect Orthographic Repetition Blindness?** LAURA JOHNSON and DON G. MACKAY, *UCLA*—Two experiments investigated effects of attention and distinctive colors on orthographic repetition blindness (RB) and illusory word (IW) report. Participants saw four RSVP frames per trial: a filler word, C1 (first critical word), C2 (second critical word), and a word fragment. To induce RB, C1 and C2 shared their final letters (e.g., LAKE, BRAKE). To induce IWs, unshared letters in C2 (here, BR) could join the fragment (here, USH) to form a word (BRUSH). To vary attention, instructions asked participants to attend to items in (one or more) particular colors and recall them after each list. In Experiment 1, RB mean and variance was identical for attended C1s and C2s regardless of color distinctiveness. In Experiment 2, identical RB mean and variance occurred when C1 and C2 had identical attended colors, different attended colors, or one attended and one unattended color. However, report of the fragment rather than the IW increased reliably for attended versus unattended fragments. These results contradict token individuation theory, but support binding theory, where orthographic forms can become bound to font color independently from attention, color distinctiveness, orthographic RB and episodic recall of C1 and C2.

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(4083)

**Do I Really Need To Worry About Millisecond Timing Any More?** RICHARD R. PLANT and GARRY TURNER, *University of York*—Psychologists are, and have always been, concerned about millisecond timing accuracy if one traces back to the development of the tachistoscope by Wundt (c.1875). In many areas contemporary researchers regularly make use of commercial and custom written software to administer paradigms. Increasingly they use complex multimodal stimuli interacting with hardware which would have been unimaginable a few years ago. It is common to see studies where conditional differences are in the order of tens of milliseconds. Some less. We discuss whether some modern equipment is actually worse than that of 136 years ago? Has experimental rigour worsened in the last decade even? Can anything be done from a practical standpoint? Illustrations from various research areas will be discussed. In common with other scientific disciplines we would like to see researchers quoting they have actively checked their equipment and foresee self-validation as a way forward for today's complex computer-centric studies.

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(4084)

**Onsets Do Not Override Top-down Goals But They Are Responded To More Quickly.** SHU-CHIEH WU, *San Jose State University and NASA Ames Research Center*, ROGER W. REMINGTON, *University of Queensland*, CHARLES L. FOLK, *Villanova University*—Do onsets automatically capture attention? While spatial cueing experiments often find no capture by onset cues in search for color targets, recent experiments show faster responses to a color target when it is an abrupt onset. If this advantage reflects attentional capture, then a single onset target should produce a reduced validity effect compared to no-onset targets, or to onset targets presented among other simultaneous onsets. Participants searched for red targets preceded by uninformative red cues. Color targets either emerged from premasks presented prior to cues (no-onset) or appeared abruptly (onset) either singly or as one of three onset items. Significant cue validity effects confirmed the top-down set for color. Responses to onset targets were faster than to no-onset ones. Importantly, cue validity was additive across conditions. The additive effects are inconsistent with automatic capture of attention by onsets, suggesting instead that the onset advantage arises from an independent source. Email: Shu-Chieh Wu, [shu-chieh.wu@nasa.gov](mailto:shu-chieh.wu@nasa.gov)

### ● DIVIDED ATTENTION ●

(4085)

**Compensating for Lack of Audio Input While Driving.** TRAVIS L. SEYMOUR and SARAH MCQUEEN, *University of California, Santa Cruz*—Situational awareness in driving may sometimes rely on monitoring for important auditory signals (e.g. emergency vehicle sirens). When hearing is impaired (naturally or artificially), drivers may employ compensatory visual strategies to maintain safety. Given that hearing drivers can auditorily distract themselves (e.g., cell-phones or radios), and that deaf drivers are at no greater accident risk than hearing drivers, we tested how hearing deprivation affects normal-hearing drivers' performance over time. In particular, we examined how hearing participants adapted to a continuous driving and emergency vehicle (EV) detection task for which the EV siren was either audible or silent. After two hours of practice, hearing-deprived drivers drove less accurately and responded more slowly to the EV (though not less accurately). However, whereas hearing drivers performed consistently over practice, hearing-deprived drivers improved significantly over time. A second experiment examined whether hearing-deprived driver improvements were strategic or perceptual. Results suggest that hearing-deprived drivers compensated with increased looking, but also scored higher on post-study peripheral-vision tests than hearing drivers. Email: Travis L. Seymour, [nogard@ucsc.edu](mailto:nogard@ucsc.edu)

(4086)

**Making Sense of Time: Modality Effects in Timing With Breaks.** ANDRÉE-ANNE OUELLET, CHARLES VIAU-QUESNEL, RÉMI GAUDREAU, PAULE ELLEFSEN GAUTHIER and CLAUDETTE FORTIN, *Université Laval*—Expecting a break in a time interval production presumably induces attentional time-sharing between timing and monitoring for the break signal; this results in longer productions when the break occurs later, the "break location effect". Auditory stimuli capture attention better than visual ones, which may explain that tones are perceived longer than lights of same durations. The present study examines the influence of stimulus modality on the break location effect. Time intervals (2.5 s) defined by auditory and visual stimuli were produced with breaks. Break location, duration and stimulus modality were varied. Results show that productions lengthened when the break occurred later, and were longer in the visual modality. More importantly, the break location effect was stronger with visual stimuli. These results suggest that auditory stimuli orient attention to time more readily than visual stimuli in a context of attention sharing, supporting an attentional interpretation of the break location effect. Email: Claudette Fortin, [claudette.fortin@psy.ulaval.ca](mailto:claudette.fortin@psy.ulaval.ca)

(4087)

**The Hard Work of Doing Nothing: Dual-Response Benefits in Simultaneously Executed Saccades and Manual Responses.** LYNN HUESTEGGE and IRING KOCH, *RWTH Aachen University*—Previous research demonstrated that simultaneously executed saccades and manual responses exhibit dual-response costs, i.e., performance costs in dual-response conditions compared with single-response conditions. Traditional models of multitasking typically explain such costs by assuming processing bottlenecks, crosstalk, or other types of interference. However, more recent conceptual frameworks are principally able to model dual-response benefits, i.e., performance benefits in dual-response conditions compared with single-response conditions. Here, we present an experiment in which saccades and manual responses towards salient peripheral visual stimuli were either performed simultaneously, or in isolation. Interestingly, performance in single-response conditions was worse than in dual-response conditions, because participants often executed erroneous saccades in conditions where only a manual response was required. This difficulty of remaining fixated in the presence of salient peripheral stimuli will be discussed within current models of multitasking. Email: Lynn Huestegge, [lynn.huestegge@psych.rwth-aachen.de](mailto:lynn.huestegge@psych.rwth-aachen.de)

(4088)

**The Cognitive Locus of Impairment in the Irrelevant Sound Effect: Not Simply Disruptions to Rehearsal or Seriation Processes.** KIRK A. STOKES and KAREN M. ARNELL, *Brock University*—The finding that serial recall performance for visually presented items is impaired by concurrently presented task-irrelevant speech or sounds is referred to as the irrelevant speech/sound effect (ISE). The foremost explanation for the effect is based on disruptions of serial order information and rehearsal processes. The present series of experiments uses a surprise non-serial recognition memory task to demonstrate that a) neither rehearsal nor maintenance of order information is necessary to observe the ISE and b) task parameters known to eliminate the ISE in serial recall do not eliminate the effect in surprise non-serial recognition. Results are discussed in terms of interference with encoding of the to-be-remembered material. Theoretical interpretations that rely solely on disruptions of rehearsal or seriation processes to account for the ISE appear insufficient.

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(4089)

**Egocentric Metacognition about Attentional Ability.** JUN I. KAWAHARA, *National Institute of Advanced Industrial Science and Technology*—Recent studies on metacognition have revealed that people overestimate their ability to detect objects in natural scenes. In the context of historical studies showing that attentional ability develops as a function of age, one might ask whether metacognition about one's own and others' attentional abilities also develops along this dimension. We examined this issue by asking a variety of participant groups (primary and high school students, undergraduates, and middle-aged and senior adults) to estimate the number of objects to which they could simultaneously attend while monitoring a video-recorded traffic scene at a major road. They also estimated the number of objects to which other age groups could attend. Consistent with several object-tracking studies, the results revealed that most age groups estimated that they could attend to approx. 3 objects at one time. Primary students overestimated their performance (5+ objects). All participants, with the exception of primary school students, believed that their own group could track a greater number of objects than could other age groups. These results suggest that metaattentional ability of the self and others develops with an egocentric bias as a function of age.

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(4090)

**An Inability to Set Independent, Feature-Based Attention Sets By Hemisphere.** MARK W. BECKER and SUSAN M. RAVIZZA, *Michigan State University*—We investigated whether people could set independent, feature-based attentional control settings for each hemisphere. Participants viewed two RSVP letter streams, one in each hemifield, and tried to detect the RED item in the LEFT and the GREEN item in the RIGHT stream. When targets

appeared in both streams, there was an attentional blink (AB) for the second target. When a distractor that matched the opposite hemifield's target color appeared prior to the target, it produced a comparable AB, regardless of whether it appeared in the same or opposite stream as the target. We conclude that people cannot set independent control settings for each hemifield. Instead, if one monitors the left stream for red and the right stream for green, both colors capture attention, regardless of the hemifield in which they occur. These data suggest that feature based attention is truly set globally across the visual field.

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(4091)

**Searching for Bottleneck Bypassing: Needle in a Haystack?** FRANÇOIS MAQUESTIAUX, *Université Paris*, ERIC RUTHRUFF, *University of New Mexico*, ANDRÉ DIDIERJEAN, *Université de Franche-Comté*, ALAN A. HARTLEY, *Scripps College*—When concurrently performing two tasks, people typically experience severe interference, perhaps because a central bottleneck imposes serial processing of central stages (e.g., response selection). Recently, however, psychological refractory period (PRP) experiments have virtually eliminated interference and provided strong evidence of bottleneck bypassing by pairing an unpracticed visual-manual Task 1 with a highly-practiced auditory-vocal Task 2 (Ruthruff et al., 2006; Maquestiaux et al., 2008). The present study explored the conditions necessary for bottleneck bypassing. To this end, we performed several replications of the PRP procedure that successfully produced bypassing, but with slight changes in Task-2, such as changing the vocal response to a manual or a pedal response. Inconsistent with bottleneck bypassing, we found very large PRP effects (500+ ms) even after multiple practice sessions. This remained true even when we changed Task 2 from discrimination to mere detection. Bottleneck bypassing might be rare, requiring the concatenation of several favorable conditions.

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(4092)

**Why We Multitask.** NATHAN MEDEIROS-WARD, DAVID M. SANBONMATSU, JASON M. WATSON and DAVID L. STRAYER, *University of Utah*—Heavy multimedia multitaskers have been found to perform worse on measures of executive attention compared to light multimedia multitaskers (Ophir, Nass, & Wagner, 2009). Here we show that frequent multitasking is associated with lower working memory capacity, as measured by the automated operation span task (Unsworth et al., 2005). Moreover, self-reports also indicate that higher levels of multitasking are associated with higher levels of impulsivity and sensation seeking and an overconfidence in the ability to multitask relative to the assessment of students peers and adults in the population. Interestingly, participants' confidence in their multitasking abilities is not correlated

with their actual multitasking abilities. Our findings indicate that impulsivity, sensation seeking, and overconfidence in the ability to multitask rather than actual ability drive the likelihood of multitasking.

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(4093)

**An Electrophysiological Dual-Task Study of Visual Word Processing Without Task Switching.** NADIA KHOJA and MEI-CHING LIEN, *Oregon State University*, ERIC RUTHRUFF, *University of New Mexico* (Sponsored by Philip Allen)—Lien, Ruthruff, Cornett, Goodin, and Allen (2008) provided evidence that people have difficulty identifying words while central attention is devoted to another non-word task. In that study, participants performed an auditory tone Task 1 and a visual word Task 2. It is possible that the real obstacle to word identification was not the lack of central attention, but rather the required task switch. The present study therefore examined this issue using a dual-task paradigm in which participants performed essentially the same word task for both Task 1 and Task 2 (i.e., there was no task switch). We measured the N400 effect elicited by Task-2 word, a measure of whether participants detected a mismatch between the word and the current semantic context. The N400 effect can occur only if a word has been identified. We found that the N400 effect was strongly attenuated for Task-2 words presented nearly simultaneously with Task-1 words. This finding suggests that, even without task switching, words still cannot be identified without central attentional resources.

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### ● COGNITIVE CONTROL III ●

(4094)

**Predictable Stimulus Positions Decrease Bottom-Up Influences on Task Choice.** STARLA M. WEAVER, KAITLIN M. REIMAN and CATHERINE M. ARRINGTON, *Lehigh University*—In multitask environments, subjects free to choose which task to perform tend to select tasks associated with greater stimulus availability (Arrington, 2008). This bottom-up influence may be mitigated within stimulus environments that prompt top-down strategies of task selection. In two experiments, subjects performed voluntary task switching on two univalent stimuli with variable stimulus availability. The number of positions in which the stimuli could appear was manipulated, such that the two stimuli appeared in two, four or eight possible positions. When only two positions were available, such that selection of a target could always be achieved via selection of a position, stimulus availability did not influence choice. However, in the four and eight position conditions, in which stimulus position was unpredictable, an effect of stimulus availability appeared. This effect was replicated under a perceptual clutter condition. Findings suggest task choice is guided by a combination of bottom-up factors and top-down strategies.

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(4095)

**Exploring the Generality of Transient Cognitive Control: Conflict Adaptation Effects Across Task-Switching and Non-Task-Switching Trial Sequences.** MARK E. FAUST, *UNC at Charlotte*, KRISTI S. MULTHAUP, *Davidson College*, SASHA LEVONS, KAREEM ABDELNABI, ANAM BARAKZAI and MICHAEL ROSS, *UNC at Charlotte*—Resolving which sources of information in a display will be used to drive task-appropriate responses is a key aspect of cognitive control. Conflict adaptation, a reduction in the influence of conflicting information on the current trial directly following a conflict versus a non-conflict trial, has been proposed to reflect the operation of a general control process operating transiently, on a trial-by-trial basis. Such a view predicts that conflict adaptation effects should be observed across successive trials where the task changes. In two experiments we use matched versions of the well-studied flanker and Stroop conflict resolution tasks and find that (a) conflict adaptation effects in task-switching sequences of trials are equivalent to those in non-task-switching sequences, and (b) mapping the boundary conditions for cross-task conflict adaptation effects can provide important insights into the operation of cognitive control during conflict resolution.

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(4096)

**Cognitive Control of Auditory Attention: Evidence for Resistible and Ineluctable Forms of Distraction By Sound.** ROBERT W. HUGHES, MARK J. HURLSTONE and JOHN E. MARSH, *Cardiff University*, FRANCOIS VACHON, *Universite Laval*, DYLAN M. JONES, *Cardiff University*—A sound deviating from the prevailing auditory context tends to capture attention and disrupt cognitive performance. In the present study, we show that this form of auditory distraction is subject to top-down control: The disruptive impact of a voice-deviation within a task-irrelevant speech sequence (i.e., one speech token presented in a different voice from the remainder) during a visual-verbal serial recall task was eliminated when task-encoding load was increased by changing the perceptual discriminability of the visual to-be-remembered stimuli (Experiment 1). Supporting the hypothesis that this effect was due to a top-down blocking mechanism rather than passive perceptual filtering, foreknowledge regarding the impending deviation had the same effect as a high encoding load (Experiment 2). In contrast, the disruptive impact of continuously changing stimuli (the classical 'irrelevant sound effect') was unaffected by encoding load or forewarning (Experiment 3). The results suggest that one form of auditory distraction is resistible whilst another is ineluctable.

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(4097)

**Using Eye-Movements to Assess Conflict Regulation Dynamics.** DAVID KUHN, KATHERINE VIALE and ULRICH MAYR, *University of Oregon*—Interference from incongruent stimuli is sometimes reduced after an incongruent trial, possibly due to a conflict-triggered increase in control. However, recent evidence that conflict adaptation often does not cross task boundaries is also consistent with passive carry-over of control settings that does not include a general mechanism for monitoring conflict. We used the reversed Stroop paradigm where subjects matched centrally presented colors or words to color patches. Color and word matching were performed either within single-task blocks (Exp. 1) or by switching between the two tasks (Exp. 2). Evidence for conflict adaptation was negligible for single-task blocks, but was robust for task-switching blocks. This pattern suggests that conflict-triggered regulation of task-unspecific control is particularly relevant when the cognitive system needs to negotiate between mutually competing tasks. We also assessed for each trial whether or not the eyes moved towards interfering information. Consistent with the conflict-triggered regulation model, adaptation effects were particularly large when the eyes had moved towards the interfering information on the preceding trial.

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(4098)

**The Hot Hand Fallacy in Cognitive Control.** WOUT DUTHOO, *Ghent University*, PETER WÜHR, *Technische Universität Dortmund*, WIM NOTEBAERT, *Ghent University*—In a series of studies, the role of expectations in cognitive control was put to the test. Going back to the original interpretation of the congruency sequence effect (Gratton, Coles, & Donchin, 1992), we sought evidence for a congruency repetition bias steering attentional control. Therefore, we investigated how participants' explicit predictions influenced subsequent Stroop performance. Similar to the fallacious hot hand belief in gambling, subjects overpredicted repeating stimulus events. Moreover, behavioral adjustments (i.e., a Gratton effect) were only found when subjects predicted a congruency repetition, whereas alternation predictions did not impact the Stroop effect. These findings point out the importance and validity of expectancy-based proactive control. Hence, we propose that repetition expectancy is a variable that should be given more attention in current theorizing and modelling of cognitive control, which is currently characterized by an emphasis on reactive, conflict-induced control adjustments.

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(4099)

**Do Stimulus-Response Bindings Influence Random Choice Decisions?** CHRIS HYDOCK and MYEONG-HO SOHN, *George Washington University*—In a series of experiments, we investigated the effects of stimulus-response (S-R) bindings on random responses. In the

experiments, a prime-probe design was used, which was modeled after Hommel (1998). The prime task required a cued response upon the presentation of a stimulus. Following the prime task, a probe stimulus was displayed. Stimuli varied in two features (e.g., form and location) and were responded to with left or right keys. Participants were told to issue a random response to the probe stimulus. Participants tended to repeat the response from prime to probe when both stimulus features repeated from prime to probe. In contrast, participants tended to issue a different response to the probe stimulus, when both stimulus features switched from prime to probe. When only one of two features repeated, participants were equally likely to repeat or switch responses from prime to probe. Stimulus-response bindings, associative priming, and response inhibition were all considered as possible explanations for participants' deviations from random response choices. The results suggest that the response choice was affected by the interference between the to-be established (S-R) binding and the previous (S-R) binding.

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(4100)

**Inflexibly Focused Under Stress: Acute Psychosocial Stress Increases Shielding of Action Goals At the Expense of Reduced Cognitive Flexibility With Increasing Time Lag To the Stressor.** FRANZISKA PLESSOW, RICO FISCHER, CLEMENS KIRSCHBAUM and THOMAS GOSCHKE, *Technische Universität Dresden*—Dynamically adjusting the right amount of goal shielding to varying situational demands is associated with the flexibility of cognitive control, typically linked with prefrontal cortex functioning. Although stress hormones are found to also bind to prefrontal receptors, the link between stress and cognitive control remains elusive. Based on that, we aimed for investigating effects of acute psychosocial stress on dynamic control adjustments. Forty-eight healthy volunteers were exposed to either a well-established stress-induction protocol (Trier Social Stress Test) or a standardised control situation before a selective attention (Simon) task involving response conflicts. Acute stress did not inevitably impair cognitive functioning as stressed participants showed tonically increased goal shielding at the expense of decreased cognitive flexibility. This effect developed gradually over time paralleling the time course of the biological (hypothalamus-pituitary-adrenal) stress response. Moreover, cortisol-level increase reflecting HPA activity was reversely related to the amount of cognitive flexibility in the final testing block.

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(4101)

**Electrophysiological Evidence for Parallel and Serial Processing in Skilled Typewriting.** EVE MILLER and DAVID L. STRAYER, *University of Utah*, GORDON D. LOGAN, *Vanderbilt University* (Sponsored by Jason Watson)—Behavioral and psychophysiological data suggest



that people cannot select for more than one response at a time, creating an immutable bottleneck in information processing. Here we provide electrophysiological evidence that the response selection bottleneck can be overcome by experts found commonly in modern culture. Lateralized Readiness Potentials (LRPs) were recorded while skilled typists typed words and non-words with keystrokes distributed between their left and right hands. Examination of the LRP elicited by words revealed parallel response selection as evidenced by a systematic decrease in LRP amplitude for the first keystroke as progressively more keystrokes were activated in the opposite hand. However, no differences in LRP amplitude for the first keystroke were found for non-words. Our data provides evidence for parallel response selection as skilled typists typed words but serial response selection for non-words.

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#### (4102)

**The Bivalency Effect in Task Switching.** PAUL D. METZAK, *University of British Columbia*, BEAT MEIER, *University of Bern*, PETER GRAF and TODD S. WOODWARD, *University of British Columbia*—When switching tasks, if stimuli are presented that cue two of the tasks in the task set (i.e., bivalent stimuli), performance slowing is observed on all tasks, including those not cued by the bivalent stimulus. This slowing has been coined the bivalency effect, and is thought to reflect adaptive tuning of the response style under conditions that appear to require adjustments in control over the course of action. In two experiments we demonstrate that (1) the bivalency effect is reduced, but not eliminated when participants are warned about the occurrence of the bivalent stimulus, and (2) even when unwarned, merely surprising but not bivalent stimuli did not induce the bivalency effect. This suggests that the bivalency effect is partially but not entirely under conscious control, and cannot be attributed to simple surprise, but depends on activation of at least two of the tasks in the task set.

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### ● LETTER/WORD PROCESSING III ●

#### (4103)

**Effects of Training On the Hemisphere Asymmetry for Letters Compared To Pseudoletters.** E. DARCY BURGUND and FREDERIK S. KAMPS, *Macalester College*—Evidence that regions within the left hemisphere of the brain process letters more effectively than non-letters is abundant. The present experiment aimed to understand the reason for this letter advantage by training subjects to match pseudoletters to other pseudoletters (visual condition), sounds (phonological condition), or pictures denoting meanings (semantic condition), and measured the left-hemisphere advantage for letters compared to pseudoletters during a same/different-matching task using divided-visual

field presentations. Before training with pseudoletters, subjects responded more quickly to letters than pseudoletters when pairs were presented to the left hemisphere, but not when pairs were presented to the right. After training, the difference between letters and pseudoletters in left-hemisphere presentations was reduced in the semantic condition but not in the phonological or visual conditions. Results suggest that regions within the left hemisphere may be particularly proficient at associating visual forms with meanings, providing a possible reason for the letter-processing advantage in these areas.

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#### (4104)

**Assessment of Dynamic Workload Capacity in the Word Superiority Effect.** JOSEPH HOUP and JAMES T. TOWNSEND, *Indiana University*—The word superiority effect has lost some luster in the literature but has never been satisfactorily explained. Proposed models vary from facilitatory interactive parallel processing to positive feedback from higher centers, to even independent parallel channels. Issues such as this call for data and analyses that are able to assess central dynamic visual mechanisms. Accuracy-only experiments are incapable of providing such diagnostics. The vast majority of research on the word superiority effect has been based on accuracy and response time based effects have been elusive. In this work, we have developed a specialized task so that we may use the workload capacity coefficient, a particularly sensitive, response time based measure of processing efficiency. Using this measure, we have found clear evidence of dramatic word superiority effects hallmarked by super capacity, in the response time domain to complement the existing research based on accuracy. Furthermore, these results demonstrate that either parallel channels with positive collateral interactions or, alternatively, models possessing facilitatory-feedback are required—independent parallel models with no facilitatory interactions or feedback cannot reasonably predict our data.

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#### (4105)

**Mirror generalization for reversible vs. nonreversible letters: Evidence from ERPs.** MARTA VERGARA-MARTÍNEZ, *University of California at Davis*, MANUEL PEREA, *Universitat de València*, NANDINI NITTUR and TAMARA Y. SWAAB, *University of California at Davis*—Recent behavioral research has revealed that the cognitive system suppresses mirror images of reversible letters (e.g., b, d), but not of non-reversible letters (e.g., r, c; Perea, Moret-Tatay, & Panadero, 2011, JML). Here we examined mirror generalization for reversible vs. nonreversible letters by analyzing the Event Related Potentials in a masked priming lexical decision task. English words containing a reversible or a non-reversible letter (b: CABIN; r: STORY) were presented as targets preceded by four masked primes: identity, mirror, unrelated and symbol control. N400

amplitudes were larger for both the mirror-letter and the unrelated conditions compared to identity condition in words with reversible letters. No differences were found for words with non-reversible letters. Thus, the cognitive system suppresses mirror generalization for reversible letters.

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(4106)

**The Conscious Identification of Letters Requires Feedback Amplification.** SYLVAIN MADEC, ARNAUD REY, PIERRE COURRIEU and JONATHAN GRAINGER, *Université de Provence*—Recent event-related potential studies suggest that the conscious identification of a visual symbol is mediated by a two-stage resonance process, a first, rapid pre-conscious burst of visual information being spread through visual and associative areas, followed by a second, feedback driven, conscious identification of the target. To test this hypothesis, we conducted a series of letter identification experiments in which we correlated the patterns of letter response latencies for degraded or fully visible letters. We repeatedly found that letter degradation produced a different pattern of results compared to the fully visible condition. We also observed greater correlations between the various degraded conditions. These data suggest that the more the visual information is degraded, the more letter identification requires feedback amplification processes, leading to a different dynamical processing of the information (and different letter identification latencies) compared to the fully visible condition.

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(4107)

**Related Prime Names Improve Name Retrieval in Young and Older Adults.** LORI E. JAMES and SHALYN OBERLE, *University of Colorado, Colorado Springs*—Name retrieval failures increase with age, and we investigated whether semantically- and phonologically-related names assist or impair name retrieval in young and older adults. The transmission deficit hypothesis predicts facilitation from related names for both age groups, whereas the blocking/inhibition deficit hypothesis predicts interference from related names, especially for older adults. Participants saw a description of a celebrity sharing the same first name and known for similar work as a target celebrity on half of the naming trials. Related names facilitated target name production overall, with older adults' naming ability more improved by these primes than younger adults'. Findings are inconsistent with blocking and inhibitory deficits as the cause of name retrieval failures, but support an activation-based model of language, such as the transmission deficit hypothesis.

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(4108)

**Reading Spaced Chinese Text: There Is a Benefit.** HAZEL I. BLYTHE, *University of Southampton*, FEIFEI LIANG, CHUANLI ZANG, JINGXIN WANG, GUOLI YAN and XUEJUN BAI, *Tianjin Normal University*, SIMON P. LIVERSEDGE, *University of Southampton*—We examined the effect of word spacing on Chinese readers' learning of new 2-character words (both characters known, but a novel combination; the word's meaning could not be derived from the individual characters' semantics). We recorded adults' and children's eye movements as they read these words embedded in explanatory sentences (learning session). Participants were divided into subgroups – half read spaced sentences, and half read unspaced sentences. Another day (test session), participants read the words in different sentences; here, all participants read unspaced text. Initially (learning session), participants in the spaced group read the new words more quickly than participants in the unspaced group. Children in the spaced group maintained this benefit in the test session. Regarding word identification models, we argue that the spacing manipulation either allowed the formation of stronger connections between character representations and the novel word representation, or a more fully specified representation of the word itself.

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(4109)

**Emotion-Induced Impairments in Speeded Word Recognition.** RENE ZEELBERG, BRUNO R. BOCANEGRA and DIANE PECHER, *Erasmus University Rotterdam*—Recent studies show that emotional stimuli impair the identification of subsequently presented, briefly flashed stimuli. In the present study, we investigated whether emotional distractors (primes) impaired target processing when presentation of the target stimulus was not impoverished. In lexical decision, animacy decision, rhyme decision, and nonword naming, targets were presented in such a manner that they were clearly visible (i.e., targets were not masked and presented until participants responded). In all tasks taboo-sexual distractors caused a slowdown in responding to the subsequent neutral target. Our results indicate that the detrimental effects of emotional distractors are not confined to paradigms which visibility of the target is limited. Moreover, impairments were obtained even when semantic processing of stimuli was not required.

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(4110)

**Stroop and Suggestion: No Elimination or Reduction of Semantic Activation.** LUDOVIC FERRAND, *CNRS and University Blaise Pascal*, MARIA AUGUSTINOVA, *University Blaise Pascal*—Since semantic activation (SA) cannot be appropriately assessed via the standard Stroop task (Neely & Kahan, 2001), two studies were conducted to reexamine the influence of a specific suggestion (Raz, Fan & Posner, 2005; Raz, Kirsch, Pollard, & Nitkin-Kaner, 2006) on SA automaticity. To this end, highly suggestible individuals completed the Stroop task (including the critical semantically-based Stroop condition) with or without a

suggestion to perceive Stroop words as meaningless symbols. In both studies, the presence of such suggestion substantially reduced the standard Stroop effect. Thus these results closely replicated the work of Raz and colleagues. However, contrary to their essential claim that SA can be deautomatized, remaining results also showed a semantically-based Stroop effect of the same amplitude independently of suggestion. Such results show that SA occurs without intent and cannot be prevented.

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(4111)

**Attentional Control and Asymmetrical Priming in the Lexical Decision Task.** SHELLY WINWARD and KEITH A. HUTCHISON, *Montana State University*, MATTHEW A. THOMAS and JAMES H. NEELY, *University at Albany*—Participants completed a battery of three attentional control (AC) tasks (Ospan, Antisaccade, and Stroop, as in Hutchison, 2007) and performed a lexical decision task with symmetrically associated (e.g., sister-brother) and asymmetrically associated primes and targets presented in both the forward (e.g., stork, baby) and backward (e.g., baby, stork) directions at either a 200 or 1200 ms stimulus onset asynchrony (SOA). As predicted, AC was predictive of priming for forward associates, but not backward associates. All groups showed priming for symmetrical and backward associates, but only high AC individuals demonstrated priming for forward associates. These results suggest AC is necessary for prospectively generating and maintaining expectancies in working memory, but not for retrospective semantic integration or matching.

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(4112)

**The Effect of Semantically Opaque Affixed Words On Eye Movements During Reading.** BARBARA J. JUHASZ, *Wesleyan University*, ELIZABETH R. SCHOTTER and KEITH RAYNER, *University of California, San Diego*—Using masked priming, Rastle, Davis, and New (2004) found morphological priming at short prime durations for opaque (audition-audit) and transparent (reaction-react) affixed words. Priming for opaque affixed words is not observed at longer prime durations (Rueckl & Aicher, 2008) or when primes and targets are embedded in sentences (Paterson, Alcock, & Liversedge, 2011). The present study examined how opaque affixed words are processed during reading in the absence of primes. The results from two eye movement experiments will be reported. The first experiment matched affixed words from the opaque and transparent conditions in Rastle et al. No reading time differences were observed. However, the roots in these items were mostly low in frequency. The second experiment manipulated the frequency of the root within opaque and transparent affixed words. High frequency roots produced inhibition in late processing measures in opaque affixed

words. Implications for theories of morphological processing will be discussed.

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(4113)

**Neurostructural Correlates of Adult Reading Skill.** ADAM FELTON and DAVID VAZQUEZ, *University of California, Riverside*, CHRISTIANA M. LEONARD, *University of Florida, Gainesville*, CHRISTINE CHIARELLO, *University of California, Riverside*—It is unclear whether regional differences in cortical volume are associated with variability in normal reading skill. The current study utilized voxel-based morphometry to evaluate gray matter correlates of reading ability in 200 university students. Scores from three subtests from the Woodcock Johnson Reading Mastery Test (word identification, word attack, passage comprehension) were entered into a whole-brain voxel-based analysis of gray matter volume. Better reading was associated with increased cortical volume in Broca's area (word identification), left lateral and medial parietal/occipital cortex (word attack), and bilateral visual cortex (passage comprehension, word identification). Better reading was also associated with reduced cortical volume in motor regions (precentral gyri, caudate) and right temporal and parietal cortex. No area accounted for more than 12% of the reading skill variance, and correlations with traditional temporal lobe language regions were not observed. Widely distributed cortical networks may support reading/language, and these may differ across individuals.

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### ● PSYCHOLINGUISTICS III ●

(4114)

**Pathway Bias in Past Tense Verb Inflection in Young and Old Adults.** EMILY R. COHEN-SHIKORA and DAVID A. BALOTA, *Washington University in St. Louis*—This study examined whether lexical or more rule-based processes can be locally biased in past tense verb inflection in young and old adults. During each trial, participants produced the past tense verb from a present tense verb. List context was manipulated across blocks such that context trials either involved regular past tense verbs (e.g., LIVE-LIVED) or irregular past tense verbs (e.g., RUN-RAN). Half of the targets within each list context were regular and half were irregular verbs. Regular target verbs produced faster response latencies in the regular list context compared to the irregular list context. Irregular target verbs produced lower accuracy and more regularization errors (e.g., producing RUNNED for RUN) in the regular list context compared to the irregular list context. Age did not modulate these effects. The results support the notion that distinct processes in past tense verb production can be locally biased by list context.

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(4115)

**Effects of Case Alternation in the Picture-Word Interference Task.** CLAUDIO MULATTI and FRANCESCA PERESSOTTI, *Università di Padova*, REMO JOB, *Università di Trento*—In the picture-word interference (PWI) task a picture is presented along with a superimposed distractor word. Participants are required to name the picture while ignoring the distractor. In two PWI experiments we factorially manipulated the case of the distractor (same vs. AltErnAteD) and the frequency of the distractor (high vs. low) (Miozzo & Caramazza, 2003; c.f. Mulatti & Coltheart, 2011). Results show the conditions for the case alternation effect to arise, and are discussed within a framework in which distractor processing and target processing compete for accessing to a resource limited mechanism.

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(4116)

**Producers SOV Use. Perceivers Like SVO.** MATTHEW L. HALL, VICTOR S. FERREIRA and RACHEL I. MAYBERRY, *UC San Diego*—Using pantomime as a window into cognitive preferences for word order, recent studies show that Subject-Object-Verb (SOV) order predominates in production, suggesting cognitive advantages for SOV, regardless of one's native language. But if SOV is favored, why do languages change from SOV toward SVO? One possibility is that different biases may be at work in comprehension and production. We asked participants to rate video clips of a confederate producing pantomime strings in various word orders. Experiment 1 revealed that although English speakers favor SOV in production, they prefer SVO in comprehension. Preliminary data from Experiment 2, which tested Turkish (SOV) speakers, suggest that this is not merely attributable to influences from English. Thus, patterns of word order emergence and change may be influenced by the differential preferences of producers and perceivers.

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(4117)

**Recursion Isn't Necessary, Much Less the Hallmark of Human Language.** DEREK PARTRIDGE, *Exeter University*, KENNETH PAAP, *San Francisco State University*—Bold claims made by (or attributed to) Hauser, Chomsky, and Fitch's (2002) regarding recursion were summarized by Holst (2010) in *Recursion & Human Language*: recursion essentially constitutes the innate human language faculty, recursion is the sole uniquely human trait of human language, recursion is unique to the language faculty, recursion is universal, and recursion is unique to the human mind. Many of the arguments against the thesis that recursion is essential for explaining human-language productivity and uniqueness that we share are scattered throughout the Holst volume. However, no strong and coherent indictment of recursion emerges because of a consistent failure to distinguish grammar specification from actual parsing algorithms. We show that an iterative grammar can be processed to yield the same tree structures

as a recursive formulation. Regarding productivity we show that recursion produces only the length dimension of infinity and contributes almost nothing to the structural diversity that exemplifies linguistic creativity. Combinatorics between simple grammar rules and an unbounded lexicon can explain linguistic creativity without the peculiarity of vast numbers of 'grammatical but unacceptable' productions. Our conclusion eliminates the need to explain the evolution of recursion and reopens accounts of the great leap forward.

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(4118)

**Effects of Processing Constraints On Implicit Acquisition of Grammatical Structures.** REBECCA HAMMARLUND and JANET L. MCDONALD, *Louisiana State University*—Grammar acquisition appears to be more difficult for adults than children. The Less is More Hypothesis (Newport, 1990) claims this is a result of the more limited processing capacity of children. Previous research has tested this through either limiting the input itself, or limiting adults' capacity to process the input with concurrent tasks. The current study examines both of these limitation methods in adults learning an artificial language containing agreement and reflexive rules. The control condition was above chance only on studied items, whereas both the limited input and limited capacity conditions showed above chance performance for studied and novel items. We also found that agreement was easier to acquire than reflexive marking. Results thus support the theory that loss of implicit language learning ability is a result of improvements in processing capacity that occur during development.

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(4119)

**Cross-Language Semantic Satiation: Mass Repetition Affects More Than One Language.** ILEANA RATIU and TAMIKO AZUMA, *Arizona State University*—In semantic satiation, the mass repetition of a word results in the attenuation of its meaning. This experiment investigated the effect of mass repetition on French-English interlingual homographs (i.e., words with the same spelling but different meanings in the two languages). Participants were presented interlingual homograph primes (e.g., pain) either 2 or 22 times and then made French relatedness decisions to prime-target pairs. Decisions were to be based on only the French meanings. The targets were related to the prime's French meaning (e.g., buerre, "butter"), related to the prime's English meaning (e.g., douleur, "ache") or unrelated to the prime (e.g., mère, "mother"). The participants included English speakers learning French and high proficiency French speakers. Both groups showed similar patterns of longer response times with higher repetitions. The findings suggest that semantic satiation affects semantic representations across both languages.

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(4120)

**American Sign Language Learning via Enactment.** LAURA MORETT, *UC Santa Cruz*, BRIAN MACWHINNEY, *Carnegie Mellon*—Research in the domain of human learning and memory has demonstrated that phrases are recalled more accurately when they are enacted than when they are simply read or listened to (Svensson & Nilsson, 1989; Cohen & Bryant, 1991). The present study investigates whether enactment can facilitate the acquisition of novel American Sign Language (ASL) signs by adults unfamiliar with ASL. In the study, participants learned 20 ASL signs via one of four methods: (1) enactment; (2) mental imagery; (3) meaningless hand motion; (4) comprehension. Participants were then tested for accuracy and efficiency of sign and gloss recall and recognition. The results reveal that enactment at learning resulted in the greatest number of signs correctly produced, and that meaningless hand motion resulted in the least number of signs correctly produced. As such, the results indicate that enactment aids sign acquisition, whereas other motion inhibits it.

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(4121)

**The Role of Cognitive Resources in Processing Second Language Syntax.** ELEONORA ROSSI, PAOLA E. DUSSIAS and JUDITH F. KROLL, *Pennsylvania State University* (Sponsored by Annette De Groot)—Some accounts of language processing assume that non-native speakers are unable to fully compute second language (L2) syntax online (e.g., Clahsen & Felser, 2006). Others attribute apparent gaps in L2 processing to reduced availability of cognitive resources (e.g., McDonald, 2006). We tested these alternatives by examining the processing of clitic violations in first language (L1) Spanish speakers, with and without an additional cognitive load, and in native English speakers relatively proficient in Spanish as the L2. The results of a self-paced reading task showed that everyone was sensitive to the presence of clitic violations in Spanish. However, native speakers of Spanish in the high load condition resembled L2 speakers in their inability to use syntactic constraints to anticipate upcoming information. The results suggest that limitations in L2 processing are not due to the absence of syntactic representations but to demands on the cognitive resources that allow speakers to generate predictions.

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## ● DISCOURSE PROCESSES II ●

(4122)

**Eye Movement-Based Rehearsal of Complex Instructions.** JENS K. APEL, *University of Dundee*, ANGELO CANGELOSI, ROB ELLIS and JEREMY GOSLIN, *University of Plymouth*, MARTIN H. FISCHER, *University of Dundee*—Eye movement-based rehearsal of complex instructions We recorded eye fixations to document how attentional rehearsal improves memory for complex instructions. Participants heard 2-6 instructions, each of the

form “Move the [object] to [location]”, followed by either no (Experiment 1) or a 6 s retention interval (Experiment 2). Instructions were then executed on a monitor by manipulating objects with a mouse. Participants fixated on named objects but as instruction complexity increased attention was divided between all previously mentioned objects and locations. This active rehearsal behaviour broke down after 4 instructions, coincident with participants’ memory span. Eye movements also predicted successful task execution. These findings suggest that attention is allocated to mentally simulate actions. We propose that the time available for eye movements created a motor limit for rehearsal, suggesting that sensory and motor capacities shape our cognitive representations and abilities. Funded by EPSRC (EP/F028598/1).

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(4123)

**A Partial Encoding Hypothesis for Pronominal Resolution.** JESSICA LOVE, *University of Illinois at Urbana Champaign* (Sponsored by Gail McKoon)—In situations in which referents are not identified, the grammatical features marked by a pronoun (e.g., gender, animacy, number) may still be integrated into readers’ understanding of a text. Five experiments use reading time and error detection paradigms to examine the role that one feature, grammatical gender, plays in allowing readers to track characters during conditions conducive to both shallow and strategic processing. The data suggest that readers are less likely to detect when first- and second-person pronouns (I and you), which do not mark gender, are misused in third-person narratives than when third-person pronouns (he and she) are misused. In addition, readers are relatively poorer at monitoring pronouns than other sources of information, perhaps due to pronouns’ highly focused discourse status.

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(4124)

**A Fan Effect in Anaphor Resolution.** KEVIN S. AUTRY and WILLIAM H. LEVINE, *University of Arkansas*—Research on anaphor resolution has shown that anaphors take longer to read when there is one distractor present than when there are none (Corbett, 1984), but the effect of additional distractors has not been examined. In this experiment, subjects read short passages containing lists of two or five nouns. Each list sentence was followed by an anaphor sentence that unambiguously referred to one item in the list. The activation level of the target noun was then measured using a probe-recognition task. Probe responses were faster when there were two nouns in the list than when there were five. From the perspective of Myers and O’Brien’s (1998) resonance model, the nouns were less active following the five-noun list because there were more candidate antecedents for activation to spread to. This result suggests that the number of candidate antecedents has a cumulative effect, with additional distractors further reducing activation.

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(4125)

**Individual Differences in Embodiment.** ANDREW JONES, TYLER HUBBARD, DALLAS SWINDELL and WILLIAM LANGSTON, *Middle Tennessee State University*—A review of the embodiment literature suggests that there are at least two types of embodiment tasks. For input embodiment tasks, participants' movements and perceptual simulations are influenced by environmental events (e.g., a sentence like "open the drawer" makes it more difficult for a participant to move their hands away from their body). For output embodiment tasks, the way that participants are holding their bodies affects perception of environmental events (e.g., smiling makes cartoons look funnier). The purpose of the research reported here was to evaluate whether or not the two types of embodiment tasks are supported by different types of processing while simultaneously investigating possible individual differences in embodiment (e.g., are some people more influenced by input or output embodiment tasks). Participants completed prototypical input and output embodiment tasks along with tasks measuring ideomotor susceptibility and facial feedback susceptibility. Relationships between embodiment tasks and individual differences are reported.

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(4126)

**Reading Comprehension Skill and the Ability To Inhibit Irrelevant Information.** JENNIFER J. STIEGLER-BALFOUR, *University of New England*, ERIKA T. WELLS, *University of New Hampshire*—Recent research into the relationship between cognitive processes and reading skill has revealed that working memory capacity, suppression mechanisms, domain knowledge, and reading strategies are essential in determining comprehension levels. To date, it remains unclear which factors have the greatest impact on reading skill. The current research explored the convergence of reading comprehension skill and suppression mechanisms; namely, the ability to successfully update task instructions. The switch cost accrued when switching between two simple tasks was measured for each participant using a task-cueing paradigm. Additionally, participants completed the Gates-MacGinitie Reading Test to determine their overall reading skill level. The results demonstrated that less-skilled readers had a significantly higher switch cost. Specifically, these readers required more time to suppress the irrelevant task instructions when focusing on a new task compared to high-skilled readers. This suggests that less-skilled readers' lack of comprehension may be rooted in their inability to inhibit irrelevant information.

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(4127)

**"Don't Go in There!": Viewers' Participatory Responses To Movie Excerpts.** JEFFREY E. FOY, MATTHEW A. BEZDEK and RICHARD J. GERRIG, *Stony Brook University*—As people experience an engaging narrative, they may mentally participate in the unfolding events. This

participation may elicit participatory responses, such as when people mentally or verbally instruct a character "Don't go in there!" Previous studies have demonstrated the impact of participatory responses using indirect measures such as reading times. In our study, we attempted to provide direct evidence for participatory responses by recording viewers' responses to excerpts from commercial movies. Participants spoke their thoughts aloud as they watched each excerpt. We transcribed their statements and coded them to provide evidence for a taxonomy of participatory responses. Participants generated a range of types, including emotional responses (e.g., "Oh no!"), problem-solving instructions (e.g., "Go go go go go!"), and character evaluations (e.g., "Good job!" or "Now that's a stupid move!"). Our research also examined contextual influences on the likelihood of participatory responses.

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(4128)

**The Role of Context in Idiom Comprehension: Evidence from Eye Movements.** SARAH HARWARD and ANNE E. COOK, *University of Utah*—This study assessed the role of context in idiom comprehension using eye tracking technology. Participants with and without autism read passages containing context that was either neutral, biased toward the literal meaning of an idiom, or biased toward the figurative meaning of an idiom. A subsequent target sentence contained the idiom, followed by a phrase that disambiguated the idiom towards either its literal or figurative meaning. Both first pass and second pass reading times were recorded for the idiom and disambiguating phrase. First pass reading times on the idiom were slower when the preceding context was biased toward the figurative meaning than when it was neutral. However, by the time the disambiguating region was encountered, this difficulty was no longer present, but only for the participants without autism. The results are discussed in terms of theories of ambiguity resolution, and in terms of theories of cognitive impairments associated with autism.

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(4129)

**You Are What You Type: Humor Use in Self-Presentation On Facebook.** KAREN A. HUSSEY, and ANDREA E. BOWES, *University of Western Ontario*, SCOTT A. LEITH, *Wilfrid Laurier University*—Humor is an important aspect of personality, often used to gauge our interest level in someone we have just met. In a novel study of humor perception, we created mock-up Facebook profiles for participants to judge on a number of interest and attractiveness scales. Using pre-tested quotes and jokes, we created profiles that could be categorized based on typology created by Martin et al.(2003); Affiliative, aggressive, self-enhancing, self-defeating. There were also an equal number of non-humor profiles. Between participants, the same profiles were identified as belonging to a male or to a

female. Overall, the fictitious males with humorous profiles (particularly those employing aggressive and self-defeating humor) were perceived as better looking, more confident, funnier, being a better partner, and having more Facebook friends than females with humorous profiles and non-humorous profiles of both sexes. Interestingly, humor seems to have no effect on ratings of perceived intelligence. Email: Karen A. Hussey, [khussey@uwo.ca](mailto:khussey@uwo.ca)

(4130)

**Alignment and Argument.** ALEXANDRA LOAN and RICK DALE, *The University of Memphis*—Previous research has revealed that two people, when interacting, come to mimic each other along a variety of dimensions. This is often referred to as synchrony — the alignment of interlocutors' cognitive, linguistic, and behavioral patterns over time. For decades many have considered it an integral element of communication, and researchers have linked synchrony to empathy, liking, and effectiveness in communication. However, no studies have investigated the existence of alignment in asymmetric types of interaction like argument. We present a study of interaction in which two people's body movements were tracked while affiliating vs. arguing about various topics. Results suggest that, under some conditions, argument can enhance synchrony: If interlocutors work for mutual comprehension with their conversational partner even during conflict, they may exhibit more alignment as a result of perspective-taking efforts.

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(4131)

**The Time-Course of Learning in Speech Perception and Production.** MELISSA M. BAESE-BERK, *Basque Center on Cognition, Brain and Language & Northwestern University*—Building on the complementary learning systems model proposed by McClelland et al. (1995), recent work has suggested that different aspects of lexical learning take place on different time scales, some of which require consolidation, occurring during sleep (see Davis & Gaskell, 2009). This project examines whether phonological learning mirrors these effects in lexical learning. Specifically, I examine learning of novel phonological categories in both perception and production. Participants were trained emphasizing either perception or production and then tested in both modalities at the beginning and end of each training day. Participants in the perception training group demonstrate an increase in discrimination abilities between training days (i.e., overnight), however participants in the production training group do not. Participant's repetition abilities do not improve in either training group between training days. This suggests that perception and production are learned in different ways and differentially affected by consolidation during sleep.

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## ● LANGUAGE PRODUCTION/ WRITING II ●

(4132)

**Phonological Advance Planning in Sentence Production: The Case of The Verb.** JÖRG D. JESCHENIAK and FRANK OPPERMAN, *University of Leipzig*, HERBERT SCHRIEFERS, *Radboud University Nijmegen*, JANA KLAUS and MARTIN BERWIG, *University of Leipzig*—In a set of picture-word interference experiments we measured the phonological activation of verbs produced in isolation and in sentence contexts. Distractors that were phonologically related to the verb affected speech onset latencies in both verb production and sentence production, but in different ways. In verb production, there was substantial facilitation. In sentence production, the effect was attenuated and eventually turned into interference. These data show that the verb is phonologically activated before speech onset during sentence production. In addition, the modulation of the phonological effect as a function of utterance format provides further evidence for models of phonological encoding of complex utterances that assume a serial position coding in terms of a graded activation pattern (e.g., Dell, 1986; Jescheniak, Schriefers, & Hantsch, 2003). Email: Jörg D. Jescheniak, [jdj@uni-leipzig.de](mailto:jdj@uni-leipzig.de)

(4133)

**Visual Shape-Relatedness Induces Semantic and Phonological Activation of Context Pictures During Picture Naming.** FRANK OPPERMAN, JÖRG D. JESCHENIAK and FRAUKE GÖRGES, *University of Leipzig*—In an extended picture-word interference paradigm a to-be-named target picture and a to-be-ignored context picture were presented that were either similar in visual shape (umbrella – palm tree) or visually unrelated (umbrella - ladder). The lexical activation of the context pictures was assessed by means of auditory distractors (semantically related, or phonologically related, or unrelated). Semantic and phonological context effects were observed for shape related picture pairs but not for unrelated picture pairs. Assuming that the shape-relatedness manipulation affects the direction of attention in visual processing, our data suggest that lexical context effects in picture-picture interference tasks originate, at least in part, from perceptual/conceptual processing stages and not during genuine lexical retrieval processes.

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(4134)

**Effects of Semantic, Conceptual, and Structural Properties on the Production of Complex Noun Phrases.** AMY DIBATTISTA and NEAL J. PEARLMUTTER, *Northeastern University*—A set of picture-description experiments investigated the effects of semantic integration (Solomon & Pearlmutter, 2004), description preference (Pearlmutter & Solomon, 2007), and structural similarity on grammatical encoding processes in language production, by

examining ordering errors and production latencies. The goals were to determine the levels of processing (Bock & Levelt, 1994) affected by integration; to examine the effects of syntactic properties on exchange error production; and to explore incrementality versus competition in production. Integration affected phrase- and word-ordering errors, suggesting functional- and positional-level integration effects. Structural similarity increased the likelihood of phrase and word errors, suggesting effects of syntactic similarity on errors previously seen only in corpora (Garrett, 1975). Integration and preference interacted in latencies and suggested generally incremental processing for unintegrated stimuli and a more complex pattern for integrated stimuli.

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(4135)

**Dynamic Effects of Phonological Neighborhood Density in Laboratory and Spontaneous Speech.** JORDANA HELLER and MATTHEW GOLDRICK, *Northwestern University*—Phonological neighborhood density (the number of words differing from a given word by a single segment) can affect vowel production (Wright, 2004). Vowels in words with many neighbors are produced with increased phonetic differentiation between vowel categories (i.e., expanded F1-F2 vowel spaces) relative to words with fewer phonological neighbors. Do such effects purely reflect stable, learned word-specific phonetic properties (Pierrehumbert, 2002) or are they also driven by dynamic adjustments to perceptual (Wright, 2004) or production (Baese-Berk & Goldrick, 2009) processes? We examine the role of dynamic mechanisms by examining how repetition influences the effect of neighbors on vowel production. A list reading experiment suggests that repetition decreases the difference between words with many vs. few neighbors. Analysis of a spontaneous speech corpus (Pitt et al., 2007) examines if similar results emerge in more naturalistic production contexts.

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(4136)

**The Role of Attention in Speakers' Perspective Taking.** LIANE WARDLOW LANE, *University of California, San Diego* (Sponsored by Karen Emmorey)—Speakers sometimes produce references that fail to take listeners' perspectives into account. Current models predict roles for working memory and attention suggesting that perspective-taking processes should break down with decreased working memory and attention capacities. The current experiment tested these predictions asking whether there is a relationship between working memory, verbal attention, nonverbal attention and ability to accommodate perspective differences when making references. Sixty speakers participated in a referential communication task measuring the percentage of perspective-adjusted references speakers produced. Speakers completed forward and backward digit span tasks measuring verbal attention and working memory, and a flanker task measuring non-verbal attention. Results revealed (1) speakers with high attention resources produced the most perspective-accommodating references; (2)

nonverbal attention predicted perspective taking at least as strongly (or even more strongly) than verbal attention; and, (3) working memory did not predict perspective taking. These findings constrain and shape theories of how speakers accommodate perspective.

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(4137)

**Production of Referential Expressions: When Overinformativity Is Optimal.** SI ON YOON and SARAH BROWN-SCHMIDT, *University of Illinois* (Sponsored by Duane Watson)—According to Grice's Maxim of Quantity, speakers should make their contribution as informative as is required, without being over-informative. We examined the on-line interpretation of potentially over-informative expressions to explore how much information is optimally needed during comprehension. Eye-tracked listeners followed instructions to click on one of 4 objects. Target expressions were either over-informative (the striped shirt) or appropriate (the shirt) for the current display. In Exp1, previous reference to the target in contexts requiring modification eliminated the penalty for over-informative expressions on target trials, suggesting informativity is judged basis on conversational history. In Exp2, listeners interpreted references to a different exemplar from the same category (the checkered shirt) prior to the target trial. While speakers produce modified expressions (e.g., the striped shirt) in these contexts, listeners showed a penalty for modified expressions. The results suggest the optimal amount of information may vary according to the type of historical experience.

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(4138)

**Imageability in Subject-Verb Agreement Production.** MAUREEN GILLESPIE and NEAL J. PEARLMUTTER, *Northeastern University* (Sponsored by Joanne Miller)—Effects of imageability and grammatical structure on subject-verb agreement errors in language production were examined, using preambles which participants completed as sentences. Errors increased with decreasing imageability, suggesting speakers use conceptual information to compute agreement. Mismatch error rates were unaffected by structure, which cannot be explained by many agreement computation theories. Two experiments varying verb frequency in relative clauses within preambles showed no effect on error rates, and two experiments varying the transitivity bias of such verbs also showed no effect; however, errors only occurred reliably in studies with low imageability preambles. Meta-analyses of these experiments showed that errors increased with decreasing imageability. These results are consistent with Eberhard (1999), as speakers were more likely to produce a verb matching the conceptual number of the preamble when it was more imageable. How these results can be incorporated into Eberhard et al.'s (2005) model will be discussed.

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(4139)

**The Influence of Social Similarity and Group Membership On Definite Reference.** CHRIS SCHMADER and WILLIAM S. HORTON, *Northwestern University*—Previous research has shown that speakers alter their representations of persons after describing them according to an interlocutor's preconceptions (the "saying-is-believing" effect), but that this effect diminishes when the interlocutor belongs to a social outgroup. We investigated these effects in the context of spoken reference production. Participants named common objects in pre- and post-tests; in between, they completed a referential communication task where a confederate used dispreferred expressions for the same objects. Participants learned that they shared (ingroup) or did not share (outgroup) the confederate's political orientation. Post-test results indicated that ingroup participants adopted more confederate expressions when they felt more similar to the confederate, suggesting that speakers attempt to relate to similar interlocutors by adopting their expressions. Overall, however, participants adopted fewer expressions when they felt closer to the confederate, suggesting that speakers who have achieved relational goals are less motivated to adopt their interlocutor's expressions.

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(4140)

**:-) = Happy? Nonverbal Cues Fulfill a Variety of Communication Goals.** MONICA A. RIORDAN and ROGER J. KREUZ, *The University of Memphis*—Researchers have largely studied nonverbal cues (primarily emoticons) in computer-mediated communication as emotion communicators. However, it has been suggested that such cues also communicate motives and intentions (Fridlund, 1994). We asked participants to: 1) write emails expressing a specific emotion, 2) rate the level of emotion, 3) write about how they express emotion online, and 4) indicate communication goals of using ten different cues (e.g., asterisks, capitalization). Using groupings based on semiotic theory (e.g., Chandler, 2003; Hudson, 2000), participants indicated using cues that have a direct relationship to their meanings (iconic cues) more than those with indirect relationships (indexical cues), and those with learned relationships (symbolic cues). Cue type was related to the writer's intended emotion and these cues were linked to communication goals. These results extend work on nonverbal cues beyond emoticons, and introduce a novel method of cue categorization that sheds light on meaning and usage patterns.

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(4141)

**The Flow of Online Conversation: Chronemic Alignment in a Synchronous Text-Only Channel.** MONICA A. RIORDAN, *The University of Memphis* (Sponsored by Roger J. Kreuz)—The pacing and flow of conversation has largely been studied in face-to-face channels of communication. This research has found that interlocutors tend to adapt themselves to each other's pacing to achieve a steady flow; that is, they speak faster or slower to accommodate each other and achieve a steady rate over time. Preliminary findings of a convenience sample of Instant Messenger conversations by de Siqueira and Herring (2009) showed that these findings might be extended to synchronous online discourse. In the current experiment, forty-two participants debated a topic via Instant Messenger with a naive confederate. Results show participants and the confederate tend to align in the length of lag time on adjacent turns, and that the confederate and participants adapted their lag time to each other, over time and turns gradually merging upon a steady flow of conversation. These findings extend Communication Accommodation Theory to temporality in online synchronous channels.

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(4142)

**Spelling 'Successful' Successfully: Effects of Language Background and Linguistic Factors on Spelling.** SITI SYUHADA FAIZAL and REBECCA TREIMAN, *Washington University in Saint Louis*—Many spelling errors in English are doubling errors, as when people are stumped by the double in. To examine the influences on such errors, we gave two nonword spelling tasks to US college students (N=68) and bilingual Singaporean college students from an English-based education system but with diverse language backgrounds: Mandarin (N=54), Malay (N=44), or Tamil (N=42). In the choice task, participants heard a nonword and chose between two spelling options, e.g. dremmib/dremib. In the free task, they wrote down its best spelling. We found a vowel length effect (more doubling after short vowels than long vowels) that was moderated by spelling ability (better spellers were more influenced by vowel length) and language background. Americans had the largest vowel length effect and Tamil Singaporeans had none, as they possibly associated consonant doubling with the lengthening of doubled consonants in Tamil instead of the preceding vowel. The Mandarin group spelled nonwords least accurately, and greater knowledge of pinyin, a phoneme-based writing system, was associated with higher nonword spelling accuracy. These and other findings show how linguistic factors and language background affect the spelling of new words.

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## ● MOTOR CONTROL ●

(4143)

**Hitting the Wall in Skilled Typing: Speed/Accuracy Tradeoffs and Serial Processing.** MATTHEW JC CRUMP, *Brooklyn College of CUNY*, GORDON D. LOGAN, *Vanderbilt University*—Two experiments investigated speed-accuracy tradeoff functions in a continuous typing task. Experiment 1 had typists adjust their typing rate by 20% faster or slower than their normal rate by following a metronome, a speedometer, or a moving color cue. Accuracy was minimally influenced by changes in typing speed. Experiment 2 parametrically varied typing rate in 10% steps by having typists attempt to type up to 90% faster than their normal rate. Typists were able to maintain low error rates over large changes in speed. Analysis of the distribution of errors across speed stress shows increases to the number of letter omissions and substitutions, but not transpositions. We suggest that typists manage the speed-accuracy tradeoff by attempting to preserve serially-ordered responses.

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(4144)

**Two Hemispheres Are Better Than One for Motor Learning.** ROBERT M. KOHL, *The College of William and Mary*—Practicing simple responses produces contralateral hemispheric activity and degrades retention scores. In contrast, practicing responses with increased demands produces contralateral and ipsilateral hemispheric activity and enhances retention scores. The purpose of these experiments was to determine the impact of hemispheric interaction on motor learning independent of increased response demands. Participants in two experiments either used ipsilateral (i.e. contralateral hemispheric activity) or contralateral (i.e. contralateral/ipsilateral hemispheric activity) alternate hand/foot taps to control the direction of a vertical accelerating cursor to track a dynamic vertical sine

wave target. Both experiments demonstrated that the contralateral practice groups produced more taps, were more rhythmic, and had less error on both ipsilateral and contralateral retention tests, even when the ipsilateral group had increased practice (Experiment 2). This pattern indicated the importance of inter-hemispheric interaction for motor learning that was exclusive of any adherence to increased response demands.

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(4145)

**Constraints for Motor Planning: End-State Comfort Is More Important Than Handedness.** CHASE J. COELHO, DAVID A. ROSENBAUM and BREANNA E. STUDENKA, *Pennsylvania State University*—People plan for motor tasks by adding and prioritizing constraints, at least when coupling or mechanics cannot solve the degrees of freedom problem. We sought to identify the relative priority of two constraints for an object displacement task -- which hand to use (left or right) and which grasp to use (overhand or underhand). The object to be displaced was a horizontal rod whose left or right end was to be placed into one of five nearer targets. In one condition, we told participants which hand to use and let them to choose either grasp. In another condition, we told participants which grasp to use and let them to choose either hand. When hand was specified, the chosen grasp ensured end-state comfort (thumb up at end). When grasp was specified, the chosen hand again ensured end-state comfort. The results suggest that end-state comfort is more important than handedness.

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(4150-4154)

**Grant Funding Agencies.** Information about various grant funding agencies is available. Representatives will be available throughout the conference.



## POSTER SESSION V

Saturday Evening

Convention Center Ballroom 6 ABC

Viewing Time 4:00 p.m.-7:30 p.m., Author Present 6:00 p.m.-7:30 p.m.

## ● ACTION AND PERCEPTION IV ●

(5001)

**Limitations of Distal Effect Anticipation With Mirrored Movement Feedback.** CHRISTINE SUTTER, JOCHEN MÜSSELER and STEFANIE SCHUCH, *RWTH Aachen University*—In the present experiments we examined whether and how the perspective of seeing one's own movements exerted an influence on distal effect anticipation. In a compatibility task participants responded to visual stimuli, while the stimulus location (irrelevant dimension) did or did not correspond with the target location. They did not see their hands and stimuli directly, and visual feedback retained or reversed left-right relations. A Simon effect was found when feedback retained left-right relations. With reversed spatial relations the Simon effect inverted (Ex.1), which means that proximal action effects dominated action control. Adding a visual (Ex.2) or a proprioceptive/tactile distractor (Ex.3) increased response times. For visual feedback with retained left-right relations we replicated the compatibility effects, but with reversed left-right relations compatibility effects completely subsided. To sum up, the predominance of the visual system seems to be valid until discrepancies between vision and proprioception become very prominent. Email: Christine Sutter, [Christine.Sutter@psych.rwth-aachen.de](mailto:Christine.Sutter@psych.rwth-aachen.de)

(5002)

**Referential Response Coding in the Go-Nogo Simon Task.** THOMAS DOLK, *Max-Planck-Institute for Human Cognitive and Brain Sciences*, ROMAN LIEPELT, *Westfälische Wilhelms-University*, BERNHARD HOMMEL, *Leiden University*, WOLFGANG PRINZ, *Max-Planck-Institute for Human Cognitive and Brain Sciences*—A Go-Nogo-Simon-Effect (GNSE) is typically observed when two individuals perform a go-nogo-Simon-task together. In contrast to the social co-representation account assumed so far, recent findings suggest that the GNSE may result from salient events that provide a reference for spatially coding one's own action. If referential-response-coding of an individual's own action is induced by any salient event, a GNSE should be elicited irrespective of whether this event is social or not (Experiment-1) and whether the reference-providing event is implemented left or right to one's own action (Experiment-2). By manipulating the presence (present, absent) and the spatial implementation (left or right) of a non-social salient event in an auditory go-nogo-Simon-task, we found reliable GNSEs in both experiments. That is, the GNSE occurred whenever agents coded their own action as left or right in reference to another salient event, suggesting low-level feature binding mechanisms to be crucial for the GNSE to emerge. Email: Thomas Dolk, [dolk@cbs.mpg.de](mailto:dolk@cbs.mpg.de)

(5003)

**Sense of Agency During Individual and Joint Skill Learning.** ROBRECHT P. VAN DER WEL, *Rutgers University Camden*, GUENTHER K. KNOBLICH and NATALIE SEBANZ, *Donders Institute for Brain, Cognition, and Behaviour*—People often perform actions with others, such as when moving furniture together. Here, we examined both performance-related and experiential aspects of such joint actions. First, we compared how people achieve successful coordination when they learn a new coordination task individually or jointly. Second, we compared the sense of agency in these two coordination modes. Third, we investigated how the sense of agency translates from individual to joint performance and vice versa. Although performance success and the rate of learning was similar in the individual and joint conditions, the accompanying sense of agency was not. Whereas individuals and dyads initially experienced a similar sense of agency, we found that only individuals experienced an increase in their sense of agency once they learned to perform the task well. Switching between modes modulated the sense of agency. The results are discussed in view of predictive and postdictive accounts for the sense of agency. Email: Robrecht P. van der Wel, [rprdvanderwel@gmail.com](mailto:rprdvanderwel@gmail.com)

(5004)

**Altered Feedback Produces Dissociation Between Perceived and Produced Errors in a Musical Keyboard Task.** ROBERTSON BEASLEY, BRIAN T. KRAUS and PETER Q. PFORDRESHER, *University at Buffalo SUNY*—In music performance, experimentally altering the pitch contents of auditory feedback can disrupt the accuracy of performance; however, it is not clear whether such alterations influence the ability to monitor one's performance for errors. We report an experiment in which participants performed short melodies on a piano, while the pitch contents of auditory feedback were altered on a randomly selected subset of produced events. After each trial, participants estimated how many errors they made. Self-reported error rates increased with the number of altered feedback events in a trial whereas produced errors remained stable, indicating that altered feedback distorts the conscious awareness of errors. The pattern of results suggested that distortion of self-monitoring by altered feedback occurs when at least 25% of the produced events are altered. The current data complement other recent results in suggesting that performers may experience an illusion of self-agency while experiencing altered feedback. Email: Peter Q. Pfordresher, [pqp@buffalo.edu](mailto:pqp@buffalo.edu)

(5005)

**An Intra- vs. Cross-modal comparison of aftereffects in tool actions.** STEFAN LADWIG, CHRISTINE SUTTER and JOCHEN MÜSSELER, *RWTH Aachen University*—Recent findings show that distal action effects control tool actions, while proximal action effects are attenuated or ignored. In the present experiments participants performed aiming movements, while different gains for the x-axis perturbed the relation between hand movements and displayed movements. The covered hand movement was constant and the cursor amplitude was shorter, equal or longer. Participants replicate their initially performed hand amplitude (cursor amplitude) by producing a hand movement on the digitizer tablet without visual feedback (Ex.1). In Ex.2 they replicate their initially performed cursor amplitude (hand amplitude) by producing a cursor movement on the display through pressing a button (Ex.2). The first (second) condition necessitated an intra- (cross-) modal replication. Results show that manually replicated hand (display) movements shifted stronger towards the visual (proprioceptive) feedback of the initial task than visually replicated movements. These aftereffects were more pronounced in cross-modal replications than in intra-modal replications. The findings support the notion of a common framework for perception and action, and the predominance of visual action effects.

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(5006)

**Brain Patterns Linked to Goal-oriented Object Knowledge Retrieval.** EVANGELIA G. CHRYSIKOU, *University of Kansas*, SHARON L. THOMPSON-SCHILL, *University of Pennsylvania*—Frequently in daily life we are faced with a problem but lack the typical means by which to achieve its solution. Nevertheless, we are able to identify rapidly objects that would satisfy the goal at hand. In this study we used functional magnetic resonance imaging to explore the neural mechanisms implicated in such goal-oriented behavior. Participants were shown common goals (e.g., 'to seal a box') and they either generated verbally the most common object that could be used to satisfy the goal (e.g., 'tape') or an uncommon object that could be used instead, if the typical objects were unavailable (e.g., 'chewing gum'). In both conditions participants also completed a baseline task. Analyses revealed dissociable brain patterns under these two distinct task conditions, with a reliable task by condition interaction in the left medial parietal lobe (posterior cingulate cortex). The results are discussed in the context of individual differences assessments.

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(5007)

**Effects of Executive Function on Search and Prediction for Mechanical Objects.** IN-KYEONG KIM, DENNIS CAMBARA, MARYAM CROGMAN, ENOCH KWON and HAY SON LAI, *La Sierra University*—In this study, a

total of 90 children (4-5 yrs.), young adults, and elderly adults participated. In the Prediction task, participants were presented with a ramp and four containers adjacent to the ramp, and were asked to predict where the ball would land if the ball was rolled from the top. For the Search task, a ball was released from the top, rolled down behind an occluder, and fell into one of the containers; participants were asked to search for the ball by opening a container. Results showed an inverted U shaped curve, indicating more errors for children and elderly participants than that of young adults. This age difference was larger for the prediction than for the search task. Additional inhibition control and working memory test results showed a negative relationship with the task performance for elderly participants. The effects of executive function on reasoning based task performance were discussed.

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(5008)

**Relative Change Probability Affects the Decision Process of Detecting Multiple Feature Changes.** CHENG-TA YANG, *National Cheng Kung University*—In real world, a change usually consists of multiple feature changes and one feature change may occur more frequent than the other. However, no prior studies have examined how relative change probability may affect the decision process when detecting multiple feature changes. Thus, this study manipulated the relative change probability between two features to examine how it affects the process characteristics. When the probability of a frequency-change and an orientation-change of a gabor patch was equal (Experiment 1), participants adopted parallel self-terminating processing to detect the change. When a frequency-change was three times more frequent than an orientation-change (Experiment 2), participants altered their decision strategy to a serial self-terminating processing. These results support the relative saliency hypothesis. Relative change probability affects relative saliency between features and consequently influences the adoption.

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(5009)

**Saving Free Will From Science.** EVE A. ISHAM, *University of California, Davis*, WILLIAM P. BANKS, *Pomona College*—In the traditional view of free will, one would expect the moment of intention to act to precede any brain activities related to the movement. In contrast, Libet et al. (1982) showed that the brain signal called the readiness potential (RP) preceded the moments in which one became conscious of his action (M) and the decision to act (W). These findings support the deterministic view and suggest that free will is illusory. But is this claim truly valid? We approached this question by testing the authenticity of M and W. If genuine, they would always remain constant and bound to the RP. If M and W varied, then the fact that the RP preceded them would be meaningless. In Exp 1 and 2, participants pressed a button that elicited a delayed tone.

Here M and W shifted systematically with the time of the tone rather than remaining constant. In Exp 3, the tone was used to falsely inform the participants of their speeded performance. M shifted in accordance with the false feedback. In Exp 4, M and W varied when using analog vs. digital clocks to tell time. Our results suggest that M and W are unstable and cannot be bound to the RP. Hence, Libet's methodology and findings cannot be used to invalidate the existence of free will.

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## ● MUSIC PERCEPTION ●

(5010)

**The Contribution of Rhythmic Processes to Verbal and Manual Sequence Reproduction.** I-TING CHIU and SHU-JEN KUNG, *National Yang-Ming University, Taiwan*, DENISE H. WU and DAISY L. HUNG, *National Central University, Taiwan*, OVID J—L. TZENG, *Academia Sinica, Taipei, Taiwan*—Melodic intonation therapy (MIT), which combines speech with melody and rhythmic tapping, helps patients with severe non-fluent aphasia improve their expressive ability. To examine the contribution of rhythmic tapping to sequence reproduction, healthy participants were required to reproduce monotonic sequences with variable metrical regularity and tempi by tapping with their left or right hand, verbal production, or both. The accuracy of reproduction performance (both in the relative and absolute durations between tones) demonstrated that regular sequences were reproduced more precisely than irregular ones, except that this effect was less pronounced when the tempo was close to the optimal zone of temporal processing. Importantly, reproduction with both verbal and manual modalities resulted in sequences that better maintained the relative rhythmic pattern of the original sequences than reproduction with only the tapping modality. These results support that the rhythmic tapping of MIT improves the mental representation of metrical processes and further facilitates the reproduction of rhythms.

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(5011)

**of All the Songs to Get Stuck in my Head, Why This One?** JESSICA STARK and KIMBERLY WEAR, *High Point University*—Musical memory is an under-researched area gaining in popularity. A few studies have highlighted the influences of timbre, dynamics, and tempo (Marvin & Brinkman, 2000; Oakes & North, 2006; Poulin-Charronnat, Bigand, LaLittle, Madurell, Vieillard, & McAdams, 2004). Research on tonality suggests tonal music leads to greater familiarity than atonal music suggesting pattern recognition processes during perception. Greater familiarity results in easier perceptual processing, but not necessarily recognition. A contradictory finding with regard to meter suggests that more distinct music is better remembered (Feierabend, Saunders, Holohan, & Getnick, 1998). The current study sought to rectify these findings by varying tonality and meter. Greater familiarity may lead to better perception, but greater distinctiveness may lead to better episodic memory.

A musical recognition test was used to reduce the familiarity effect in hopes to promote actual recognition and episodic memory. In addition, the current study examined the memory differences between musicians and non-musicians, for which previous research has suggested, may also lend clarity to the effects of familiarity and distinctiveness.

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(5012)

**The Effect of Musical Training on Automatic Music Processing Networks.** SHANNON E. MACLEAN, ELIZABETH BLUNDON and LAWRENCE M. WARD, *University of British Columbia*—Musical training is thought to develop regions in the prefrontal cortex mediating attention, working memory and long term memory. We hypothesized that trained musicians may recruit cerebral networks similar to those used for language during music perception. To investigate the functional relationship between brain regions active during passive processing of brief musical stimuli, high density EEG was separated into sources using independent component analysis (ICA) and source spatiotemporal properties were examined between healthy young adults with extensive musical training (>10yrs) to those with little to no training (<1 yr) during a passive melodic change detection paradigm. Phase synchronization analyses showed that during the MMN response synchronous interactions occurred among sources located in the left and right STG (BA42), the left and right SFG (BA10), R IFG (BA45), and the L IFG (BA47) and Broca's area (BA45). Finding interacting sources in speech processing regions in this context provides support for the role of similar mechanisms for linguistic and music processing in the MMN network for those with musical training.

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(5013)

**Processes for Tone Identification in Observers With Absolute Pitch.** MALIK REFAAT, *University of Warwick*, KOEN LAMBERTS (Sponsored by Gordon Brown)—Behavioral studies have shown that observers with absolute pitch tend to perform very proficiently in a range of tone identification tasks. However, most studies focus only on response accuracy, leaving the question whether the strategies used by these observers are absolute (i.e., not based on a comparison with an internal or external reference point different from the judged note) or relative (based on estimates of intervals between notes and internal or external reference points). To gain further insight into the nature of tone identification by individuals with absolute pitch, we collected response time data from three participants in a standard two-octave tone identification task. The data showed reliable differences in response time between notes within individuals. We discuss the implications of these differences, and provide an account of judgment by observers with absolute pitch in terms of a relative strategy based on multiple internal references.

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## ● EVENT COGNITION ●

(5014)

**A Fake Smile Thwarts Cheater Detection.** MATIA OKUBO, AKIHIRO KOBAYASHI and KENTA ISHIKAWA, *Senshu University*—People can discriminate cheaters from cooperators on the basis of negative facial expressions. However, such cheater detection is far from perfect in real-world situations. Therefore, it is possible that cheaters have the ability to disguise negative emotional expressions that signal their uncooperative attitude. To test this possibility, emotional intensity and trustworthiness were evaluated for facial photographs of cheaters and cooperators defined by scores in an economic game. The facial photographs had either posed happy or angry expressions. The angry expressions of cheaters were rated angrier and less trustworthy than those of cooperators. On the other hand, On the other hand, happy expressions of cheaters were higher in emotional intensity but comparable to those of cooperators in trustworthiness. These results suggest that cheater detection based on the processing of negative facial expressions can be thwarted by a posed or fake smile, which cheaters put on with higher intensity than cooperators.

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(5015)

**Event Segmentation Ability Uniquely Predicts Memory.** JESSE Q. SARGENT and JEFFREY M. ZACKS, *Washington University in St. Louis*, ZACH D. HAMBRICK and ROSE T. ZACKS, *Michigan State University*, MICHELLE L. EISENBERG and TAYLOR M. BECK, *Washington University in St. Louis*—Episodic memory depends in part on segmenting action into meaningful events as it happens. This study investigated the relationship among age, segmentation during event encoding, individual differences in cognitive ability, and subsequent episodic memory. A sample of adults ranging from 20 to 79 years old segmented movies of everyday events and attempted to remember them later. They also completed tests of conventional cognitive abilities: verbal episodic memory, working memory span, processing speed, and crystallized intelligence. The cognitive ability measures accounted for substantial variance in the memory measures. However, event segmentation explained significant additional variance in some aspects of memory performance. This suggests that some of the computational operations involved in encoding events for later memory are not well captured by existing psychometric measures of cognitive ability.

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(5016)

**Priming Shows That Episodic Memory Is Structured According To Perceptual Events.** CHRISTOPHER A. KURBY, *Grand Valley State University*, JEFFREY M. ZACKS, *Washington University in St. Louis*—Perceivers spontaneously segment ongoing activity into discrete events. This segmentation is important for the moment-by-moment understanding of events, but may also be critical for how events are encoded into episodic memory. In this study, we

tested the possibility that perceptual event boundaries organize episodic memory for everyday activity. Viewers watched movies of everyday activities such as washing a car, and then performed a yes-no recognition task using pictures taken from the movies. Some target pictures were preceded by a prime picture taken from 5 s previously in the movie. This produced priming, reducing response times for the target picture. Critically, priming was greater when the prime was part of the same perceptual event as the target, than when it was part of a different event. This result suggests that segmentation during perception helps to make the episodes in episodic memory.

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(5017)

**The Impact of Cue Repetition on Autobiographical Memory Retrieval.** TUGBA UZER, PETER J. LEE and NORMAN R. BROWN, *University of Alberta*—Recent research shows that direct retrieval of autobiographical memories, in response to word cues, is possible and also common. This raises a paradoxical question – why are we not inundated by directly retrieved memories cued by everyday, familiar, surroundings? Here we investigated how repeated exposure to the same cues impacts the prevalence of direct retrieval. 484 participants provided uniquely identifiable cues from their own life (e.g., the names of people they know), and then attempted to retrieve memories in response to each cue once, twice or three times. On each trial, participants reported if memories were directly retrieved, or if they were generated. The prevalence of direct retrievals fell swiftly as the number of cue repetitions increased. Conversely, reaction times for generative retrievals increased with the number of cue repetitions, although the speed of direct retrievals remained unchanged over trials. Results suggest that interference theory partly explains the cue paradox question.

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(5018)

**Confirmatory Interviewer Feedback Alters the Time-course of False Memory Development.** PATRICK RICH and MARIA S. ZARAGOZA, *Kent State University*—Participant-witnesses who are pressed to describe entire events they never witnessed (i.e., are forced to fabricate) sometimes develop false memories for these forcibly fabricated events. However, the development of these false memories appears to be time dependent: in Chrobak & Zaragoza (2008) warned participants who correctly identified their fabrications as ‘not witnessed’ after one week nevertheless misremembered witnessing these same fabricated events when re-tested 8 weeks later. In two experiments confirmatory interviewer feedback (“That’s right!”) shortened the time course of false memory development in warned participants to one week, even in those who did not remember the feedback. Results support the proposal that confirmatory feedback leads participants to discount their uncertainty in their forced fabrications.

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(5019)

**What Makes a Personal Event an Important Event?**

CONNIE SVOB, NORMAN R. BROWN, TUGBA UZER and PETER J. LEE, *University of Alberta*—The Transitional Impact Scale (TIS) measures beliefs about the material and psychological impact of transitional events; the Centrality of Events Scale (CES) measures how central an event is to a person's identity and life story. The present study was undertaken to understand the relation between these scales and their relationship to conventional memory ratings. Participants recalled 3 autobiographical memories in response to neutral cues and nominated 3 personal transitions. Then, for each event, they completed the TIS and CES, and rated importance, vividness, emotional intensity and rehearsal. CES scores correlated highly with TIS scores, and both predicted importance. Also, the TIS indicated that material and psychological change can be independent; with some transitions scoring high on both dimensions (immigration) and others only scoring high on psychological change (religious conversion). Compared to transitions, cued events had lower TIS and CES scores and were less important, vivid, intense, and less frequently rehearsed.

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(5020)

**Nuclear Accident in Tokaimura: Flashbulb Memories 10 Years Later.**

HAJIME OTANI, *Central Michigan University*, TAKASHI KUSUMI, *Kyoto University*, MAKIKO NAKA, *Hokkaido University*, KOICHI KATO, *Tokyo University and Graduate School of Social Welfare*, MAI MIGITA, *Central Michigan University*, NOBUO OHTA, *Gakushuin University*—Flashbulb memories (FBM) are vivid memories about the details surrounding how one received the news of emotionally arousing events. In 1999, Japan experienced a nuclear disaster, which, up until the most recent disaster in 2011, was the worst in its history. A questionnaire was distributed two weeks after the accident in 1999 and, again, one year later to examine whether this event triggered FBM as well as what factors are responsible for the formation of FBM. The results showed that rehearsal was the only factor that distinguished between those who formed FBM and those who did not. We distributed the questionnaire once more in 2009 to investigate whether FBM was maintained over a 10-year period. The results showed that only a few people met the criteria of having FBM; however, meta-cognitive judgments of having FBM were more predictive of the ratings on a number of scales.

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(5021)

**Time Distortion of Emotional Charged Images in Normal and Phobic Individuals.** SIMONA BUETTI, STEFANIA MEREU and ALEJANDRO LLERAS, *University of Illinois*—Normal subjects experience highly arousing aversive images as lasting longer than highly arousing positive images. This time dilation illusion is

reversed with low-arousal images: positive-low arousal images are perceived as lasting longer than negative-low arousal images. It has been proposed that this reversal of the time illusion is partly due to an arousal-driven internal clock that ticks faster when individuals are aroused and more so, when the images are aversive. Previously, we showed that illusory control over the valence of the images eliminates the temporal illusion for highly arousing images. Here, we study this time dilation effect using spider-phobic individuals with a dual goal: (1) to test the arousal theory by comparing performance using a single set of images (spiders) that differed in terms of the arousal they induced across participants (phobics vs. non-phobics) and (2) to test whether illusory control can eliminate the illusion in phobic individuals. As expected, phobic individuals perceived spider images as lasting longer than arousal-matched positive images while non-phobic individuals rated them as lasting longer than arousal-matched positive images.

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(5022)

**Distinguishing Experienced From Non-Experienced Events: Can Children's Drawings Tell Us What is Real?**

TAMMY A. MARCHE, TOBI PATKAU-CEH and JENNIFER L. BRIERE, *University of Saskatchewan*—Adults typically perform at, or slightly above, chance when distinguishing the veracity of children's verbal statements (e.g., Vrij, Akehurst, Brown & Mann, 2006). The purpose of the current study was to determine whether adults can discern the veracity of children's drawings that were based on events that the children did, or did not, experience. Fourteen younger ( $M = 7.21$  years) and 14 older ( $M = 11.29$  years) children witnessed 1 of 2 staged events and heard about the other event in story format. Children then created drawings of the experienced and non-experienced event. Fifty adults judged whether or not the children's drawings were based on experience. Results indicated that although adults performed around chance when the artists were younger, they were more accurate at distinguishing experienced (66%) from non-experienced (42%) drawings with the older artists. Caution should be taken when using children's drawings as evidence of the veracity of events.

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(5023)

**Stronger Mu- and Beta-Desynchronization in Low- vs. High-Span Individuals During Action Planning.**

LAWRENCE P. BEHMER JR. and LISA R. FOURNIER, *Washington State University*—Recent evidence regarding the mirror neuron system suggests that abstract stimuli containing learned motor programs may activate action-understanding mechanisms in the same manner as meaningful biological actions. Evidence exists which suggests that this activation may be more pronounced during learning. EEG was employed to measure differences in bandwidth power while participants engaged in an action



planning task, in which participants were taught a series of left or right hand button presses based upon abstract images. The O-SPAN was used to assess working memory capacity, grouping participants in either the upper or lower 25%. Low-span participants demonstrated significantly stronger mu- and beta-desynchronization during the action planning phase. In accordance with recent mirror neuron findings, we posit that stronger mu- and beta-desynchronization in low span participants may be indicative of greater neural workload while processing novel (or abstract) motor related stimuli. High-span participants may require fewer resources, or demonstrate greater efficiency.

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(5024)

**Building a Sense of Time – Attentional Processing Influences Subjective Duration.** SOPHIE HERBST and ELKE VAN DER MEER, *Humboldt Universität Berlin*, NIKO BUSCH, *Charité Berlin*—Humans lack a sensory organ for time perception. Therefore, subjective duration is highly influenced by non-temporal factors, particularly by the number of changes in the percept. To date, it is unknown whether subjective duration is determined rather by automatic or attentional processing of such changes. We presented rapid sequences of letters of various durations and combined a duration judgment task with an attentional blink paradigm in order to dissociate the number of presented stimuli from the number of attentively processed stimuli. We found that allocation of attention to target stimuli in a stream prolongs the subjective duration of the sequence. By contrast, missed targets due to attentional blinks lead to subjective shortening. Thus, subjective duration is determined by the number of subjectively perceived stimuli rather than by the objective number. This finding is in line with the idea that attention affects the collection of temporal pulses by an internal clock.

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## ● ASSOCIATIVE LEARNING II ●

(5025)

**Spaced Retrieval Compensates for the Associative Memory Impairment in Older Adults.** PATTI M. SIMONE and MATT BELL, *Santa Clara University*—Age-related decline is common in associative learning tasks although the deficit can be remediated with the spacing of learning episodes. One theory to explain this spacing benefit suggests that information that is hard to retrieve is more likely to be remembered (“desired difficulty”). We examined the spacing effect in older adults over a multi-day period. Younger ( $M = 19$ ) and older ( $M = 64$ ) participants studied 20 Swahili-English word pairs. Words were retrieved immediately (massed) or 24 h later (spaced) and a final test was given 10 days later. Test performance was evaluated with a  $2 \times 2$  factorial ANOVA with age and spacing as between-subjects factors. Main effects of age,  $F(1,88) = 34.8$ ,  $p < .05$ , spacing,  $F(1,88) = 29.4$ ,  $p < .05$  and the

interaction,  $F(1,88) = 5.6$ ,  $p < .05$  were significant. Younger adults remembered more words than older adults but spacing benefited both groups. Our experiment replicated earlier findings (Cepeda et al., 2009) of a long-lasting spacing advantage in younger adults and extended the work to older adults. Additional analyses suggest these results may not be able to be explained by the “desired difficulty” hypothesis.

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(5026)

**A Dissociation Between Conscious Expectancy and Automatic Priming in the Allocation of Attention.** EVAN J. LIVESEY and MICHELLE SATKUNARAJAH, *University of Sydney*—In human conditioning and priming studies, participants acquire a tendency to respond in anticipation of a critical event, such as an unconditioned stimulus or a target requiring a speeded response. A unique set of circumstances can be created in which the strength of this anticipatory response increases even though conscious expectancy of the event itself decreases. This dissociation has played a critical role in recent debates about the nature of human associative learning. Here we demonstrate a similar dissociation in the direction of eye-movements made in anticipation of a target cue. Experiments demonstrate that automatic priming and conscious expectancy have dissociable but additive effects on the allocation of attention. The results have implications for current theories of associative learning and the deployment of attention.

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(5027)

**Intentional Gesturing During Encoding Enhances Retrieval.** STEPHANI FORAKER, *Buffalo State College* (Sponsored by Gail Mauner)—Generating images for unrelated word pairs leads to better memory than repetition (Paivio 1971), presumably because of dual coding and formation of richer conceptual representations. Although gesturing during speech enhances concept learning, event memory (Cook, Yip, & Goldin-Meadow, 2010), and lexical retrieval (Krauss & Chen, 2000) does gesturing during encoding enhance memory? We investigated whether cued recall for word pairs was better when unassociated word pairs (cookie-garage) were just repeated, or were repeated while either generating an image or gestures to relate the words. Cued recall immediately and two days later revealed that imagery (immediate 66%, delayed 45%) and gesturing (54%, 34%) enhanced memory over repetition (30%, 18%). These results provide the first demonstration that intentional rather than incidental gesturing during encoding enhances retrieval. Post hoc item analyses showed that when word pairs lent themselves to more specific or distinctive gestures, memory accuracy rivaled that of image generation.

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(5028)

**Prepared Learning of Cheaters? Memory for Cheaters Survives Instructed Extinction.** ATSUNOBU SUZUKI and YOSHIKO HONMA, *Nagoya University*, SAYAKA SUGA, *Toyo University*—It has been argued that humans have evolved a module dedicated to cheater detection as an adaptation for social exchange (Cosmides & Tooby, 1989). The present study tested this idea using an instructed extinction paradigm (Hugdahl & Ohman, 1977). In the experiment, participants first learned to associate unfamiliar faces with either a cheating or a cooperative trait, and then were instructed to suppress the associations intentionally. If people have a predisposition to remember cheaters, the memory would be resistant to instructed extinction, similarly to conditioned fear responses to snakes and spiders (Mineka & Ohman, 2002). Indeed, results showed that acquired negative impressions of cheater faces remained significant even after instructed extinction, while good impressions of cooperator faces were not. The findings suggest that humans might be prepared to associate a cheating trait with unfamiliar others.

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(5029)

**Differential Neural Activity During Emotional vs. Non-emotional Reversal Learning.** KAORU NASHIRO, NGALIN, MICHIO SAKAKI and MARA MATHER, *University of Southern California* (Sponsored by Linda Henkel)—The ability to change an established stimulus-behavior association based on feedback is critical for adaptive social behaviors. This ability is required in reversal learning tasks, where participants first learn a stimulus-response association (e.g., select a particular object to get a reward), and then need to alter their response when reinforcement contingencies change. While substantial evidence demonstrates that the orbitofrontal cortex (OFC) is a critical region for reversal learning, past studies have not distinguished reversal learning for emotional associations from non-emotional associations. The current study examined whether OFC plays similar roles in emotional vs. non-emotional reversal learning. The OFC showed greater activity during emotional than during non-emotional reversals. Furthermore, OFC activity is more negatively correlated with the amygdala activity during emotional than during non-emotional reversals. The results suggest that OFC allows for flexible emotional reversal learning by down-regulating the amygdala.

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(5030)

**JAM-boree: A Meta-Analysis of Judgment of Memory.** ERIN M. BUCHANAN and KATHRENE VALENTINE, *Missouri State University*—Judgments of associative memory (JAM) have been shown to be both insensitive and biased even after training and feedback (Maki, 2007). JAM functions tend to show very shallow slopes (.2-.3) along with very high intercept values (50) when comparing

participant judgments to database norms. A meta-analysis of data from a collection of JAM experiments was performed utilizing new modeling software; Observation Oriented Modeling (OOM). OOM looks at data on the individual participant level to examine predicted effects ability to conform to their manipulated cause. These experiments have manipulated the instructions given to participants (similar to Koriart & Bjork, 2006), changed type judgment (Buchanan, 2010), and examined when judgments were used in priming. OOM will be used to determine consistencies across experimental manipulations. We predict participants will have very high intercept values and very low slope values, which indicates an inability to judge from the associative processor.

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(5031)

**The Effect of Emotional Background Information On the Impression Formation of Avatars in Virtual Space.** KEN MATSUDA and TATSUNORI NAKAGAKI, *Yamaguchi University*, TAKASHI KUSUMI, *Kyoto University*—We investigated the influence of nostalgia generalization and delayed source memory decay on the evaluation of products by pairing repeated exposure to advertised products with nostalgic pictures. Participants were shown avatars with background pictures that varied in emotional valence (pleasant or unpleasant). Experiment consisted of eight sessions. In session 1,3,5, and 7, participants rated avatars on preference, educational level, and reliability. They rate the background that served as a manipulation check of background affective valence in session 2, 4, and 6. Session 8 conducted one week later, and asked for a similar assessment of the avatars eliminating background information. The results showed that the impressions of the avatars rose in pleasant background condition and fell in unpleasant background condition by increasing the number of presentation. After one week not only the evaluation of the avatars remained strong but the influences of affective background also remained strong.

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(5032)

**Neural Substrates of Change-point Detection and Reinforcement Learning in Foraging Behavior.** WOLFGANG M. PAULI and MATT JONES, *University of Colorado*—Foraging animals in non-stationary environments must adapt to changes in payoffs expected from each location. Competing normative approaches to learning in non-stationary environments have been founded on two alternative assumptions regarding temporal dynamics. One approach relies on the assumption that reward probabilities drift continuously over time. Under this assumption, optimal inference is described by the Kalman filter and is closely approximated by reinforcement learning mechanisms that incrementally adjust value estimates following each action. An alternative assumption is that the environment undergoes periods of stationarity punctuated by change-points. Optimal behavior under this assumption entails abrupt resetting of knowledge at likely change-points

and little learning otherwise. We will report results of a reversal-learning experiment with rats, using concurrent variable interval schedules on two levers. Before the contingency reversal we pharmacologically impaired either the dorsomedial or dorsolateral striatum of the basal ganglia. It is predicted that the dorsomedial striatum is better characterized by changepoint inference, whereas the dorsolateral system is better characterized by reinforcement learning.

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## ● MEMORY AND EMOTION ●

(5033)

**Emotional Recall: A Dual-Trace Analysis.** CARLOS F. GOMES, *Cornell University*, LILIAN M. STEIN, *PUCRS - Brazil*, CHARLES J. BRAINERD, *Cornell University*—Dual-trace conceptions have often been used to explain how emotion influences memory. The notion that emotional valence affects recollective retrieval has been supported by recognition memory experiments, but valence is confounded with emotional arousal in most of these experiments. This notion is inconsistent with fuzzy-trace theory's hypothesis that emotional valence is a conceptual gist that should affect nonrecollective retrieval. To compare these two ideas about emotional valence, we investigated valence effects on memory via a recall methodology in which participants' performance involves both recollective and nonrecollective retrieval processes. Using a Markov model that measures both processes we found that emotional valence affected nonrecollective retrieval but that it did not affect recollective retrieval.

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(5034)

**The Fate of Neutral Words Surrounding Emotionally Arousing Oddballs.** KIMBERLY WEAR, *High Point University*—Research has demonstrated enhanced memory for emotionally arousing items. However, the fate of neutral information immediately preceding or following these emotionally arousing items is still in doubt. Emotion-induced interference of a neutral item presented immediately preceding and following an emotional item has been demonstrated for images, line drawings, and words (Knight & Mather, 2009; Hurlmann et al., 2005; Strange, Hurlmann, & Dolan, 2003; Wear & Stambaugh, 2010). Previous research focused primarily on unpleasant emotion and the effects on items one or two positions away. Using the oddball paradigm, the current study investigated interference effects of emotional words (both unpleasant and pleasant) on the memory of neutral words up to 7 items away. In addition, the relatedness of the neutral items to the emotional target was varied. The results shed light on the interactions between emotional and semantic memory that contribute to episodic recall.

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(5035)

**The Influence of Emotional Valence on True and False Memory.** HAE-YOON CHOI, *Stony Brook University*, ELIZABETH A. KENSINGER, *Boston College*, SUPARNA RAJARAM, *Stony Brook University*—Two experiments were conducted to investigate the influence of emotional valence on memory. We employed categorically-bound stimuli (negative, positive, or neutral) to equate conceptual relatedness across valence. Participants studied both pictorial and word representations of stimuli and completed either recognition or cued-recall tasks after a 30-min delay (Experiment 1) or 24-hr delay (Experiment 2). Findings from each experiment converged to show (1) enhanced true memory for valenced (especially negatively valenced) stimuli, replicating past literature, and (2) no influence of valence on false memory. These findings suggest that when valenced and neutral stimuli are equivalently high in conceptual relatedness, valence does not override other types of grouping to increase false memory, while the enhancement effects of valence on true memory remain intact. These findings will be discussed in the context of two main hypotheses proposed in the literature, namely the distinctiveness heuristic hypothesis and the conceptual relatedness hypothesis.

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(5036)

**The Long-Term Effect of Perspective Change on Emotional Intensity for Autobiographical Memories.** TAKAHIRO SEKIGUCHI and SAORI NONAKA, *Tokyo Gakuji University*—Autobiographical memories (AM) can be recalled from two perspectives: the field (F) perspective, wherein a past scene is recollected from a first-person viewpoint, and the observer (O) perspective, which is a third-person viewpoint. Previous studies have reported that changing the perspective from F to O reduced emotional intensity for remembered episodes. The present study examined whether this effect lasts long. The participants were first asked to recollect their past episodes without any perspective instruction (Phase 1). On the next day (Phase 2), half of them were asked to recollect the same episodes using a different perspective from the one used in Phase 1, while the other half were asked to recollect the episodes without a shift in perspective. A month later (Phase 3), all the participants were asked to recollect the same episodes freely. The emotional intensity for the remembered episodes reduced owing to the perspective change from F to O in Phase 2; this reduction continued to Phase 3, which was independent of memory perspectives. This effect was not observed when the perspective changed from O to F. These results showed that perspective change from F to O reduces emotional intensity for AM for at least one month.

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(5037)

**The Effects of Emotional Words On False Recall and Recognition.** TOMOHIRO NABETA, *Japan Advanced Institute of Science and Technology*—With DRM procedures the present study investigated the effect of emotional words on false recall and recognition. The experiment was consisted of learning-recall phase and recognition test phase. In the learning-recall phase, twenty-four participants viewed positive, negative and neutral lists of semantic associated words. Immediately after each presentation of a list of the words the participants conducted the recall task or the distractor task. In the recognition phase, the participants were presented the words that had been followed by the distractor task previously. The results showed reduction effect of emotion on false recall. Specifically, the false recall in the positive word lists and that in the negative word lists were less than the false recall in the neutral word lists. However, the reduction was not found in the false recognition. The results suggested that the memory trace of false memory was constructed by learning of the lists of emotional words.

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(5038)

**Initial Testing Can Reduce the Emotionality Advantage.** TANYA KARAM, SEAN M. LANE, KATHLEEN VIEIRA, LESLIE BUTLER and SERENA FISHER, *Louisiana State University*—Generally, negatively arousing stimuli are better retained than neutral stimuli (the emotionality advantage; Mather, 2007). Furthermore, initial testing enhances long-term retention (i.e., the testing effect). In three experiments, we examined how the impact of emotion on long-term memory is influenced by an intervening retrieval. Participants studied neutral and negatively arousing pictures once or twice with or without an orienting task. Shortly afterwards, they were tested on a subset of the items under full or divided attention, and returned 48-hours later for a final recognition test. The primary finding was that the emotionality advantage occurred only after a delay, and only when participants had not been initially tested on the item or had studied it twice without an orienting task. Results suggest that neutral stimuli benefitted more than emotional stimuli when the item was elaborated upon (either through an initial test, or when studied twice with an orienting task).

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(5039)

**Enhancing the Testing Effect With Negative Emotional Pictures: Is Successful Retrieval Necessary?** BRIDGID FINN and HENRY L. ROEDIGER III, *Washington University in St. Louis*—When an emotional picture is presented immediately after successful retrieval, later retention is enhanced as compared to when a neutral picture or blank screen follows retrieval (Finn & Roediger, 2011). In three new experiments, we tested whether successful retrieval is necessary to show the enhancing effect.

Participants studied Swahili-English vocabulary, took an intervening cued-recall test, and a final test. During the initial test, unsuccessful retrieval was followed by feedback and then either a negative picture, neutral picture or blank screen. Final test performance was best for items followed by negative pictures. A second experiment showed that negative pictures presented just prior to successful retrieval did not cause enhancement. In a third experiment, subjects predicted that recall would be best for items followed by negative pictures whether or not enhancement occurred. The results indicate that effort in retrieving is critical to the enhancing effect and that metacognitive awareness of the effect is limited.

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(5040)

**Intention To Learn and the Emotional-Carryover Effect in Memory.** STEPHEN R. SCHMIDT, *Middle Tennessee State University*—Several researchers have demonstrated that material in the temporal proximity of emotional items is remembered better than material surrounding neutral items. This pattern of results supports a generalized role of emotion in memory consolidation. However, other researchers have reported memory impairment for material preceding or following emotional items. The positive carryover effect is sometimes found with incidental learning instructions, whereas negative carryover is often reported with intentional learning. In this experiment, participants viewed a series of neutral and taboo words and completed a delayed recognition test that was either expected or unexpected. Taboo words were remembered better than neutral words, and words following taboo words were more poorly recognized than words following neutral words. Intention to learn had no impact on the magnitude of this negative carryover effect. These results suggest that emotional stimuli impair memory of immediately following material irrespective of intent to learn.

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(5041)

**Completion of Everyday Time-Based Tasks is Influenced by Source of Task and Type of Deadline.** JOYCE M. OATES, ZEHRA F. PEYNIRCIOGLU and TIMOTHY J. HOHMAN, *American University*—Emotion hurts event-based prospective memory (ProM) in the laboratory (Clark-Foos et al., 2009). We explored the effect of emotion as well as the effect of task source (self-generated vs experimenter-given) and deadline type (“at”-time vs “by”-time) in everyday ProM tasks. Unlike in laboratory experiments with event-based tasks, there was no effect of emotion. There was also no effect of task source. There was, however, an effect of deadline type, with better performance in “by”-time than in “at”-time tasks. Further, there was an interaction between source and deadline types. For “at” time tasks, participants were more likely to complete self-generated tasks, whereas for “by” deadline tasks, they were more likely to complete



experimenter-given tasks. Thus, the impact of emotion on ProM did not generalize to everyday time-based tasks. In real world settings, the source of the task and the type of deadline appear to be more important in influencing ProM performance.

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(5042)

**Remembered Duration of Movies Depends On the Delay Before Recall, Not On the Emotional Content.** SIMON GRONDIN, NICOLAS BISSON, FÉLIX DÉSAUTELS and VINCENT LAFLAMME, *Université Laval*—234 participants were asked to look at a series of brief movies lasting a total of 15 minutes and to estimate retrospectively this 15-min period. The movies either induced joy, sadness or were emotionally neutral. There were two neutral conditions, one for each emotional condition (the number of movies and their duration, within the 15 minutes, was the same for one emotional sequence and one neutral sequence). There were 12 groups of participants, three for each emotional condition (Joy, Sadness, Neutral for Joy, Neutral for Sadness), each of three being assigned to one recall condition: immediately after the presentation of movies, one week later, or one month later. The results show that the estimated time is largely overestimated in the 1-week and 1-month condition, but not when the recall is immediate. This effect applies to each emotional condition.

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(5043)

**The Effects of Action Video Games on Affective Information Processing.** KIRA BAILEY and ROBERT WEST, *Iowa State University*—Extensive research demonstrates that action video games affect social information processing. Individual difference and priming studies reveal effects on emotion processing; however, the causal effect of longer exposure to video games is unknown. The current study was designed to address this gap in the literature using the emotion search task and a picture rating task and ERPs. In the emotion search task, the P3 was attenuated for positive faces after 10 hours of playing Unreal Tournament, and there was no effect on the P3 for negative faces. In the picture rating task, the negativity bias was enhanced and habituation to the affective valence in the pictures was attenuated in the Unreal players. These findings reveal causal effects of video game experience on emotion processing that persist beyond one's immediate exposure to the game, converging with the individual difference data.

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## ● COGNITIVE AGING II ●

(5044)

**The Effect of Immigration On the Positivity Effect in Memory.** CHRISTIE CHUNG and ZIYONG LIN, *Mills College*—Many studies document that older adults remember positive information better than young adults

(Carstensen, 1995). In the present study, we examined the effect of immigration on this age-related positivity effect in memory, as previous studies have found that immigrants recall childhood memories more negatively than non-immigrants (Shrauf & Hoffman, 2007). We tested young (ages 18-30) and older adults (ages 60-80) in US and China; as well as young and older Chinese immigrants in US. Participants were shown 30 pictures (10 positive, 10 negative, 10 neutral) on a computer screen during an incidental memory task and were asked to recall these pictures using brief verbal descriptions. A positivity effect was found in both US and China groups (albeit different patterns), but not in the immigrant participants. Our results not only suggest a cross-cultural difference in emotional memory processing, but also an interesting influence that immigration might have on emotion and memory.

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(5045)

**Retrieval-Induced Forgetting: The Effects of Age, Valence, and Social Factors.** SARAH J. BARBER and MARA MATHER, *University of Southern California*—Retrieval-induced forgetting (RIF) refers to the finding that selectively retrieving some information can cause the forgetting of related, but not retrieved, information. Previous research has shown that RIF occurs not only for speakers who are doing the selective retrieval, but also for listeners who are exposed to the speakers' recollections (i.e., socially-shared retrieval-induced forgetting; SS-RIF). In the current study we examined the effects of participant age and stimuli valence in affecting both RIF and SS-RIF. Consistent with previous results, we observed RIF for both younger and older adults, and for both neutral and valenced information. Novel to the current study, SS-RIF occurred not only for younger adults and neutral information, but also for older adults and valenced information. Furthermore, the extent of SS-RIF was dependent upon characteristics of the speaker. Listeners were more likely to exhibit SS-RIF when the speaker was the same gender as themselves.

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(5046)

**Do Older Adults Hypercorrect Their Errors?** ANDRÉE-ANN CYR and NICOLE D. ANDERSON, *Rotman Research Institute, University of Toronto*—The hypercorrection effect (Butterfield & Metcalfe, 2001) has never been investigated among older adults although much prior work (Clare & Jones, 2008) showing evidence of age-related error resolution deficits calls into question whether they would show this effect. In Study 1, we used a free recall format and a 7-point confidence scale; in Study 2, we used a multiple choice format and participants indicated how many alternatives they narrowed it down to prior to answering. In both studies, we found a positive relationship between confidence in self-generated errors among both young and older adults, replicating the hypercorrection



effect. Moreover, the effect was equivalent between groups in Study 2 where confidence ratings were not required. These results are consistent with other findings of ours (Cyr & Anderson, 2011) suggesting that older adults can successfully resolve errors to promote learning if the learning context provides sufficient support.

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(5047)

**Ex-Gaussian Analyses of Age-Related Changes in Two Implicit Learning Tasks.** ASHLEY S. BANGERT, *University of Texas at El Paso*, DAVID A. BALOTA, *Washington University in St. Louis*—Prior work demonstrates age-related declines in implicit learning on a higher-order sequence task (ASRT) but relative preservation during a contextual cueing task (spatial configuration) (Howard et al., 2004). The current study used ex-Gaussian analyses to explore changes in the characteristics (Mu, Sigma and Tau) of the underlying RT distributions across these two tasks in both healthy young and older adults. Tau increased on random trials in the ASRT, compared to sequenced trials, only in the older adults. Mu and Tau for the ASRT were also overall larger in older adults. Turning to the spatial configuration task, older adults showed larger Mu, Sigma and Tau estimates, consistent with age-related slowing. These findings support the view that different mechanisms drive implicit learning in these two tasks. Higher-order sequence learning may rely more on attentional control mechanisms, leading to declines in older adults.

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(5048)

**Impact of Aging on the Dynamics of Short-Term Memory Retrieval: A Time-Course Analysis.** İLKE ÖZTEKİN, *Koç University*, ZEYNEP GÜNGÖR, *Rutgers University*, DAVID BADRE, *Brown University*—The response-signal speed-accuracy trade-off (SAT) procedure was used to provide an in-depth investigation of the impact of aging on the dynamics of short-term memory retrieval. Young and older adults studied sequentially presented 3-item lists, immediately followed by a recognition probe. Analyses of composite list and serial position SAT functions found no differences in overall accuracy, but indicated slower retrieval speed for older adults when access to item information from memory was required. Analysis of false alarms to recent negatives (lures from the previous study list) revealed no differences in the timing or magnitude of early false alarms that are thought to reflect familiarity-based judgments. However, analyses of false alarms later in retrieval indicated that recollective information accrues more slowly for older adults, in addition to a further difference in overall accuracy. These findings can provide an insight into the cognitive mechanisms that lead to age related deficits in memory function.

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(5049)

**White Matter Integrity and RT Variability in Healthy Aging and Early-Stage Alzheimer Disease.** JONATHAN D. JACKSON, DAVID A. BALOTA, JANET M. DUCHEK and DENISE HEAD, *Washington University*—Aging and early-stage Alzheimer disease (AD) are associated with increased RT intraindividual variability (IIV) and an exaggeration of the slow tail of RT distributions in attention-demanding cognitive tasks, based on ex-Gaussian analyses. The current study examined associations between white matter volume, IIV, and ex-Gaussian RT distribution parameters in cognitively normal aging and early-stage AD. Three attention tasks (Stroop, Simon, and CVOE switching), in conjunction with MRI-based measures of cerebral and regional white matter volume were obtained in 133 cognitively normal and 33 early-stage AD individuals. Larger volumes were associated with less IIV and less slowing in the slow tail of the RT distribution. Larger inferior parietal white matter volume was associated with faster modal reaction time. These results support a role of white matter integrity in both IIV and slow-tail responses in RT distributions. Discussion focuses on possible theoretical mechanisms accounting for this relationship in normal and pathological aging.

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(5050)

**Impact of Aging and Chronic Exercise On Visual Search for Words Within Lists.** NICOLAS VIBERT, GEOFFROY BOUCARD and CHRISTINE ROS, *CNRS - Université de Poitiers*, AURELIA BUGAJSKA, *LEAD, CNRS - Université de Bourgogne*, DAVID CLARYS and JEAN-FRANÇOIS ROUET, *CNRS - Université de Poitiers*—Two experiments assessed young and older adults' visual search for words within lists. Both young (aged 18-28 years) and older participants (aged 60-82 years) were divided into active and sedentary groups (30 participants each) according to their aerobic fitness and level of physical activity. Participants were asked to locate a word within lists of 13 items. Targets were either shown in advance (Experiment 1) or defined by their semantic category (Experiment 2). Older adults were expected to take longer to find target words, and high levels of physical activity to reduce or suppress this performance impairment. As expected, older adults displayed lower reaction times in both experiments. In Experiment 1, chronic exercise was associated with better performance among older, but also young adults. In Experiment 2, in contrast, no significant effect of physical activity was observed. In summary, the impact of chronic exercise on visual search performance was task-dependent.

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(5051)

**The Effects of Domain General and Health Knowledge on Reading General and Health Texts among Older Adults with Hypertension.** JESSIE CHIN, DANIEL G. MORROW, ELIZABETH A.L. STINE-MORROW, XUEFEI GAO, THEMBI CONNER-GARCIA and JAMES GRAUMLICH *University of Illinois College of Medicine, Michael D. Murray, Regenstrief Institute and Purdue University*—While there is much evidence that health knowledge influences understanding of health texts, little is known about the processing mechanisms underlying this effect. We used the moving window paradigm to examine attention allocation to reading health and domain-general texts among older adults with hypertension varying in general and health knowledge. Mixed-effects modeling (with crossed random effects for subjects and items) suggested that general knowledge facilitates word-level processing and conceptual integration during reading both general and health texts. Health knowledge further engendered earlier conceptual integration in the health texts, as measured by differential allocation to intrasentence integration but less at the end of the sentence. The results showed that knowledge gave readers a head start in building a textbase representation of the ideas conveyed by the sentence. An association between intrasentence integration and later recall suggested that this strategy improved comprehension.

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(5052)

**Age and Short Term Sleep Deprivation.** ELISHEVA BEN-ARTZI, *Center for Academic Studies*, EPHRAIM GROSSMAN, *Bar Ilan University*, HARVEY BABKOFF, *Ashkelon Academic College and Bar-Ilan University*—Recent studies report that the elderly are less affected by sleep loss and report higher levels of subjective arousal than younger people when assessed during the morning. This is consonant with reports that aging is often accompanied by advanced sleep syndrome and phase shift in the circadian rhythm leading to better performance during morning hours. In the present study we ask whether the reported ability of the elderly to withstand the effects of sleep loss is due to their circadian phase shift, or does aging provide protection against sleep loss even when circadian phase advance is controlled. We measured subjective arousal ratings, working memory and choice RT on a morning following 26 hours of sleep deprivation in 41 individuals aged 20-70. Circadian phase, measured by sleep onset and wake times was significantly advanced in older individuals as was the subjectively reported tendency to "morningness". There were significant age-related decrements in choice RT and working memory and higher levels of arousal with and without sleep deprivation. In addition, the negative impact of sleep deprivation on working memory was significantly reduced among older individuals even when controlling for the advanced circadian phase.

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(5053)

**Constraints on Statistical Learning: Active Adjoinment and Task Set.** JOHN L. JONES and MICHAEL P. KASCHAK, *Florida State University*—Relations between stimuli (contingencies, dependencies, etc.) provide valuable information about regularities and uncertainties in the environment. Statistical and associative mechanisms thought to be responsible for learning such information are commonly assumed to be passive and automatic. The feasibility of such learning mechanisms is questionable, however, because the magnitude of the possible associative links exceeds the neurological potential for stimulus relation encoding. Constraints are needed to limit learning processes to profitable stimulus information. The current research explores two such constraints. The first one yields successful learning of a relation between stimuli only when they are actively co-processed in a manner that adjoins them, for example, by means of a comparison. Secondly, relations between stimuli are better learned when they or (some of) their features are relevant to completing a goal directed task. These constraints provide a powerful and effective means to demarcate target information for learning processes.

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#### ● EXPLICIT MEMORY IV ●

(5054)

**Examining the Role of Initial Testing on False Memories in the Social Contagion Paradigm.** MARK J. HUFF, *University of Calgary*, SARA D. DAVIS and MICHELLE L. MEADE, *Montana State University*—We examined the role of initial testing on susceptibility to socially presented misinformation using the social contagion paradigm (Roediger, Meade, & Bergman, 2001). In Experiment 1, participants who completed an initial categorically-cued recall test were just as likely as participants who were not initially tested to falsely recall suggested items on a subsequent recall test. Interestingly, on a final source-monitoring recognition test, initially tested participants were relatively less likely to falsely attribute the suggested items to the study episode. Subsequent experiments varied the parameters of the initial test by providing participants with corrective feedback (Experiment 2) and by using an item-cued recall test (Experiment 3). Results showed that initial testing with feedback reduced susceptibility to socially presented misinformation on both the subsequent recall and final source-monitoring tests, demonstrating that some types of initial tests protect against false memories in the social contagion paradigm.

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(5055)

**The Recall Advantage of Sounds versus Words: A Dual Coding Account.** ROBERT J. CRUTCHER, *University of Dayton*—The auditory picture superiority effect (Crutcher & Beer, 2011), in which environmental sounds (e.g. the sound of someone laughing) are recalled better than the spoken verbal labels for those sounds (e.g. the word “laughing”), is readily explained by dual coding theory (Paivio, 2007): Sounds are more likely to activate multiple representational codes at encoding because of a probabilistic bias to verbally label perceptual stimuli (pictures or sounds) but not the other way around. This interpretation is strengthened by experiments showing that imagining the corresponding sounds while listening to the verbal labels of those sounds, equalizes recall of sounds and words (Crutcher & Beer, 2011). The experiments reported here further strengthen a dual coding account by showing that incidental instructions to label the stimuli increases the recall advantage of sounds over words compared to a variety of controls, including: an intentional-labeling group, a free strategy group, and an intentional-no instructions group.

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(5056)

**Retrieval-Induced Forgetting in Memory for Odours.** JO SAUNDERS, MARCELLE FERNANDES and SOPHIE WILLIAMS, *Swansea University*—Memory for hard-to-describe sensory information can be impaired following attempts to describe it (verbal overshadowing), whereas related research indicates that it is non-described information that is drawn from the described category that is subject to impairment (retrieval-induced forgetting). Memory impairment was, therefore, examined for memory for odours. In Experiment 1, participants smelled odours before either describing half the odours (description condition), being re-presented with half the odours (re-presentation condition) or completing verbal distracter tasks (control condition). Recognition for non-described scents from the described category was impaired compared to the no description control participants (i.e., retrieval-induced forgetting). Re-presentation did not initiate retrieval-induced forgetting. Metacognitive judgments of ability to evoke emotions and pleasantness were found not to be affected by retrieval-induced forgetting (Experiment 2). Semantic and episodic generation of verbal labels were found to both initiate retrieval-induced forgetting (Experiment 3). The findings are discussed in terms of inhibitory processes.

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(5057)

**Illusory Recollection of Studied Location.** KARIN M. BUTLER and BRYAN A. FRANKS, *University of New Mexico*—The illusory recollection of source information for false memories was examined using the DRM paradigm (Deese, 1959; Roediger & McDermott, 1995). One explanation of illusory recollection proposes that source information is borrowed from studied items with the highest

association to the theme. Alternatively, gist-based accounts suggest that source attributions for themes are derived from the source information associated with a set of studied items. We manipulated the assignment of studied items with varying BAS to different locations. Falsely recalled themes were more likely to be attributed to the locations of High-BAS studied items, replicating the source-strength effect and consistent with content borrowing. However, when Medium-BAS items were studied before High-BAS items and an empty location was between them, themes were attributed to the location of the studied Medium-BAS items more often than to the studied location of High-BAS items, suggesting that gist-based representations of source also guide illusory recollection.

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(5058)

**Examining Selective Directed Forgetting.** REBECCA H. KOPPEL, BRITTANY WILSON, TARA A. JOBE and BENJAMIN C. STORM, *University of Illinois at Chicago*—Recent work by Delaney, Nghiem and Waldum (2009) has shown that individuals can selectively forget specific information in memory, a phenomenon referred to as selective directed forgetting. In their study, participants learned facts about two fictitious characters. Some participants were told to remember all of the facts about both characters (remember condition) whereas other participants were told to forget facts about one character to help them remember facts about the other character (forget condition). After a 90 s delay, all participants learned facts about a third character. On a subsequent test, participants in the forget condition were less able to recall facts about the character they were told to forget than were participants in the remember condition. In the current study, we sought to replicate Delaney et al.'s experiment and to elucidate the theoretical mechanisms underlying the effect. Unfortunately, results from two experiments failed to provide any evidence of selective directed forgetting.

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(5059)

**Threshold Priming in Cued Recall Performance.** GEOFFREY B. MADDOX and DAVID A. BALOTA, *Washington University in St. Louis*—Past studies examining the influence of threshold priming on episodic memory performance have primarily used recognition tests in which familiarity can serve as a basis for the memory decision (e.g., Jacoby & Whitehouse, 1989). This issue has been relatively unexplored in studies examining more explicit, recollection-based retrieval (e.g., cued-recall). In the current experiments, participants initially studied a list of unrelated paired associates (DOG-CHAIR) and then completed an immediate cued recall test in which each test trial (DOG-????) was briefly primed (and both forward and backward masked) with the target word (CHAIR), an associatively related word (TABLE), or an unrelated word (APPLE).

Results revealed a significant facilitatory priming benefit of the identical prime in both recall accuracy and response latency. Results from a subsequent delayed cued recall test indicated reliably greater forgetting in the identity condition compared to the related and unrelated conditions.

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#### (5060)

**Are Mental Blocks Forgotten during Creative Problem Solving due to Inhibitory Control?** GENNA ANGELLO, *Texas A&M University*, BENJAMIN C. STORM, *University of Illinois at Chicago*, ELIZABETH L. BJORK, *University of California, Los Angeles*, STEVEN M. SMITH and TAKASHI YAMAUCHI, *Texas A&M University*—Associates of a retrieval cue compete for access, impeding retrieval of targets. Inhibitory control resolves this competition, resulting in retrieval-induced forgetting for strong associates (Anderson, Bjork, & Bjork, 1994) and associates that participants are instructed to remember (Storm, Bjork, & Bjork, 2007). Similarly, incorrect associates can compete with access to creative solutions and are forgotten when tested following problem solving (Storm, Angello, & Bjork, in press). The present study investigated whether this problem-solving-induced forgetting is the result of inhibitory control resolving competition during problem solving by manipulating competition during problem solving. Participants were instructed to remember or forget incorrect associates before working on a Remote Associates Test problem. If problem-solving-induced forgetting is caused by inhibition, then associates participants are told to remember should suffer more forgetting than associates participants are told to forget, and implications of our findings for various accounts of problem-solving-induced forgetting are discussed.

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#### (5061)

**Differential Effects of Retrieval Practice on the Retention of Coherent and Incoherent Text Material.** MARIO DE JONGE, HUIB TABBERS and REMY RIKERS, *Erasmus University Rotterdam* (Sponsored by Diane Pecher)—Research has shown that retrieval practice can enhance long-term retention of text material. In two experiments we investigated the effect of retrieval practice with a fill-in-the-blank test on the retention of complex text. In Experiment 1, using a coherent text, we found no benefit of retrieval practice compared to a restudy (control) condition. In Experiment 2, text coherent was disrupted by scrambling the order of the sentences. The material was subsequently presented as a list of facts as opposed to connected discourse. We found that, for the incoherent version of the text, retrieval practice slowed down the rate of forgetting and enhanced retention compared to a restudy (control) condition. The results suggest that the connectedness of material can play an important role in determining the magnitude of testing benefits for long-term retention. Retrieval practice seems especially beneficial for

disorganized materials and less so for highly structured materials.

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#### (5062)

**False Memory and Importance: Can We Prioritize Without Consequence?** DUNG C. BUI, *Washington University in St. Louis*, IAN M. MCDONOUGH, *University of Texas at Dallas*, MICHAEL C. FRIEDMAN and ALAN D. CASTEL, *University of California, Los Angeles*, JOEL MYERSON, *Washington University in St. Louis*—The Deese-Roediger-McDermott (DRM; Roediger & McDermott, 1995) paradigm highlights the phenomenon by which people study a list of associated words, and falsely remember a related, but never studied word. Previous work has shown that people can selectively remember words paired with high-point values, and fewer low-point value words, leading to value-directed remembering (see Castel, 2008). However, little is known about how these false memories are affected by how important it is to remember specific information. To examine this, participants studied DRM lists with each list associated either with low, medium, or high point values. Results replicated previous findings; recall was better for high value words relative to low value words. More importantly, our results indicated that processing high value lists increased false memory intrusions as well, suggesting that value processing alters attention by increasing relational processing. Our findings suggest that prioritizing incoming information comes at a cost of accurate memory.

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#### (5063)

**Organizational Strategy and Recall: Effects of Divided Attention at Encoding vs. Retrieval.** LAURENCE TACONNAT, BADIAA BOUAZZAOUI, MICHEL ISINGRINI and SEVERINE FAY, *University of Tours, France*—Organizational strategy is a useful process which may improve recall when it is implemented. However, this strategy is known to be an effortful process, which does not always conduct to an increase in recall in individuals with low processing resource, (i.e. utilization deficiency Gaultney et al., 2005). Whether controlled processes are more involved at encoding or retrieval is not clear. In this experiment, effects of divided attention (DA) at encoding and retrieval were compared on free-recall and cued-recall tasks and organizational strategy (assessed by an index of clustering: ARC) and on the relation between these two variables, which quantified the utilization deficiency. Results showed that DA at encoding affected more recall performance and ARC scores than DA at retrieval and that cues provided at test could reduce this effect. Performance in recall and ARC scores were not correlated when participants learn or recall under divided attention, reflecting a utilization deficiency.

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(5064)

**Psychometric Properties of Retrieval-Induced Forgetting.** JENNIFER L. BRIERE, TAMMY A. MARCHE and LAURIE HELLSTEN, *University of Saskatchewan*—Repeatedly retrieving information from memory has been shown to induce forgetting of related, un-retrieved information below baseline, termed retrieval-induced forgetting (RIF; Anderson, Bjork & Bjork, 1994). In the current research, stability and alternate-forms reliability estimates were evaluated through correlations of 4 RIF tasks using 2 sets of equated category-word pairs and 1 set of facts in sentence format. Convergent- and divergent-validity estimates were evaluated through correlation of RIF scores and scores on the Cognitive Failures Questionnaire (CFQ) and the Social Desirability Scale-17 (SDS-17), respectively. Preliminary analysis (n=24) indicates that although RIF was obtained on all 4 tasks, stability reliability was obtained for the set of category-word pairs that participants completed twice, 2 weeks apart, with no evidence for alternate forms reliability. Divergent validity was obtained through non-significant correlations between the RIF tasks and scores on the SDS-17, however evidence of convergent validity was not obtained when correlating CFQ and RIF scores.

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(5065)

**Developmental Differences in Controlled Retrieval.** THOMAS C. LORSBACH, *University of Nebraska at Omaha*, JASON F. REIMER, *California State University, San Bernardino*, MARY J. FRIEHE, *University of Nebraska at Omaha*—The present study examined whether developmental differences exist in memory control when retrieval must be restricted to highly specific information. Following the procedure of Luo and Craik (2009), participants (grades 3, 6, or college) were presented with words in three different contexts: with a black line drawing, with a colorized line drawing, or alone without a picture. Six recognition tests were then presented that varied in the demands (high or low) placed on the retrieval of specific information. High specificity tests consisted of words (targets and distracters) that had been studied with images (black or colorized line drawings), while low specificity tests contained words that had been studied as words alone or with one of the two images (black or colorized drawings). Analysis of recollection scores revealed that age differences were present on high, but not low specificity tests, with the performance of third graders being disproportionately affected the demands of high specificity tests.

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(5066)

**Modeling Intentional Forgetting in Depressed Individuals.** MELISSA LEHMAN, *Purdue University*, KENNETH J. MALMBERG, *University of South Florida*—Past research has shown that depressed individuals are unable to forget or ignore unwanted information of a

negative nature. Some have proposed that this is due to an inhibitory deficit associated with depression (Power, Dalgleish, Claudio, Tata, & Kentish, 2000). We tested the inhibitory deficit hypothesis with an experiment examining list-method directed forgetting of neutral materials in depressed and non-depressed participants. Contrary to the predictions of an inhibitory deficit hypothesis, depressed individuals were better able to forget the to-be-forgotten information than nondepressed individuals. These findings are consistent with a context-change hypothesis of directed forgetting, and these data were fit with the Lehman-MalMBERG model of memory (Lehman & MalMBERG, 2009).

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(5067)

**F>R IOR in Item-Method Directed Forgetting as a Bias Against Responding to a Source of Irrelevant Information: Can 'Source' be Something Other Than a Spatial Location?** KATE THOMPSON and TRACY L. TAYLOR, *Dalhousie University*—In item-method directed forgetting, there is a greater magnitude of IOR after F than R items. Taylor and Fawcett (in press) have interpreted this as a bias against responding to an irrelevant source of information. The present experiments were designed to determine whether, if the F>R IOR difference represents a bias against responding to a source of irrelevant information, this 'source' could be something other than a location. Participants were presented simultaneously with a word and a face, followed by an R or F instruction. Then, another face was presented (either the same, or a new face), and a response was required (E1: go/no-go, E2: gender discrimination). Participants should be slower to respond to the same face compared to a new face due to a bias against responding to this source. The results of these experiments are compared, and conclusions about whether the bias generalized to sources other than location are discussed.

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(5068)

**The Paradoxical Effects of Detailed Plans on Complex Prospective Memory.** JILL R. SETTLE, DEBORAH M. CLAWSON, L. ERIN FRITSCH and MARC M. SEBRECHTS, *The Catholic University of America*—In a study of complex prospective memory, participants were instructed to complete several errands in a virtual-reality town. After reading a letter about the errands that included subtasks, rules, and order constraints, subjects were directed either to write an initial plan for completing the errands or to simply begin executing the errands. The plan was then removed from view; however all subjects could consult the original letter and a map. The plan group completed more tasks overall and broke rules less frequently than the control group, while consulting the letter and map less often. However, more detailed plans led to more time-based prospective memory errors, and there was a tradeoff between performance effects of order planning and subtask planning. Participants whose plans reflected more order



constraints completed fewer subtasks, whereas those whose plans included more subtask details committed more order errors. Mental workload appears to play a role. Although planning improved overall task completion, specific aspects of planning affected that relationship.

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(5069)

**To Have and to Hold: Episodic Memory in 3- and 4-Year-Old Children.** DAMIAN K. SCARF, JULIEN GROSS, MICHAEL COLOMBO and HARLENE HAYNE, *University of Otago* (Sponsored by K. Geoffrey White)—Episodic memory endows us with the ability to reflect on our past and plan for our future. At present, the developmental emergence of episodic memory is unclear. Here, we show that while both 3- and 4-year-old children can form episodic memories, 3-year-old children have difficulty holding onto those memories following a delay (Experiments 1 & 2). In contrast, 4-year-old children are able to retain episodic memories over delays of 24 hours (Experiment 1) and 1 week (Experiment 2). This marked change in the retention of episodic memories between 3- and 4-years-of-age suggests that it is our ability to retain, rather than to form episodic memories that limits our ability to recall episodes from early childhood. These findings have important implications for childhood amnesia suggesting it is the emergence of the ability to retain, rather than to form, episodic memories that marks the offset of childhood amnesia.

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(5070)

**Cry Me Beaver: False Memory for Mediated and Direct Associations.** JENNIFER H. COANE, *Colby College*, MARK J. HUFF, *University of Calgary*, KEITH A. HUTCHISON, *Montana State University*, JESSICA E. BLAIS and ELIZABETH B. GRASSER, *Colby College*—In the Deese-Roediger-McDermott (DRM) paradigm, participants study lists of words (e.g., water, bridge, run) that are related to a non-presented critical lure (CL, e.g., river). According to activation/monitoring accounts, activation spreads in semantic networks to the CL and monitoring failures result in false memories. After studying lists of direct or mediated (e.g., faucet, London, jog) items, participants either: 1) completed a recall test; 2) completed a recall test with a warning about the CL; 3) guessed the CL; or 4) completed arithmetic problems. On a final recognition test, both warning and guessing decreased false recognition for direct DRM lists, but increased false recognition for mediated lists. It is argued that warning and guessing instructions result in reactivation of the pathways associated with the CL, which is countered by an enhanced monitoring ability to identify and exclude the CL for direct DRM, but not mediated, lists.

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## ● AUTOMATIC PROCESSING ●

(5071)

**Reflexive Orienting To Pointing Hands and Arrows.** TY W. BOYER, NATSUKI ATAGI and BENNETT I. BERTENTHAL, *Indiana University*—Directional cues, such as averted gaze and arrows influence spatial attention (e.g., Kuhn & Kingstone, 2009; Tipples, 2008), with some evidence of automatic effects for biologically relevant but not non-biologically relevant stimuli (Friesen et al., 2004). The current study was designed to extend this investigation to other deictic gestures; specifically, to examine the influence of pointing hands and arrows on spatially cued responses. A two-alternative forced choice response time paradigm was used to test localization of a peripheral target (an asterisk) that appeared to the right or left of a pointing hand or arrow stimulus cue that appeared for a stimulus onset asynchrony (SOA) of 100 or 600 ms. Participants were instructed that on 75% of the trials the stimulus cue was counterpredictive of the target location. Nevertheless, responses were faster when the stimulus cue was congruent with the target at the 100 ms SOA, and, conversely, were faster when the stimulus cue was incongruent with the target at the 600 ms SOA. Contrary to the evidence for automatic cueing of attention via eye gaze as greater than via arrows, these results show that both hand and arrow automatically orient covert attention equally at short SOAs.

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(5072)

**Psychophysical Test for the Interaction between Numerosity and Area.** MIDORI TOKITA and AKIRA ISHIGUCHI, *Ochanomizu University*—A number of studies have suggested that the processes underlying perception of approximate numerosity are independent from those underlying perception of other dimensions such as area, texture, duration and luminance. On the other hand, some studies have shown that perceptual variables affect the performance of numerosity comparison. In this study, multidimensional signal detection analysis was used to distinguish among the possible interaction between the numerosity of a set of stimuli and summed area of the set. The results showed that there were perceptual interactions between processes for the numerosity and the summed area; numerosity perceived independently when their numerosity difference was large and when the set size of numerosity was small.

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(5073)

**Fast and Slow effects in an Emotional Stroop Task and Anxiety.** JESSICA Z. MARRINGTON, GEORGINA A. TOLAN and XOCHITL DE LA PIEDAD GARCIA, *Australian Catholic University*—The Emotional Stroop Task is a widely used method of demonstrating that certain stimuli can disrupt performance through the biasing of attention. This bias was thought to be fast, occurring on a

single trial. More recently, research has shown that threatening material can disrupt colour-naming performance beyond its presentation. Currently, there is no consensus as to the duration of the disruption and whether it is isolated to threatening material. Additionally, this has not been explored in individuals with differing types of anxiety. This study (N = 114) examined the role of both fast and slow components of attentional bias in non-anxious, state-anxious, and trait-anxious individuals. Evidence of both fast and slow effects emerged with differential patterns noted for each anxiety group. Additionally, results indicated that it is not necessarily the threatening nature of material that disrupts performance with high arousing positive stimuli also causing interference.

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(5074)

**Time Course of the Effects of Spatial and Hand Correspondence Between Pointing Hand Stimulus and Manual Response.** AKIO NISHIMURA and CHIKASHI MICHIMATA, *Sophia University*—We investigated the time course of the effects of spatial compatibility (i.e., correspondence of pointing direction and key position) and imitative compatibility (i.e., correspondence of presented hand and responding hand) between task-irrelevant pointing hand stimulus and bimanual left/right key press responses. Depending upon the color of a centrally presented visual target, participants pressed either a left or right response key. When a pointing hand stimulus was briefly presented before the onset of the target, spatial compatibility effect was observed, whereas imitative compatibility effect was not. The spatial compatibility effect was larger for the stimulus of index finger than that of little finger, indicating the spatial compatibility effect based on intention of others. With longer presentation of the pointing hand stimulus, both the spatial and the imitative compatibility effects were observed. Both direction and identity of the perceived pointing hand would automatically affect action of an observer, with different temporal properties.

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(5075)

**Physical Fitness and Performance on the ANT and O-Span Tasks: Implications for Workplace Safety.** KYLE STANYAR, PAUL MERRITT, ROBERT SINCLAIR and JIM MCCUBBIN, *Clemson University*, GABRIEL COOK, *Claremont-McKenna College*—With increasing levels of obesity and declining fitness levels, there is emerging concern over how fitness levels may be associated with cognitive operations such as central executive functions and attention tasks. Reductions in such abilities related to fitness would have consequences for safety in a variety of occupations such as transportation and manufacturing sectors. We set out to examine how overall fitness measures such as body-mass index, percentage body fat, basal metabolic rate, resting heart rate, and blood pressure are

associated with performance on both the O-Span tasks of working memory (Unsworth, Heitz, Shrock & Engle, 2005) and the Attentional Network Test (ANT; Fan, McCandliss, Sommer, Raz & Posner, 2002). We also examined the effects of acute exercise on the ANT by examining performance at rest and following a 3-minute step test (a proxy measure of cardiovascular fitness). Exercise has been shown to improve mindfulness, which in turn has been shown to improve performance on the ANT. We found evidence that fitness levels and acute exercise are associated with ANT performance. Implications for the application of this research to workplace safety are discussed.

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(5076)

**What Does Response Selection Select in Skilled Typewriting?** MOTONORI YAMAGUCHI, GORDON D. LOGAN and VANESSA LI, *Vanderbilt University*—Performance suffers when two responses must be selected concurrently. This dual-task interference is often studied in the psychological refractory period (PRP) effect, a slowing of responding to the second of two successive stimuli as the interval between the stimuli decreases. The PRP effect reflects an immutable bottleneck in which only one response can be selected at a time. We asked what responses are selected when skilled typists type 3-5 letter words followed by a tone they classify with a vocal response. If typists select the whole word as a response, then tone RT should not vary with word length. If typists select individual letters as responses, then tone RT should increase with word length in proportion to the interval between successive keystrokes. The data support the former alternative, suggesting that response selection process selects whole words and activates individual keystrokes in parallel.

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(5077)

**In Search of Klein's 'Semantic Gradient'.** YULIA LEVIN and JOSEPH TZELGOV, *Ben Gurion University*—Sharma and McKenna (1998), following the work of Klein (1964), suggested the existence of a 'semantic gradient' within the Stroop-interference effect; meaning that a stronger connection between a word and related color concept leads to greater interference. The present study aimed to replicate these findings with Hebrew (Experiment 1) and Russian (Experiment 2) native speakers using the same paradigm but with stimuli types being presented in mixed instead of blocked order. In both experiments, color words elicited faster RTs and colored shapes elicited slower RTs than color associates, neutral words, and letter strings, with the latter three conditions yielding similar RTs. Surprisingly, even the exact replication of Sharma and McKenna's method in Hebrew (Experiment 3) exposed the same pattern. According to the present results, the (semantic) distance of a word from the color-word in an incongruent Stroop stimulus doesn't modulate response latency.

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(5078)

**Examining Psychological Distance in a Flanker Task.** XIAOANG WAN, *Tsinghua University*—In the construal-level theory (CLT), psychological distance is egocentric and refers to the distance of a stimulus from self, here, and now (e.g., Trope & Liberman, 2010). We propose that psychological distance should also refer to the allocentric distance between two stimuli which is independent from the perceiver's direct experience. For example, one may perceive that the temporal distance between January and March is closer than that between January and July, which is independent of now; one may also perceive that the social distance between "student" and "teacher" is closer than that between "student" and "principal", which is independent of self. We tested the automatic processing of the allocentric psychological distance in a flanker paradigm. We manipulated the temporal or social distance between the target word and flanker words to examine how the flanker compatibility effect was affected by temporal or social spacing. The underlying mechanisms were discussed. Email: Xiaoang Wan, [wanxa@mail.tsinghua.edu.cn](mailto:wanxa@mail.tsinghua.edu.cn)

#### ● COGNITIVE CONTROL IV ●

(5079)

**Context-Sensitive Adjustments of Control: Divergent vs. Convergent Creative Thinking Determine Between-Task Interference in Dual-Tasks.** RICO FISCHER, *Technische Universitaet Dresden*, BERNHARD HOMMEL, *Leiden University*—Performing two tasks simultaneously requires the adjustment of control to shield the primary task from concurrent processing of the secondary task, thus, minimizing between-task interferences. Investigating control adjustments in dual-task coordination, we primed participants with a creativity task that calls for divergent thinking (assumed to induce a more parallel, integrative cognitive-control state) or a creativity task that calls for convergent thinking (assumed to induce a focused and narrow cognitive-control state). As expected the induced control state by the priming task determined the quality of subsequent dual-task processing. Participants showed increased between-task interference after having carried out a divergent-thinking task than after a convergent-thinking task. Therefore, prior tasks containing conditions of "loose" or "focused" thinking alter control states in subsequent dual-task coordination. Email: Rico Fischer, [fischer@psychologie.tu-dresden.de](mailto:fischer@psychologie.tu-dresden.de)

(5080)

**Encoding and Choice in the Task Span Procedure.** KAITLIN M. REIMAN, STARLA M. WEAVER and CATHERINE M. ARRINGTON, *Lehigh University*—The task span procedure (Logan, 2004) combines task switching and working memory paradigms to examine the executive control processes allowing for flexible control of behavior and manipulation of stored information. The present research extended past work with the task span paradigm to

investigate encoding processes and volitional sequence generation. Experiment 1 replicated the standard task span procedure, with measurements of encoding behavior, investigating the effects of sequence complexity on RT and memory data. Experiment 2 required participants to generate spans and memorize their chosen sequence rather than encoding an externally-defined list. Across both experiments, results suggested that as the complexity of a sequence increased, performance measures decreased for both encoded and generated sequences. Additionally, performance measures in Experiment 1 reliably predicted sequence generation behaviors in Experiment 2. Individuals appear sensitive to the demands a particular sequence might have on their cognitive systems, and thus choose spans accordingly to limit cognitive effort.

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(5081)

**Control of Eye Movements: Effects of Stimulus Type On Flanker Effects and Conflict Adaptation.** BETTINA OLK, CLAUDIA PESCHKE and CLAUS C. HILGETAG, *Jacobs University Bremen, Germany*—Control of eye movements requires suppression of interfering information. In the flanker paradigm, saccades are made in the direction indicated by a central target while ignoring peripheral flankers. We examined eye movement control as a function of type of orienting (involuntary, voluntary). To this end, we assessed whether the type of target and flanker (arrow/involuntary, letter/voluntary) modulated flanker and trial sequence effects. Significantly stronger flanker effects were obtained for arrows than for letter flankers, indicating that the automaticity with which arrows are processed and involuntary orienting following arrows increases their impact. For letters, flanker effects were only observed when participants looked in the direction of the flanker. Inter-trial effects showed no conflict adaptation effect for arrows. For letters, however, performance improved for incongruent trials when the preceding trial was also incongruent, suggesting that the impact of involuntary orienting is short-lived, but the impact of voluntary orienting persists across trials.

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(5082)

**Control Mechanism Resolves Conflict through Suppression of the Distractor Dimension.** JAEYONG LEE, MIN WOO KIM and YANG SEOK CHO, *Korea University* (Sponsored by Gregory Francis)—A smaller congruency effect is obtained after an incongruent trial than a congruent trial. It has been suggested that this congruency sequence effect is due to the control process triggered by conflict. In order to investigate the nature of the control mechanism, it was examined whether the congruency sequence effect was evident between two different tasks with the identical distractor dimension but different target dimensions. Participants were to perform four-choice Simon and spatial Stroop tasks in an alternating way with a one-

hand response set in Experiment 1 and similar Simon and Spatial Stroop tasks with two-hand response set in Experiment 2. In both experiments, a significant congruency sequence effect was obtained between the two tasks even with the removal of the target and the distractor repetition trials. These findings provide evidence that the control mechanism resolves conflict by suppressing the distractor dimension when the two tasks share a response set.

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(5083)

**Higher Trait Anxiety Associated with Slower Overriding of Prior Task Sets.** LEE J. ALTAMIRANO, DANIEL E. GUSTAVSON, DANIEL P. JOHNSON, MARK A. WHISMAN and AKIRA MIYAKE, *University of Colorado at Boulder* (Sponsored by L. E. Bourne)—To test the relationship between anxiety and the influence of prior task sets on executive control, 92 undergraduates were given a cued asymmetric switching paradigm, where one task is more prepotent than the other. The less prepotent task requires more effort to perform, so that the task set remains active even after switching to the prepotent task. Larger switch costs are, therefore, seen in the prepotent task. In our paradigm, arrows appeared on the left or right side of the screen (prepotent location task), pointing left or right (direction task). Cues indicated which dimension to respond to on each trial. We found that higher anxiety symptoms were unrelated to switch costs, until the cue-response mapping was reversed. After the reversal, higher anxiety symptoms were associated with increased carryover after switching away from the prepotent location task, as measured with slower reaction times. We suggest that the initial task set mapping remains active for longer in highly anxious participants, so that after the reversal they must exert extra effort to override the prior mapping in addition to performing the current task. This effect still remained after controlling for the influence of co-occurring depressive symptoms.

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(5084)

**Exposure To Negative Emotional Stimuli Reduces the Efficacy of Subsequent Response Inhibition.** AGATHA LENARTOWICZ, *UCLA*, ELLIOT T. BERKMAN, *University of Oregon*, RUSS A. POLDRACK, *University of Texas, Austin*, BARBARA J. KNOWLTON, *UCLA*—Previous findings suggest that control mechanisms are compromised in the presence of negative stimuli. We examined whether negative emotional events would also impact performance on a non-concurrent control task. We tested 55 subjects on the stop-signal task after they viewed either negatively emotional or neutral images. During the stop-signal task, subjects made a key press response to a cue on most trials, with a tone given on some trials signaling that they should inhibit the response after it had been initiated. Stopping performance was impaired following the viewing of negatively emotional pictures, resulting in reduced stopping performance. Performing a task in which subjects regulated their emotional responses enhanced stopping. The

present results demonstrate that negative emotional events can impact control processes prospectively, thus through pathways other than by directly reorienting attention. Furthermore, the mechanism of emotion inhibition does not appear to share substrates with that of response inhibition.

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(5085)

**A Bayesian Parametric Approach for the Estimation of Stop-Signal Reaction Time Distributions.** DORA MATZKE and CONOR V. DOLAN, *University of Amsterdam*, GORDON D. LOGAN, *Vanderbilt University*, SCOTT D. BROWN, *University of Newcastle*, ERIC-JAN WAGENMAKERS, *University of Amsterdam*—The cognitive concept of response inhibition can be measured using the so-called stop-signal paradigm. In this paradigm, participants perform a two-choice reaction time task where, on some of the trials, the primary task is interrupted by a stop-signal that instructs participants to withhold their response. The dependent variable of interest is the latency of the unobservable stop response (stop signal reaction time or SSRT). Based on the horse-race model (Logan & Cowan, 1984), several methods have been developed to estimate SSRTs. None of these approaches, however, allows for the reliable estimation of the entire distribution of SSRTs. Here we introduce a Bayesian parametric approach that addresses this limitation. Our method is based on the assumptions of the horse-race model and rests on the concept of censored distributions. The method assumes that SSRTs are ex-Gaussian distributed and uses Markov chain Monte Carlo sampling to obtain posterior distributions for the model parameters. The method can be applied to individual as well as hierarchical data structures. We present the results of a number of parameter recovery studies and apply our approach to published data from stop-signal experiments.

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(5086)

**Post-Stop-Signal Slowing: Strategies Dominate Reflexes and Implicit Learning.** PATRICK G. BISSETT and GORDON D. LOGAN, *Vanderbilt University* (Sponsored by Timothy McNamara)—Control adjustments are necessary to balance competing cognitive demands. The stop-signal paradigm is well-suited to explore control adjustments, as subjects must balance initiation and inhibition. We explored whether post-stop-signal adjustments were reflexive, strategic or based upon implicit learning by manipulating the probability of stop trial repetition. In one experiment, we introduced a contingency in which stop signals could never repeat and found that eliminated or reversed post-stop-signal slowing. In another experiment, we presented cues that indicated whether stop signals were likely (80%) or unlikely (20%) to repeat and found that greatly increased (80%) or decreased (20%) post-stop-signal slowing. Last, we changed stop trial repetition probability every 21 trials, and showed that the post-stop-signal adjustments occurred on the very first trial after cues



indicating repetition probability. These results suggest that fast-acting strategies dominate post-stop-signal slowing, implicit learning plays a secondary role, and reflexive adjustments are not involved.

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(5087)

**Below Baseline Suppression of Competitors in Semantic Interference Resolution.** M. KARL HEALEY, *University of Pennsylvania*, K. W. JOAN NGO and LYNN HASHER, *University of Toronto*—Using a novel paradigm we provide evidence that resolving semantic competition entails suppression of rejected competitors. On each trial of Phase 1 a cue word was presented and participants were prompted to either generate a closely related word or one with as little relation to the cue as possible. Producing an unrelated should require suppression of the cue's close associates. In Phase 2 participants read a list of words as quickly as possible, including the strongest associate of each cue word and control words. Participants were slower to name associates of cues they had seen in the Unrelated condition than associates of cues from the Related condition. Naming of associates from the Unrelated condition was even slower than that of control words, suggesting unrelated associates were suppressed to below baseline levels.

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(5088)

**Eye Movements Reveal No Immediate 'WOW' Effect in Autism Spectrum Disorder.** VALERIE BENSON, *University of Southampton*, MONICA S. CASTELHANO, *Queens University*, SHEENA K. AU-YEUNG, KEITH RAYNER, *University of California San Diego*—Autistic Spectrum Disorder (ASD) and Typically Developed (TD) adult participants viewed pairs of scenes for a simple, spot the difference (STD), and a complex, which one's weird (WOW) task. There were no group differences in the STD task but the ASD group took longer to respond manually, and to begin fixating the target 'weird' region for the WOW task. Additionally, as indexed by the first fixation duration into the target region, the ASD group failed to 'pick up' immediately on what was 'weird'. Underconnectivity within and between neural systems at the level of the cortex could underpin observed deficits and the findings have potential significance for ASD in the social processing domain.

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### ● LETTER/WORD PROCESSING III ●

(5089)

**The Role of Non-Adjacent Letter Bigrams and Embedded Words in Letter Identification.** GIORDANA GROSSI, *SUNY New Paltz*—According to bigram theories, word recognition involves the activation of both adjacent and non-adjacent letter bigrams. Evidence mainly hinges on masked priming experiments. The role of non-adjacent letter bigrams was tested in a forced-choice letter identification

task, where contextual effects are consistently observed. Adjacent letter bigram frequency and non-adjacent letter bigram frequency were orthogonally manipulated (low, high). Also, for half of the stimuli, the first, third, and fifth letters formed a word. Letters in the central position were identified more accurately when embedded in letter strings with high compared to low adjacent letter bigram frequency. Furthermore, this effect was qualified by an interaction with non-adjacent letter bigram frequency: for nonwords (low adjacent letter bigram frequency), accuracy was lower when non-adjacent letter bigram frequency was high compared to low. The presence of embedded words did not impact letter identification. Results are discussed in terms of theories of orthographic processing.

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(5090)

**Distributional Analysis of the Transposed-Letter Neighborhood Effect On Naming Latency.** REBECCA L. JOHNSON, *Skidmore College*, ADRIAN STAUB, *University of Massachusetts Amherst*, AMANDA M. FLERI, *Skidmore College*—Printed words that have a transposed-letter (TL) neighbor (e.g., angel has the TL neighbor angle) have been shown to be more difficult to process, in a range of paradigms, than words that do not have a TL neighbor. In order to investigate why difficulty occurs, here we fit the ex-Gaussian distribution to naming latencies. The results indicate that the effect of a TL neighbor elicits long response times on a subset of trials, rather than shifting the entire distribution of response times. This suggests that the TL effect involves inhibiting an incorrect output, rather than broader competition between lexical entries.

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(5091)

**Position Specification of Chinese Radicals -- Data From RT and ERPs.** SAM-PO LAW, I-FAN SU and CASSIE MAK, *University of Hong Kong*—Previous investigation of spatial information of Chinese radicals in orthographic representation has reported conflicting findings (e.g. Ding, Peng, & Taft, 2004; Tsang & Chen, 2009). Differing from previous work, radical position information in this study is conceived in terms of relative frequencies across different positions in a character. A lexical decision task in a masked priming paradigm focusing on radicals with a preferred position was conducted. The prime was presented for 48ms or 96ms. It might share a radical with the target in the same or different positions. Moreover, the shared radical might appear in its preferred or non-preferred position in the target. Responses were significantly faster for the same than different position and for the long prime duration. Relevant ERP results revealed a marginally greater negativity elicited by radicals in their non-preferred position appearing in the same position as in the prime, compared with different position in N170, and greater positivity for the non-preferred



than preferred position in P200, in long prime duration only. These findings suggest that spatial specification is an inherent feature of the radical and weighted according to relative frequency of occurrence.

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(5092)

**Visual Word Recognition of Nonwords: Insights From the English Lexicon Project.** MELVIN J. YAP, *National University of Singapore*, DARAGH E. SIBLEY, *Haskins Laboratories*, DAVID A. BALOTA, *Washington University*, ROGER RATCLIFF, *Ohio State University*, JAY RUECKL, *University of Connecticut*—Researchers have extensively studied how the statistical properties of words (e.g., frequency, length, imageability) influence lexical processing. However, the relationships between lexical variables and nonword recognition are less well understood. In the present study, we examine these phenomena using item- and participant-level analyses of lexical decision data from the English Lexicon Project (ELP; <http://ellexicon.wustl.edu>). Item-level analyses indicated that letter length, syllable length, neighborhood density, and orthographic Levenshtein distance-20 influenced word and nonword recognition in qualitatively and quantitatively distinct ways. Participant-level analyses revealed that individuals' sensitivity to a variable in word recognition latencies (e.g., orthographic N) strongly predicted their sensitivity to the same variable in nonword recognition latencies. Moreover, the relationships between word recognition efficiency (as reflected by RT distributional characteristics, diffusion model parameters, and vocabulary knowledge) and sensitivity to stimulus dimensions were moderated by lexicality. The implications of these findings for models of word recognition are discussed.

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(5093)

**A Rational Model of Eye Movement Control in Reading.** KLINTON BICKNELL and ROGER LEVY, *University of California at San Diego*—We provide a rational model for understanding eye movement control in reading, in which the task of reading is taken to be sentence identification. In this model readers move their eyes to obtain noisy visual input, which they combine with probabilistic language knowledge through Bayesian inference to yield gradient posterior beliefs about sentence form and structure. Simulations reveal that the model naturally accounts for many effects of linguistic variables on eye movements. This contrasts with current leading models of eye movement control in reading (e.g., Reichle et al., 2009; Engbert et al., 2005), which account for these phenomena by directly stipulating the shape of the effects of these variables on word processing rate functions. This rational model thus provides both a new way of understanding reading behavior and begins to answer the call to incorporate more detailed accounts of lexical processing into models of reading (Reichle et al., 2003).

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(5094)

**The Transposed-Letter Effects in Hangul Word Recognition.** SUN-KYOUNG KIM and HYE-WON LEE, *Ewha Womans University*—Hangul (Korean alphabets) is written in syllabic blocks (usually composed of CVC letters) in which onset, nucleus, and coda have fixed positions. Phonological changes often occur across syllabic boundaries. We explored transposed-letter effects in Hangul words by comparing priming effects of TL nonwords (exchanging two letters of target words) and controls (substituting them with other letters) in lexical decision task. Changed letters are coda and onset of the first and second syllables (E1), or codas of two syllables (E2). The question of E1 was whether phonological changes influence TL effects. We didn't find TL effects whether or not the prime is phonologically changed. In E2, TL primes were created by exchanging codas of target words spelled originally (underlying-TL condition), or spelled following pronunciations after phonological change (surface-TL condition). We found greater priming effects in both TL conditions than control condition. Interestingly, the magnitudes of effects were similar in two TL-conditions.

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(5095)

**Preview Effects of Plausibility and Character Order in Reading Chinese Transposed Words.** JINMIAN YANG and KEITH RAYNER, *University of California, San Diego*—The current paper examined the role of plausibility information in the parafovea for Chinese readers by using two-character transposed words (in which the order of the component characters are reversed, but are still words). The meaning of a transposed word can be identical or different when the order of its component characters is reversed. The results of two eye-tracking experiments indicated that readers were not slowed down by a reverse preview word (which was the target word with the order of its characters reversed) when it was plausible in the sentence. However, when the reverse preview words were implausible, reading slowed down for the target words. This plausibility preview effect was independent of whether the reverse words shared the meaning with the target words or not. Furthermore, the reverse preview words yielded shorter fixation durations than the control preview words as the reverse preview words provided useful orthographic information for the processing of the target words. Implications of these results for preview processing during Chinese reading are discussed.

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(5096)

**Individual Differences in Word Naming: A Mega-Study, Item Effects, and Dual-Route Cascaded Models.** JAMES S. ADELMAN, *University of Warwick*, MAURA G. SABATOS-DEVITO, *University of North Carolina---Chapel Hill*, SUZANNE J. MARQUIS, *University of Warwick*—Normal individual differences are rarely considered in the modeling of visual word recognition —

with item response time effects and neuropsychological disorders being given more emphasis — but such individual differences can inform and test accounts of the processes of reading. One hundred participants read aloud words selected to assess theoretically important item response time effects on an individual basis. Using two major models of reading aloud — DRC and CDP+ — we sought numerical parameters to best model each individual's response times to see if this would allow the models to capture the effects, individual differences in them and the correlations among these individual differences. It did not. We interpret DRC's failures as potentially due to its use of perfect representation of the vocabulary and left-aligned representations. We interpret CDP+'s failures as due to sensitivity to statistical spelling-sound regularities that are not evidenced in humans. The database offers a set of important constraints for future modeling of visual word recognition, and is a step towards integrating such models with other knowledge about individual differences in reading.

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(5097)

**Imageability and Age of Acquisition Effects in Disyllabic Word Recognition.** JOCELYN SCHOCK and MICHAEL J. CORTESE, *University of Nebraska at Omaha*, MELVIN J. YAP, *National University of Singapore*—Imageability and age of acquisition (AoA) effects for disyllabic words were examined in reading aloud and lexical decision. Imageability and AoA estimates were collected for 3,000 disyllabic words. Next, item reaction time z scores and accuracy rates for 1,937 of these words were obtained from the English Lexicon Project. These items were chosen because they allowed us to examine imageability and AoA while controlling for the variables examined by Yap and Balota (2009). Both imageability and AoA accounted for unique variance in lexical decision and reading aloud reaction times and accuracy. The reading aloud results contrast with Cortese and Khanna's (2007) monosyllabic word study in which imageability did not account for unique variance in reaction times. The discrepant results indicate that meaning contributes more to the reading aloud of multisyllabic words than monosyllabic words. This increased semantic influence for disyllabic words may be related to processing time and/or spelling-to-sound consistency.

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(5098)

**Rapid Serial Naming in Dyslexic and Typical Readers: Evidence from Eye Movements.** MANON JONES, *Bangor University*, JANE ASHBY, *Central Michigan University*—Fluent reading requires coordinated, serial processing of multiple items, an ability known to be impaired in dyslexia. Using a serial naming task (e.g., RAN), we investigated the phonological and orthographic processes that contribute to serial naming speed. In two multi-line contingent-change experiments, we recorded eye movements and eye-voice

span as adult dyslexic and non-dyslexic readers' named adjacent letter pairs (in a 10x5 letter grid) that were visually (e.g., p-q) and phonologically (e.g., k-q) confusable. Experiment 1 tested how the second, confusable letter was processed parafoveally; Experiment 2 tested how the second letter was processed foveally. Both visual and phonological similarity slowed serial processing more for dyslexic readers than for typical readers, but with different time courses. We discuss how these findings contribute to our understanding of reading fluency in dyslexic readers.

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## ● CONCEPTS AND CATEGORIES II ●

(5099)

**Individual Differences in Learning Tendency Predict Learning of Economics.** CYNTHIA FADLER, JI HAE LEE, MICHAEL K. SCULLIN, MICHAEL J. CAHILL, JILL T. SHELTON and MARK A. MCDANIEL, *Washington University in St. Louis*—Concept learning has been widely studied for decades; however, little attention has been paid to the role of individual differences. The present study first used a laboratory-based concept learning task to classify people according to different learning tendencies: rule- vs. exemplar-based learners. Next, we investigated whether an individual's learning tendency could predict the ability to learn educationally relevant materials. After being classified as a rule or exemplar learner, participants viewed an economics lecture embedded with practice problems. Participants then solved repeated practice problems along with novel transfer problems. The exemplar-based learners performed better on the repeated problems, suggesting their reliance on memory for those during the lecture. The rule-based learners performed better on the transfer problems, suggesting their application of abstracted rules to novel problems. Also, performance differed based on previous experience with economics, indicating the influence of prior knowledge in concept learning.

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(5100)

**Multiple Systems in Real-World Category Learning.** JOHN P. CLAPPER, *California State University, San Bernardino*—There is increasing evidence for the existence of multiple category learning systems in the brain, but how do these systems partition the task of learning in complex, real-world domains? One hypothesis is that highly distinctive categories are recognized spontaneously by an automatic novelty detection system while categories with similar neighbors are learned incrementally by an explicit rule-learning system. In these experiments, participants learned three species of birds, two of which were similar to each other and the third more distinctive. Experiment 1 showed that the distinctive category was learned considerably faster than the similar categories, as predicted by the two-system account. Experiment 2 showed that learning of similar categories could be increased by

presenting a list of diagnostic features with each example early in training, consistent with a strategy based on explicit rule learning (identifying individual diagnostic features). Further experiments will search for additional dissociations indicating that similar vs. distinctive categories are acquired by qualitatively different learning systems.

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(5101)

**On the Relationships Between Acquired Knowledge and Manifested Behaviors.** TOSHIHIKO MATSUKA, *Chiba University*, SACHIKO KIYOKAWA, *Chubu University*, HIDEHITO HONDA, *Chiba University*—In the present study, we examined whether or not acquired knowledge and manifested behaviors have a one-to-one relationship using a category-learning task. The stimulus set used in the experiment consisted of two redundant diagnostic dimensions and thus allowed multiple approaches for perfect categorization. The results showed that participants, who paid attention to a single diagnostic dimension at the later phase of learning trials, were able to correctly categorize the stimuli using the other dimension in the generalization test in which the dimension that was attended at the learning trial was made inaccessible, indicating that acquired knowledge allows several behaviors to be manifested. We, then, developed two computational models in order to account for this phenomenon. In one model knowledge is represented with multiple independent coefficient vectors where each vector representing a unique strategy. In other model, knowledge is represented with random variables with “optimized” distributions. The results of simulations showed that both models successfully replicated the phenomenon.

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(5102)

**Learning Categories From an Intermittent Teacher.** JOHN V. MCDONNELL and TODD M. GURECKIS, *New York University* (Sponsored by Brian McElree)—Category learners typically experience at least two types of learning episodes. In some cases, category members are simply observed (unsupervised learning), while in other cases a teacher provides a category label or name (supervised learning). These two types of learning are often studied independently of one another, despite the fact that many influential models of category learning treat them as equivalent. We devised a task in which the distribution of labeled and unlabeled items each suggested alternative organizations of a category. This design allowed us to specifically evaluate the degree to which learners combined information from both types of learning episodes. In contrast to a number of recent findings in the categorization literature, we show that participants can integrate information from both labeled and unlabeled category exemplars. These results lend further credence to models which assume that supervised and unsupervised category learning are best viewed as part of a unitary category learning process.

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(5103)

**Property Inclusion in Combined Concepts: Effects of Inference and Meta-knowledge.** CHRISTINA L. GAGNE and THOMAS L. SPALDING, *University of Alberta*—Connolly, Fodor, Gleitman and Gleitman (2007) found that the judged likelihood of properties of modified nouns (baby ducks have webbed feet) is reduced relative to unmodified nouns (ducks have webbed feet), and this work has initiated a debate about whether properties of combined concepts are directly inherited during the initial stages of conceptual combination (e.g., Hampton, 1997) or whether they arise during a post-compositional inferential processing stage (e.g., Connolly et al., 2007; Fodor, 1994). We present three experiments that tested key predictions of these two theoretical positions. In Experiment 1, we used generic statements containing either an unmodified or modified noun, but we extended the original work by Connolly et al. (2007) by including a property verification task and by obtaining a measure of ease of processing. Experiments 2-3 included statements containing content-free modifiers (chonk ducks have webbed feet) to examine the extent to which the modification effect is influenced by the content of the modifier and knowledge about the combined concepts. Our results provide support for a framework in which properties are inferred after a structural interpretation has been derived.

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(5104)

**Constructing Representations through Iterated Relational Learning.** MATT JONES, JAMES FOSTER and FABIÁN CAÑAS, *University of Colorado*—Constructing new representations is a primary computational challenge for any cognitive system. Discovering concepts and features that capture the structure of the environment is critical to learning adaptive behavior. However, the computational principles and mechanisms by which the brain constructs, refines, and selects among representations are still poorly understood. We suggest much of representation learning is founded on mechanisms of analogical reasoning. Theories of analogical learning and relational predication propose that identification of common relational structure across multiple scenarios can lead to formation of new concepts. This project explores, computationally, what happens when these and related learning mechanisms are iterated. We develop a hierarchical representational framework in which all concepts are both objects (i.e., potential elements in relational systems) and relations (i.e., structured systems of constituent objects). The model’s ability to incrementally discover hierarchical structure is then explored in simulation studies in complex artificial environments.

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(5105)

**Not All Distance Effects Are Created Equal: Examining Three Commonly-Studied Symbolic Numerical Distance Effects.** NATHANIEL BARR and ERIN A. MALONEY, *University of Waterloo*, DANIEL ANSARI, *University of Western Ontario*, JENNIFER A. STOLZ and JONATHAN FUGELSANG, *University of Waterloo*—The numerical distance effect (NDE) is a hallmark effect in numerical cognition research. As this effect arises similarly in multiple variants of numerical tasks (e.g., comparison, priming), conventional wisdom has suggested that these NDEs all result from the same underlying mechanisms. In the present study we examine the reliability of two numerical comparison tasks (two-digit comparison and lower/higher than 5) and a numerical priming task that all elicit the NDE. We then assess the degree to which the NDEs elicited in each task are correlated with each other, and with performance on an addition task. We found that although each of these tasks were relatively reliable, neither of the three tasks were correlated, and only the two-digit comparison task was correlated with performance on the addition task. Results are discussed with respect to their implications for the use of the NDE as a metric of numerical processing and representation.

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(5106)

**Laypeople's Views of the Communicability of Mental and Medical Disorder Categories.** LINDZI L. SHANKS and JESSECAE K. MARSH, *Texas Tech University*—Our prior research indicates undergraduate students believe medical and mental disorders are communicable. The current study was aimed towards understanding the underlying cognitive mechanisms participants use to justify these communicability beliefs. Participants answered questions measuring endorsement of disorder communicability, length of time necessary to catch a disorder, and were asked to list ways in which they believed it was possible to catch each disorder. While our previous studies have indicated participants rate mental and medical disorders as equally communicable, participants used different causal mechanisms to describe how to catch mental and medical disorders. Medical disorders were described as being caught through mainly physical transmission, whereas mental disorders were described as being caught mainly through social transmission. Both medical and mental disorders were rated as being caught through the environment. Overall, mental disorders were rated as taking significantly longer to catch regardless of mechanism. We discuss possible explanations for these findings.

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(5107)

**A Generative Model of Causal Cycles.** JAY B. MARTIN and BOB REHDER, *New York University*—Causal graphical models (CGMs) have become popular in numerous domains of psychological research for representing people's causal knowledge. Unfortunately, however, the CGMs typically used in cognitive models prohibit representations of causal cycles. Building on work in machine learning, we propose an extension of CGMs that allows cycles and apply that representation to one real-world reasoning task, namely, classification. Our model's predictions were assessed in experiments that tested both probabilistic and deterministic causal relations. The results were qualitatively consistent with the predictions of our model and inconsistent with those of an alternative model.

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(5108)

**Implicit and Explicit Processes in Category-Based Induction.** STEPHANIE Y. CHEN and GREGORY L. MURPHY, *New York University*, BRIAN H. ROSS, *University of Illinois at Urbana-Champaign*—In category-based induction (CBI), people use category information to predict unknown properties of exemplars. When an item's classification is uncertain, normative Bayesian principles suggest that predictions should be based on information from all its possible categories. However, previous research has found that predictions are often based on only one category. The present research investigates the possible distinction between implicit and explicit processes in CBI. Property predictions took the form of either a catching task (implicit), or a formally identical verbal task (explicit). Subjects performed both tasks in the same test session. When making predictions implicitly, subjects considered multiple categories. When making predictions explicitly, subjects also considered multiple categories, but not in the manner Bayesian analysis predicts. These results provide support for a distinction between implicit and explicit processes in CBI and furthermore argue that the same category knowledge may result in normative or nonnormative responding, depending on the response mode.

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(5109)

**Modeling Creative Idea Generation Using LSA.** SERGEY V. BLOK, ISIAH HARBISON, HENK J. HAARMANN and MICHAEL BLOODGOOD, *University of Maryland, College Park* (Sponsored by Joseph Dien)—Tests of creative verbal cognition often use an open-ended idea generation format and measure three related but theoretically distinguishable constructs: productivity (the number of ideas generated); flexibility (the diversity of semantic categories in the response set) and originality (the



rarity of an idea across respondents). We show that response similarity as determined by Latent Semantic Analysis on an open-ended test of creativity is inversely related to participants' category flexibility score determined by human raters. This suggests that methods of statistically representing semantic information may provide a method of automatically scoring creativity measures. We discuss these findings in terms of application to creative information search, machine-assisted problem solving, and automated assessment of creative abilities.

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(5110)

**Cued Creativity using a Verb Generation Task: Validation of a Novel Paradigm.** RANJANI PRABHAKARAN, *Yale University*, ADAM E. GREEN, *Georgetown University*, JEREMY R. GRAY, *Yale University*—We developed a novel task for assessing creative cognition that provides a more objective measure of the novelty of participants' responses and is suitable for neuroimaging. We validated this task by demonstrating its relationship with performance across a battery of creativity measures. In the verb generation task, participants are asked to say a verb when presented with a noun; in cued conditions, they are asked to respond creatively. Latent Semantic Analysis (LSA) was used to assess semantic distance (SD) between nouns and verbs. SD values were significantly lower in the cued versus uncued condition, indicating more unusual responding. Additionally, SD values in the cued, but not uncued, condition were correlated with performance on diverse creativity measures, even after controlling for intelligence and personality. These results provide further evidence for the role of an explicit cue in enhancing participants' abilities to generate creative semantic associations, and validate a new task.

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(5111)

**Fuzzy Signal Detection Account of Perceptual Classification.** COREY J. BOHIL, *University of Central Florida*—Fuzzy signal detection theory (Hancock, Masalonis, & Parasuraman, 2000) extends traditional signal detection theory by allowing partial membership in "signal" and "noise" categories. This reflects the common situation where physical stimulus properties are representative of more than one response class. Signal detection can be considered "fuzzy" when either signal, response, or both are non-binary. As a result, fuzzy signal detection may shed new light on perceptual-classification task performance where stimulus values vary continuously along perceptual dimensions, but responses are discrete (e.g., 2 categories). This presentation explores systematic differences in prediction between traditional and fuzzy signal detection theory in the context of perceptual classification tasks. Some notable differences include a tendency toward smaller (and less variable) values of discriminability ( $d'$ ) and bias ( $\beta$ ) measures in fuzzy SDT than in traditional SDT. Data from

previous studies is analyzed to evaluate predictions related to category discriminability, base-rates and payoff ratios.

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(5112)

**Modeling the Effect of Mood on Dimensional Attention during Categorization.** MATTHEW T. ZIVOT and ANDREW L. COHEN, *University of Massachusetts*, AYCAN KAPUCU, *Ozyegin University*—Classification is a flexible process that can be affected by mood. The goal of this research is to evaluate the idea that mood may modulate categorization behavior through an attentional weighting mechanism in which mood changes the attention afforded to different stimulus dimensions. In two experiments, participants learn and are tested on categories while in a calm, happy, or sad mood. In Experiment 1, whereas sad participants are fastest to learn one- and two-dimensional category structures, happy participants show an advantage on a three-dimensional category structure. In Experiment 2, the Generalized Context Model of categorization is used to measure dimensional weighting. The results suggest that sad participants have a narrower focus of attention, but that the narrowing tends to be on diagnostic dimensions. In contrast, happy participants have a wider focus of attention and greater between-subject variability in the dimensions attended.

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(5113)

**Response Location Effects in Categorization: Evidence for Multiple Systems Or Task Complexity?** SAFA R. ZAKI, *Williams College*, DAVID F. KLEINSCHMIDT, *University of Rochester*—According to COVIS, an influential multiple-systems model of category learning, an implicit procedural system governs learning of information-integration category structures, whereas a rule-based system governs learning of explicit rule-based categories. Support for this model has come in part from demonstrations that motor interference, in the form of inconsistent mapping between response location and category labels, disrupts the learning of information integration category structures but has no effect on rule-based category structures. We argue that this response location manipulation results in a more cognitively complex task in which feedback is difficult to interpret. We attempted to attenuate cognitive complexity by providing more information in the feedback that participants received in our experiment. This modified feedback eliminated the observed performance deficit for the information integration category structure condition. Our data support the idea that task complexity, and not separate systems, might be the source of this particular dissociation between performance on rule-based and information-integration tasks.

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## ● BILINGUALISM II ●

(5114)

**Evaluating Lexical Access and Executive Function in Late Bilinguals, Lifelong Bilinguals, and Monolinguals.** SABRA D. PELHAM and LISE ABRAMS, *University of Florida*—Relative to monolinguals, lifelong bilinguals exhibit both cognitive advantages and disadvantages, specifically better executive function abilities but deficits in lexical access. This study investigated whether late bilinguals, defined as becoming bilingual in adolescence or later, manifest the advantages and disadvantages typical of lifelong bilinguals. Monolinguals, late bilinguals, and lifelong bilinguals completed an executive function task (flanker task) and a lexical access task (picture naming). In terms of executive function, both bilingual groups demonstrated an advantage compared to monolinguals, evidenced by smaller response time costs for incongruent trials. In contrast, both bilingual groups showed lexical access deficits with slower picture naming times compared to monolinguals, and late bilinguals were slower than lifelong bilinguals when naming in their non-dominant language. These results are discussed in terms of a language interference account of bilingualism, where controlling interference from the non-use language requires executive control, enhancing executive function and slowing lexical access.

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(5115)

**The Differential Role of Executive Function in Trilingual Language Switching.** JARED A. LINCK, *University of Maryland Center for Advanced Study of Language*, JOHN W. SCHWEITER, *Wilfrid Laurier University*, GRETCHEN SUNDERMAN, *Florida State University*—Recent studies of bilingual speech production suggest that different executive functions (EFs) contribute to the cognitive control of language production. However, no study has simultaneously examined the relationship between different EFs and language control during online speech production. The current study examined individual differences in three EFs (working memory, inhibitory control, and task switching) and their relationship with performance on a trilingual language switching task for a group of fifty-seven native English (L1) speakers learning French (L2) and Spanish (L3). Analyses indicate complex interactions between EFs and language switching: better inhibitory control was related to smaller L3 switch costs, whereas better working memory was related to larger switch costs in the L1 as well as the L2 and L3, but only when switching from the L1. These results suggest unique contributions of each EF to cognitive control during language switching. We discuss the theoretical implications for multilingual language production.

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(5116)

**The Effect of Spontaneous Production of Translation Equivalents on Lexical Retrieval in ASL-English Bilinguals.** JENNIE E. PYERS and RACHEL MAGID, *Wellesley College*, KAREN EMMOREY, *San Diego State University*, TAMAR GOLLAN, *University of California, San Diego*—Bilinguals have more TOTs than monolinguals, possibly in part because translation equivalents compete for selection. We examined the frequency of spontaneous production of translation equivalents by 31 ASL-English bilinguals during a picture-naming task to identify if production of translations affects lexical retrieval. Twenty-six participants produced at least one ASL translation ( $M=7.33$ ,  $SD=5.88$ ) when attempting an English target. Translation equivalents were produced for only 5% of successful retrievals but for 44% of TOTs. 63% of TOTs accompanied by a translation equivalent were resolved, whereas 90% of TOTs were resolved without translation equivalents. TOTs accompanied by translation equivalents took longer to resolve (8.31s) than TOTs where no translation was produced (5.04s). When controlling for the time spent in a TOT, TOT resolution is not affected by translation equivalent production. These data suggest competition between languages at the lemma level, but could also reflect strategic attempts to resolve a TOT.

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(5117)

**Does Bilingualism Incur a Cost to Language Production?** CARI A. BOGULSKI and JUDITH F. KROLL, *Pennsylvania State University*—Bilinguals are sometimes slower than monolinguals to name pictures in the native language (L1). The weaker links hypothesis argues that the larger number of associative connections in the bilingual lexicon renders it functionally lower frequency (e.g., Gollan et al., 2008). In contrast, competition for selection assumes that the cost for bilinguals is due to cross-language competition (e.g., Kroll et al., 2006). In two experiments, we tested these alternatives. In Experiment 1, native English speakers who were functionally monolingual or who spoke Spanish as a relatively proficient L2 performed a picture naming task in English alone. There were no group differences. To determine whether the results were due to the large number of pictures with high frequency names, in Experiment 2 bilinguals named pictures in both languages but in counterbalanced order and using a great frequency range. Here, there was indeed a cost to bilingualism, with slower naming for bilinguals than monolinguals. However, bilinguals who named pictures in L1 after naming in L2 were slower than those who did the reverse. Taken together, the results are more easily understood within a competition for selection account.

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(5118)

**What ERPs Tell Us About Asymmetries in Cross-language Translation.** RHONDA MCCLAIN, *Pennsylvania State University*, TAOMEI GUO and BINGLE CHEN, *Beijing Normal University*, JUDITH F. KROLL, *Pennsylvania State University* (Sponsored by Wido La Heij)—How do second language (L2) learners come to understand the meaning of L2 words? There is debate as to whether learners mediate the L2 through the first language (L1) or conceptually process L2 from the start (e.g., Brysbaert & Duyck, 2009; Kroll & Stewart, 1994). We report a study that exploits the sensitivity of ERP measures to examine translation performance in relatively proficient late learners of English as the L2. Chinese-English bilinguals translated words in each direction of translation in the presence of picture distractors that were either semantically or phonologically related to the words to be produced. Although distractors influenced performance in both translation tasks, only forward translation revealed early sensitivity to the semantics of the picture distractor in the ERP measures. We ask whether the observed asymmetries are a consequence of time course differences in the L2 vs. L1 or reflect a difference in the form of word-to-concept mappings across the two languages.

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(5119)

**The Bilingual Advantage: Conflict-Monitoring, Cognitive Control, and Syntactic Ambiguity Resolution.** SUSAN E. TEUBNER-RHODES, ALAN MISHLER and RYAN CORBETT, *University Maryland, College Park*, MONICA SANZ-TORRENT, *University of Barcelona*, JOHN C. TRUESWELL, *University of Pennsylvania* JARED M. NOVICK, *University Maryland, College Park*—Previous research reveals balanced bilinguals outperform monolinguals on tasks requiring cognitive control (CC), namely when resolving interference among competing representations. Considering findings demonstrating CC enables recovery from misinterpretation during language processing, we show bilinguals' CC advantage impacts syntactic ambiguity resolution. Spanish-Catalan bilinguals and Spanish monolinguals completed (1) a reading task involving temporarily ambiguous sentences susceptible to misanalysis and unambiguous baselines; (2) a high- or low-interference N-back memory task; and (3) a posttest form of the reading task. Bilinguals were more accurate than monolinguals in the high-interference but not the low-interference N-back. During reading, bilinguals were more accurate across all items, suggesting their comprehension advantage was not specific to revising misinterpretations. Accuracy improvement throughout N-back on interference trials selectively predicted bilinguals', but not monolinguals', improvement from pre- to posttest on sentences requiring reinterpretation. We discuss how bilinguals' enhanced conflict-monitoring (frequent switching between interference and non-interference trials) affects language processing.

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(5120)

**Age of Second Language Acquisition Predicts Enhanced Executive Control in Bilingual Adolescents.** JOANNA C. BOVEE, KARA MORGAN-SHORT, KATHERINE A. BRILL and GARY E. RANEY, *University of Illinois at Chicago*—It has been established that compared to monolinguals, some bilinguals show enhanced executive control but not enhanced working memory. This set of findings, however, has been largely undetectable in adolescents. The current study examines the relation between adolescents' second language learning experience and executive control and working memory. Native English speaking adolescents, who were enrolled in high school Spanish but had differing levels of experience with the language, completed an executive control task (Simon) and a working memory task (reading span), and provided language background information. Results showed that learners' age of acquisition of Spanish was a significant predictor of the Simon effect's size but did not predict performance on the reading span task. These findings suggest that bilinguals' enhanced executive control is evident even during an age at which it is considered to be at near peak performance levels but that this advantage does not extend to working memory.

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(5121)

**Bilingual Experience and Inhibitory Control Influence Novel Word-Form Learning.** SCOTT R. SCHROEDER, VIORICA MARIAN, ANTHONY SHOOK, JAMES BAROLOTTI and SARAH A. CHABAL, *Northwestern University*—We examined the influence of bilingual experience and inhibitory control on novel language acquisition. Using a statistical learning paradigm, participants learned words in two Morse-code based languages. First, participants listened to a continuous stream of Morse-code words to test word segmentation ability. Since Morse sounds are distinct from natural language sounds, interference from known languages was low. Next, participants listened to another Morse language that conflicted with the first. Interference in the second language was high due to conflict between languages and due to the presence of two colliding cues (compressed pauses between words and statistical regularities) that competed to define word boundaries. Results indicated that bilingualism can improve word learning when interference from other languages is low, while inhibitory ability can improve word learning when interference is high. We conclude that the ability to extract words from continuous speech is affected by linguistic experience and cognitive ability.

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(5122)

**Resolution of Lexical Competition in Monolingual and Bilingual Listeners.** DEANNA FRIESEN, MICHAEL RAKOCZY and ELLEN BIALYSTOK, *York University*—The reported advantage for bilinguals in nonverbal executive control (EC) tasks has been attributed to their use of EC to resolve competition from the non-target language. However, monolinguals also experience competition from semantically and phonologically related words, a situation that does not lead to EC advantages. We used event-related potentials (ERPs) to investigate how monolinguals and bilinguals resolve conflict in a picture selection task. Participants saw two pictures that varied in their relationship to each other, heard a word naming one of them, and indicated the named picture. For all participants, semantic distractors created significantly more interference than phonological distractors, which in turn created more interference than unrelated control pictures. However, the bilinguals showed a smaller RT cost and smaller N400 amplitude to semantic distractors, indicating less interference. This greater bilingual facility in dealing with semantic competition is proposed to underlie the bilingual advantages found for nonverbal conflict resolution.  
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(5123)

**Repercussions of Early Translation Experience: Is There a Brokering Advantage?** JYOTSNA VAID, BELEM LOPEZ and SUMEYRA TOSUN, *Texas A&M University*—Language brokering is the practice whereby an individual translates on behalf of a family member. Bilingual adults with extensive early brokering experience have been shown to perform differently on metalinguistic tasks than their proficiency-matched counterparts who did not engage in language brokering in childhood (Vaid, Chen, Rao, & Manzano, 2006; Vaid, Milliken, Lopez & Rao, 2011). The present study examined the impact of language brokering in two domains: categorization (category exemplar generation) and divergent thinking (the Remote Associates Test). It was hypothesized that prior brokering experience would be associated with greater cross-language convergence in category exemplar generation and with greater success in identifying remote associates in each language. Two groups of Spanish-English bilinguals (brokers and non-brokers) were compared. The findings are discussed in terms of their implications for research on “the bilingual advantage” and, in particular, for the need to move beyond the view of bilingualism as a homogeneous category.  
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## ● REASONING AND PROBLEM SOLVING ●

(5124)

**Estimation Bias in Bounded and Unbounded Number Line Tasks.** DARYN R. BLANC-GOLDHAMMER and DALE J. COHEN, *University of North Carolina Wilmington*—Participants generally use a proportion estimation strategy to complete the traditional bounded number line task. We developed an unbounded number line task in which participants use an integer estimation strategy (Cohen & Blanc-Goldhammer, 2011). Here we present detailed data on how participants perform both tasks in a judgment condition (whereby participants judge target numbers from positions on a line) and three estimation conditions (whereby participants estimate the position of a line from target numbers).  
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(5125)

**Repeated Deductive Reasoning on Logic Table Problems.** JOHN BEST, *Eastern Illinois University*—Dual-systems theories of conditional reasoning (e.g., Evans, 2004) argue that reasoning can be accomplished by either a fast (associationistic) or slow (logical) system. The Dynamic Graded Continuum (DGC) position (Osman, 2004) argues instead that the representation underlying reasoning changes with repeated exposure. To explore this, participants solved a series of three “logic table” problems. Half of the participants were randomly assigned to an Isomorphs condition in which only the problem’s cover story was changed while the logical relationships among the problem’s predicates were maintained. Half of the participants were assigned to a Different Structures condition: The factual statements were manipulated so that different logical relationships existed among the problem’s predicates. Contrary to the implications of the DGC position, reasoners showed a reduction in solution time in the Different Structures condition equivalent to that of the reasoners in the Isomorphs condition, while improving in deductive accuracy across the set of problems.  
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(5126)

**Eye-Movements Reflect Information Search in Memory During Diagnostic Reasoning.** AGNES SCHOLZ, *TU Chemnitz*, KATJA MEHLHORN, *University of Groningen*, JOSEF F. KREMS—Diagnostic reasoning aims at describing cognitive processes to find a best explanation for a given set of observed symptoms. Till now, it was hardly possible to trace information search when observations are retrieved from memory. The current experiment used eye-tracking as a process-measure to study diagnostic reasoning. The method is based on the observation that people fixate on blank locations if a relevant visual stimulus previously occupied that spatial location. 42 participants first learned the causal structure underlying possible hypothesis with

each hypothesis being presented in a different spatial area. During hypothesis testing, the display was empty. Participants showed more fixations towards spatial areas that were associated with currently valid hypothesis both when new observations were presented as well as when giving the diagnosis. More transitions were made between valid in comparison to invalid areas. Therefore, eye-movements can provide an online-measurement tool of foregoing cognitive processes in diagnostic reasoning.

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(5127)

**Cascade Models of the Development of Speed, Memory, and Fluid Reasoning in Children.** DUNEESHA DE ALWIS, SANDRA HALE and JOEL MYERSON, *Washington University in St. Louis*—Processing speed, working memory, secondary memory, and fluid reasoning were assessed in a sample of 113 children, ages 6-12 years. Regression and path analyses revealed that working memory accounted for unique variance in fluid reasoning over and above that explained by secondary memory. This finding in children is consistent with the findings in adults reported by Shelton et al. (2010), but is inconsistent with the results of two other adult studies, one that found both working memory and secondary memory accounted for unique variance in fluid reasoning (Unsworth et al., 2009) and one that found that only secondary memory accounted for unique variance (Mogle et al., 2008). Importantly, the present results support the developmental cascade (Fry & Hale, 1996) account of age-related improvements in fluid reasoning, and also provide evidence for a second cascade involving age, speed, working memory, and secondary memory.

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(5128)

**Effects of Self Goal Setting on Insight Problem Solving.** SACHIKO KIYOKAWA, KATSUYUKI HAYASHI and TOSHIHIKO MATSUKA, *Chiba University*—Previous studies have shown that emphasizing the goal state could facilitate insight problem solving (e.g. Chronicle, MacGregor, & Ormerod, 2004; Kojima, Ito, & Matsui, 2008). In these studies, the goal states were given by the experimenters and the participants were instructed to reach the goal state. In the present study, we investigated whether or not the same facilitative effect could be obtained when the participants were forced to find the goal state by themselves before performing the tasks. We used the 6-coin problem and compared the performance between the self goal setting condition and the control condition (i.e., without self goal setting). The results showed that the participants in the self goal setting condition could solve the problem more often than those in the control condition. The results indicated that self goal setting is effective in solving the insight problem.

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(5129)

**The Effect of Cognitive Load on Communication Monitoring.** BROOKE N. MACNAMARA, SAM GLUCKSBERG and ANDREW R. A. CONWAY, *Princeton University*—The extent to which theory of mind is effortful in adults is unclear. The current study investigates the effect of cognitive load on communication monitoring, specifically keeping another person's perspective in mind (engaging theory of mind) while providing descriptive instructions. Cognitive load was manipulated between groups. All participants were assigned the role of speaker and tasked with describing locations of abstract compartments in an apparatus to "the receiver". There actually wasn't a receiver but participants were told that the receiver was another student, also participating for course-credit. Importantly, the speaker was told that the receiver was viewing the same apparatus but from a different angle. Participants under load provided significantly fewer non-egocentric descriptors ("the largest shape on an edge") but significantly more egocentric utterances ("the shape on the bottom left"). The results suggest that maintaining theory of mind while communicating, even in adults, is cognitively demanding and suffers under load.

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(5130)

**Individual Differences in Preferences for Evidence-Based Versus Affect-Based Arguments.** CARLOS R. SALAS and THOMAS D. GRIFFIN, *University of Illinois at Chicago*—In this study, participants read eight texts that provided either evidence-based or affect-based arguments for or against the theory of evolution. Results indicated that many participants did not report selective use of the evidence-based arguments. Some participants selectively used texts that they themselves acknowledge were less evidence-based and more affect-based. This selective use of texts was predicted by whether readers previously reported that they had based their evolution beliefs in evidence or emotional motivations. These results support competitive routes to belief in which affective concerns can directly determine belief without reasoning processes really being engaged.

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(5131)

**Individual Differences and Spontaneous Transfer During Analogical Problem Solving.** PATRICK J. CUSHEN and JENNIFER WILEY, *University of Illinois at Chicago*—What factors might allow for the seemingly rare occurrence of spontaneous transfer between distant (superficially dissimilar) sources and targets during problem solving? While previous research has emphasized the role of executive function in the final stage of analogical mapping, the current research explores the influence of several kinds of individual differences on earlier stages of analogical transfer, including both initial representation and spontaneous retrieval of potential source analogs. Following



the traditional paradigm, participants attempted to solve Duncker's radiation problem after having been exposed to relevant, but superficially dissimilar sources. Several individual differences measures were collected including a battery of executive function and divergent thinking tasks. Results suggest that individual differences may mediate the analogical transfer process.

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## ● JUDGMENT/DECISION-MAKING II ●

(5132)

**Impulsivity and Explicit Goals in Reward-Based Decision Making.** ERIC G. FREEDMAN, JULIE BROADBENT, BRUCE FRANCEK, DAVID LYNCH and RANDY GENGLER, *University of Michigan-Flint*—The present study investigated how individual differences in impulsivity (as measured by the BIS-11) affected performance on the Iowa Gambling Task (IGT) with explicit or implicit instructional goals. The IGT required deciding between advantageous (low immediate gains/better long term gains) and disadvantageous (higher immediate gains/larger long-term losses) choices. Explicit goals resulted in more advantageous choices than implicit goals as well as explicit goals produced a relatively greater increase in the number of advantageous choices with succeeding blocks of trials than with implicit goals. Whereas low impulsive individuals did well with both explicit and implicit goals, high impulsivity was associated with lower advantageous choices specifically when implicit goals were provided. In the early blocks, participants had longer decision times than in the later blocks. Thus, providing explicit goals is important for high impulsive individuals to form associations between choices and outcomes necessary to make future advantageous decisions.

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(5133)

**Interhemispheric Processing and the Anchoring Heuristic.** ANTHONY W. MCCOY and MAREIKE B. WIETH, *Albion College*—Anchoring occurs when individuals use previous information (the anchor) to help make a current decision. Strack and Mussweiler (1997) proposed that anchoring occurs through a more complex process of semantic priming instead of the relatively simple process of numerical priming originally proposed by Tversky and Kahneman (1974). Research looking at interhemispheric processing shows benefits for across hemisphere processing when resource demands of tasks are high, but within hemisphere benefits when resource demands of tasks are low (e.g., Banich, 1998). To test the relationship between the anchoring heuristic and interhemispheric processing, participants were presented with an anchor to either their right or left visual field and were asked to use either their right or left hand to make a response. Results showed that participants were more

anchored when visual information and motor output were processed within one hemisphere than across both hemispheres. These findings support a semantic priming view of anchoring.

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(5134)

**Is Bigger Better... or Just More Intense?** PAUL C. PRICE and ADRIENNE FAIRCHILD, *California State University, Fresno*—Larger stimuli are evaluated more positively than smaller stimuli for stimuli like individual alphanumeric characters and affectively neutral words. One explanation is that people have an innate preference for larger stimuli—a “bigger-is-better heuristic.” It is unclear, however, whether this is true for affectively negative stimuli. It could be that larger negative stimuli would be evaluated more negatively than smaller negative stimuli. We tested this idea using a paradigm developed by Meier et al. (2008), in which people evaluated words presented in a larger and a smaller font. We began by replicating the effect of size on affectively neutral words. The mean large-small difference on a -3 to +3 rating scale was 0.17 (SD = 0.30),  $t(21) = 2.67$ ,  $p = .014$ . Then we studied the effect of font size on mildly negative and positive words (e.g., “shark,” “honey”). Although there was no effect of font size for positive words, there was a marginal “bigger-is-worse effect” for the negative words. The mean large-small difference on a -5 to +5 rating scale was 0.19 (SD = 0.59),  $t(26) = 1.70$ ,  $p = .10$ . Although the pattern of results is not yet entirely clear, it may be that bigger is not always better. It may just be more intense.

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(5135)

**The Footbridge Reflects More Utilitarian Thinking Than the Trolley Dilemma: Effect of Number of Victims in Moral Dilemmas.** KUNINORI NAKAMURA and KIMIHIKO YAMAGISHI, *Tokyo Institute of Technology*—Waldman and Dieterich's (2007) “intervention myopia” hypothesis argued that the trolley dilemma enhances more utilitarian response than the footbridge dilemma because the former dilemma focuses on agent (trolley) whereas the latter dilemma focuses on patient (a big man). We argue that this hypothesis leads to a paradoxical prediction: Changing the number of victims triggers a larger effect in the footbridge dilemma than the trolley dilemma. To test this prediction, this study ran two experiments in which numbers of the victims in the trolley and footbridge dilemmas were manipulated. Results consistently showed an interaction between the dilemma type and the number of the victims, indicating that manipulation of the utilitarian aspect of moral dilemmas has more effect on the footbridge dilemma than has been considered as reflecting the deontologist thinking.

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(5136)

**Modeling Dynamic Decision-Making Behavior Under Single and Dual Task Conditions.** DARRELL A. WORTHY, A. ROSS OTTO and W. TODD MADDOX, *University of Texas at Austin*—We incorporated accumulating and replacing eligibility trace methods into reinforcement learning models to examine how working-memory (WM) load influenced behavior in a dynamic decision-making task. This task required learning that one option, while leading to a smaller short-term payoff, was ultimately advantageous because it led to larger payoffs on future trials. Data were fit with an Accumulating Eligibility Trace (AET) model that assumed memory traces for recent actions accumulated across trials, a Replacing Eligibility Trace (RET) model that assumed that memory traces were reset and did not accumulate across trials, and a random-responder model to identify non-learners. Participants without WM load performed better and were generally better fit by the AET, whereas participants under WM load performed worse and were better fit by the RET or random-responder models. These results suggest that WM load impairs participants' ability to accumulate eligibility traces from recent actions, which are needed to perform optimally. Email: Darrell A Worthy, [worthyda@tamu.edu](mailto:worthyda@tamu.edu)

(5137)

**The Effects of Divided Attention and Age on Magical Thinking and Semantic Categorization.** NADIA M. BRASHIER and KRISTI S. MULTHAUP, *Davidson College*—Magical thinking, or atypical causal belief, has been explained from multiple theoretical perspectives, one of which is an information-processing account. Keinan (1994) claimed that stressors decrease attentional resource availability, resulting in both magical thinking and chunking in semantic categorization. The present study directly manipulated attentional resources by comparing (a) young adults under divided attention with young adults under full attention, and (b) older adults, who demonstrate deficits in attentional resources (Craik, 1983), with young adults under full attention. The information-processing model predicts that young adults under divided attention and older adults will exhibit more magical thinking and chunking than will young adults under full-attention. However, the young adult groups did not differ on measures of magical thinking or categorization. Moreover, older adults exhibited similar categorization and less magical thinking relative to the young adults. The data fail to support the attentional resource account of magical thinking and chunking. Email: Kristi S. Multhaup, [krmulthaup@davidson.edu](mailto:krmulthaup@davidson.edu)

(5138)

**Consistency Across Different Real-Life Important Decisions.** KATHLEEN M. GALOTTI and JANE TANDLER, *Carleton College*—First-year undergraduates ( $n = 148$ ) participated or are participating in a short-term longitudinal study of decision-making, goal-setting and stylistic change over their first 14 months of college. One

aspect of this project focuses on decision making. Students have been surveyed about choosing courses for an upcoming term (for three different terms), choosing a major (twice), their plans for the summer, and their plans for sophomore year housing. We analyze a variety of measures of performance for each decision (e.g., number of alternatives considered, number of criteria used, calibration of decision structures with predictions of linear models) to assess behavioral consistency across different important, real life decisions.

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(5139)

**Does Information About Alternative Causes Facilitate Judgment Under Uncertainty?** SIMON MCNAIR and AIDAN FEENEY, *Queen's University Belfast*—Krynski and Tenenbaum (2007) found that base rate neglect is significantly reduced when information about an alternative cause is presented. They claimed that presentation of an alternative cause helps participants to construct a causal model of the information in the problem. We studied their causal facilitation effect in three experiments. In Experiment 1 we showed that the effect is easier to replicate with participants who are likely to be more expert in mathematics. Two further experiments employed a dual task paradigm to assess the locus of the facilitation effect, but neither found an effect of secondary task on participants' responses. Information about an alternative cause facilitated performance in a between subject design (Experiment 1) but made performance worse in a within subject design (Experiment 3). Our results suggest that the causal facilitation effect is real but fragile and that drawing conclusions about the locus of the facilitation effect will not be straightforward.

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(5140)

**Optimal Belief-Based Exploration by Human Decision-Makers and its Behavioral and Physiological Signatures.** A. ROSS OTTO, W. BRADLEY KNOX, TYLER DAVIS, ARTHUR B. MARKMAN and BRADLEY C. LOVE, *University of Texas*—Decision-making in uncertain environments poses a conflict between the goals of exploiting past knowledge in order to maximize rewards and exploring less-known options in order to gather information. This work presents an Ideal Actor model that prescribes an optimal incremental belief-update procedure and payoff-maximizing pattern of choice in a simple decision-making task. By comparing human choice dynamics to those prescribed by the Ideal Observer/Actor, we evaluate the notion that people conduct exploration in a belief-directed fashion. Further, we examine how decision-makers' beliefs are indexed by pre-choice autonomic arousal (measured using skin conductance) and choice reaction times, suggesting that people engage in a belief-directed choice process similar to that prescribed by the Ideal Actor.

Further, this model-based analysis provides a quantitative analysis of how uncertainty relates to anticipatory autonomic arousal preceding choices will elucidate the role of autonomic arousal in risky decision-making, a topic of much debate in the literature.

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(5141)

**The Choice to Text and Drive: A Disconnect Between Attitudes and Punishments.** PAUL ATCHLEY and CHELSIE HADLOCK, *University of Kansas*, SEAN LANE, *Louisiana State University*—One of the mysteries about why younger drivers engage in risky behavior is understanding how they can know a behavior is risky, and yet still engage in the behavior. Younger drivers know texting is dangerous, yet they still do it at alarmingly high rates. In two experiments, we presented younger drivers with crash scenarios. The cause of the crash (no cause, drinking, cell phone, texting) differed for each group. We asked younger drivers to judge how responsible a driver was for the crash as well as how much they should be punished (fines and jail time). While they viewed the texting driver as the most responsible for the crash, they levied the most punishment on the drunk driver, even with equivalent distracted driving laws. The results demonstrate the disconnect between perceived norms and perceived risk.

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(5142)

**Leave the Experiment as Quickly as Possible, Without Looking Stupid: An Optimal Adjustment Procedure to Explain Context Effects in Multi-Alternative Choice.** GUY HAWKINS and SCOTT D. BROWN, *University of Newcastle*, MARK STEYVERS, *University of California, Irvine*, ERIC-JAN WAGENMAKERS, *University of Amsterdam*—One of the oldest and most robust findings in cognitive psychology is Hick's Law, stating that mean choice latency is linearly related to the logarithm of the number of choice alternatives. We recently demonstrated context effects in Hick's Law, where patterns of response latency and accuracy differed depending on the context within which the choice appeared. The context effect reconciled previously divergent empirical results, and presented a new challenge for models of decisions between multiple alternatives. We explain here the first principled approach to accommodate context effects in any model of multi-alternative choice with a speed-accuracy criterion parameter. Our approach is based on a definition of "optimality" as a participant might define it: to leave the experiment as quickly as possible, without committing a socially unacceptable proportion of errors. We apply our approach to existing models of choice to demonstrate its ability to explain previously published and novel empirical data.

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(5143)

**Decision Making in Severe Weather Uncertainty.** JARED E. LECLERC and SUSAN JOSLYN, *University of Washington*—The present research uses an experimental approach to address the communication of forecast uncertainty for rare, severe weather events. Participants performed a realistic computer simulation task in which they assumed the role of the manager of a road maintenance company and used forecast information to decide whether or not to take precautionary action to prevent icy conditions on a town's roads. Results suggest that participants who were provided information about the probability of freezing performed better on the task overall than participants with only deterministic forecast information, but participants with forecast uncertainty expressed in terms of the increase in odds over climatology performed better on a single target trial with an extreme low temperature forecast. Results also address the effectiveness of providing participants with normative decision advice and combining that advice with different types of uncertainty information. This carries important implications about efforts to increase compliance with severe weather warnings.

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(5144)

**What is the Evidence for Context Effects in Inference?** JENNIFER S. TRUEBLOOD and JEROME R. BUSEMEYER, *Indiana University*—Context effects arise when preferences among options are influenced by "decoy" and irrelevant alternatives. There are three context effects: the attraction effect, the similarity effect, and the compromise effect. There are also two modeling accounts of these effects: Multialternative Decision Field Theory (MDFT) (Roe, Busemeyer, & Townsend, 2001) and the Leaky Competing Accumulators (LCA) model (Usher & McClelland, 2004). The LCA model attributes the effects to loss aversion whereas MDFT attributes the effects to similarity judgments along indifference and dominance dimensions. While previous research has demonstrated these effects in domains where there are obvious losses such as choices among gambles or consumer goods, the present research provides evidence that these effects are more generalized and can arise in inference problems where there are no inherent gains or losses. The experimental evidence suggests that the loss aversion principles of the LCA model are not suitable for modeling all forms of context effects.

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(5145)

**Attributing Attitude to a Writer Who Has No Choice in Topic: Revisiting Jones and Harris (1967).** JESSICA S. THIERMAN, SHLOMI SHER and CRAIG R M MCKENZIE, *UC San Diego*—Jones and Harris (1967) provided the original demonstration of what came to be known as the Fundamental Attribution Error. They found a difference in attitude attribution to authors of pro and con essays even when readers knew that the authors had no

choice in essay position. This behavior is routinely interpreted as an error, but the interpretation rests on the assumption that there is no signal in the essays regarding the authors' true attitude. By using participant-generated essays instead of experimenter-generated essays, we were able to test whether essays about randomly assigned positions contain information about the authors' true attitude. In addition to replicating Jones and Harris's original result, we found that readers were sensitive to the true attitudes of the essay authors. Thus useful information about true author attitude exists in essays even when essay position is randomly assigned.

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(5146)

**Linking Religion and Moral Judgment through Access to Cognitive Resources.** SARAH E. CAVRAK, LESLIE N. KNUYCKY and HEATHER M. KLEIDER, *Georgia State University* (Sponsored by David Washburn)—The relationship between religion and morality is tenuous. Although, Kohlberg (1981) argued that they are independent constructs, Wahrman (1981) concluded that rigid adherence to religious doctrine resulted from lesser moral development (i.e., a lack of cognitive capacity for reasoning regarding abstract ethical concepts). Recently, cognitive capacity has been directly linked to moral judgments (Moore, Clark, & Kane, 2007), and interfering with processing ability slows reaction time, and decreases controlled decisions (Greene, et al., 2008). The religion-morality link (via cognitive interference) was directly tested in the current study. We measured religiosity, and then had participants assess the moral valuation of a series of dilemmas (moral, non-moral) when "loaded" or with full cognitive capacity. "Load" only impacted persons low in religious reflection when rating moral dilemmas (Mload=4.13, Mnoload=4.49). We suggest that dogmatic beliefs are influential during moral deliberation, and by limiting cognitive resources, consideration of rigidly held beliefs becomes difficult.

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(5147)

**Maximizers perceive time differently than satisfiers.** RAFFAELLA MISURACA, *Universita' degli Studi di Palermo*; Washington State University, URSINA TEUSCHER, *Portland State University*; Oregon Health and Science University, ADELE DANDENEAU, *Washington State University*; Oregon Health and Science University, ALLISON FRYMAN, *Portland State University*—This study investigated how individual decision styles and the complexity of a decision situation can affect time perception. 59 undergraduates were asked to choose between either 6 or 24 cell phones. Maximizers (i.e., people who report to generally search for the best possible option) underestimated the time spent choosing, independently of the number of options. Satisfiers on the other hand (people who tend to make a decision once they find an option that is

good enough) underestimated time only when faced with 24 options, but overestimated time when choosing among 6 options. We presume that the 24 options led to an overwhelmingly high cognitive load, regardless of decisional styles, and therefore always to time underestimation. When the options were more limited though, satisfiers were able to make a decision by engaging fewer cognitive resources and therefore overestimated the time spent choosing, which was not the case for maximizers.

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(5148)

**Decisions from Experience: Information Search and Choice in Younger and Older Adults.** JULIA SPANIOI and PETE WEGIER, *Ryerson University*—In real-world decision-making, outcomes and their probabilities are often not known a priori, but are learned from experience. The cognitive mechanisms underlying experience-based decisions are still under debate (Hertwig et al., 2009). Here we examined experience-based choice in healthy younger and older adults using a sampling paradigm (Hau et al., 2010). Participants were presented with 24 scenarios requiring a choice between a certain option (e.g., \$3 with probability 1.0) and a risky option of similar expected value (e.g., \$4 with probability .80, else \$0). The outcomes and probabilities of the risky option were acquired through sampling, with sampling frequency providing a measure of information search. Participants' eventual choices resulted in real monetary gains and losses. Risky options with low-probability desirable outcomes produced extensive sampling and risk-averse decisions, in both gain and loss domains. The opposite pattern (frugal sampling, risk-seeking decisions) was observed for risky options with high-probability desirable outcomes. Younger and older adults performed similarly, suggesting that decisions from experience may rely on age-invariant implicit learning mechanisms.

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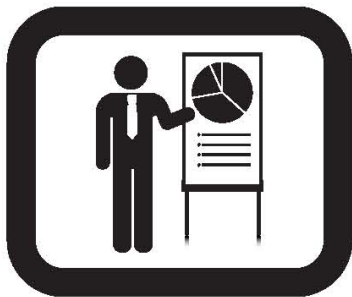
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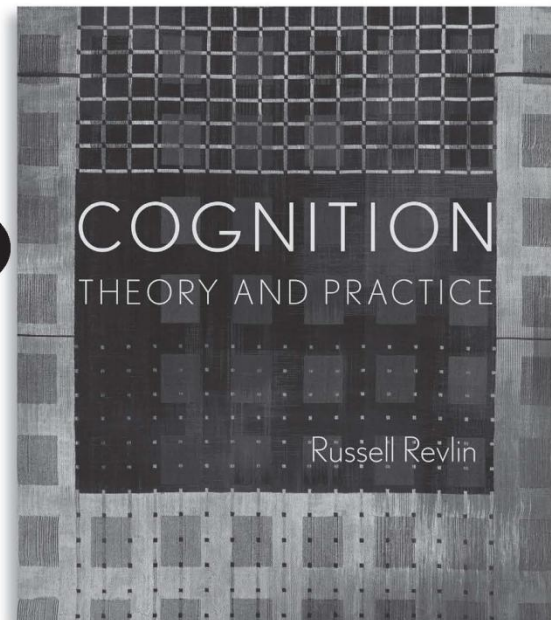
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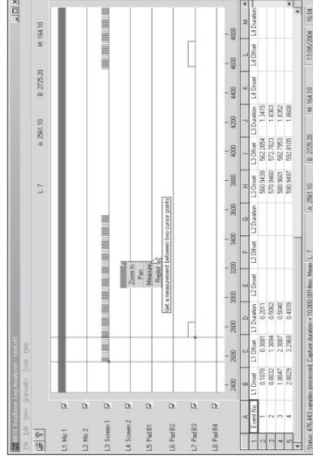
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