58TH ANNUAL MEETING

Vancouver Convention Centre West
Vancouver, British Columbia, Canada
Thursday, November 9-Sunday, November 12, 2017

REGISTRATION

Ballroom Lobby, Level 1, Vancouver Convention Centre West (VCC West)
Wednesday, November 8 .... 4:00 p.m.-8:00 p.m.
Thursday, November 9 .... 7:30 a.m.-8:00 p.m.
Friday, November 10............. 7:30 a.m.-6:00 p.m.
Saturday, November 11........ 7:30 a.m.-5:00 p.m.
Sunday, November 12 .... 7:30 a.m.-12:00 p.m.

OPENING SESSION/KEYNOTE ADDRESS

Ballroom A, VCC West
Thursday, November 9 .... 8:00 p.m.-9:30 p.m.
- **Psychonomic Society 2017 Early Career Awards**
- **Psychonomic Society/Women in Cognitive Science Travel and Networking Award for Junior Scientists**
- **Working Memory Capacity and Intelligence**
  Randall "Randy" W. Engle, *Georgia Institute of Technology*

OPENING RECEPTION

Ballroom BC, VCC West
Thursday, November 9 .... Immediately Following Keynote Address

SYMPOSIA

Meeting Rooms 109-110, VCC West
Friday, November 10......... 10:00 a.m.-12:00 p.m.
Symposia I: Dual Process Theory 2.0

Friday, November 10............. 1:30 p.m.-3:30 p.m.
Symposia II: Improving Use of Statistical Inference in Science

Friday, November 10............. 3:50 p.m.-5:50 p.m.
Symposia III: Beyond the Lab: Using Big Data to Discover Principles of Cognition
From the Psychonomic Society's Leading Edge Workshop Initiative

SYMPOSIA - CONTINUED

Saturday, November 11.... 10:00 a.m.-12:00 p.m.
Symposia IV: When Man Bites Dog: What do Developmental Reversals Tell Us About Cognitive Development, Aging, and the Brain

Saturday, November 11........ 1:30 p.m.-3:30 p.m.
Symposia V: 50 Years of Implicit Learning Research: A Symposium in Honor of Arthur S. Reber

POSTER SESSIONS

Ballroom BCD, VCC West
Session I
Thursday, November 9 .... 6:00 p.m.-7:30 p.m.
Session II
Friday, November 10........... 12:00 p.m.-1:30 p.m.
Session III
Friday, November 10............. 6:00 p.m.-7:30 p.m.
Session IV
Saturday, November 11...... 12:00 p.m.-1:30 p.m.
Session V
Saturday, November 11........ 6:00 p.m.-7:30 p.m.

BUSINESS MEETING

Meeting Room 114, VCC West
Saturday, November 11........ 5:10 p.m.-6:00 p.m.
- **Presentation of the Psychonomic Society 2017 Clifford T. Morgan Best Article Awards, Graduate Travel Awards, and J. Frank Yates Student Travel Awards**
- **Business of the Psychonomic Society**

FUTURE MEETINGS

2018 – IMPS – Amsterdam, NL – May 9-12
2018 – New Orleans, LA – November 15-18
2019 – Montréal, QC – November 14-17
2020 – Austin, TX – November 19-22
2021 – San Diego, CA – November 18-21
2022 – Washington, DC – November 17-20
2023 – San Francisco, CA – November 16-19
2024 – New York City, NY – November 21-24

embedded stem processing routinely occurs during sentence reading. We discuss our findings with regard to extant models of morphological processing and eye movement control.
Email: Sascha Schroeder, sascha.schroeder@mpib-berlin.mpg.de

Numerical Cognition
West Meeting Room 208-209, Friday Afternoon, 3:50-5:30
Chaired by Anthony D. Cate, Virginia Polytechnic Institute and State University

3:50-4:05 PM (127)
Numeracy Neuroimaging: Cortical Surface-Based Meta-Analysis. ANTHONY D. CATE, LEAH COOPER, RISHI DEVULAPALLI, TAYLOR FLYNN, DALE HILES and TIMOTHY QUINN, *Virginia Tech* — Neuroimaging research has identified regions in parietal cortex related to visual numeracy, including the horizontal segment of the intraparietal sulcus (IPS) that has been proposed to be the site of number-specific neural activity. It can be difficult to assess the precise cortical location of meta-analysis foci in deep, variable sulci like the IPS using stereotaxic (3D) coordinates. This study projected coordinates from over 50 adult numeracy studies onto a cortical surface atlas to compare differences among parameters that varied across studies, including cognitive task, visual stimuli, and ranges of numbers. The horizontal segment of the IPS is activated during diverse kinds of number judgments. There was also evidence that symbolic and analog (e.g. dots) numbers activated relatively superior and inferior portions of the horizontal/anterior IPS. Finally, activation from subitizing range quantities (< 5) may be limited to the mesial parietal lobe. Relatively few studies employed this range, but this result could indicate a link between subitizing and manual actions like reaching and pointing that rely on mesial parietal cortex.
Email: Anthony D. Cate, acate@vt.edu

4:10-4:25 PM (128)
The Racing Diffusion Model of Speeded Decision Making. GABRIEL TILLMAN and GORDON D. LOGAN, *Vanderbilt University* — We describe and test a simple sequential sampling model of N-choice speeded decision making: the racing diffusion model. The model makes speeded decisions from a race of evidence accumulators that integrate information in a noisy fashion within a trial. Unlike many current sequential sampling models, the racing diffusion does not assume that evidence accumulation rate varies between trial, and so, the model provides alternative explanations of key response time (RT) phenomena, such as fast and slow error RTs relative to correct RTs. Applying the racing diffusion model is relatively fast and easy given the analytic solution to the likelihood of response times, yet the model contains processing dynamics that may be of interest to cognitive-neuroscientist. The racing diffusion is an alternative to simple sequential sampling models that do without within-trial drift variability and complex models that include this variability, but are difficult to implement.
Email: Gabriel Tillman, gabrieltillman.au@gmail.com

4:30-4:45 PM (129)
A Single-Boundary Accumulator Model of Decisions in a Mental Arithmetic Task. THOMAS J. FAULKENBERRY, *Tarleton State University* — Models of mental arithmetic differ with respect to the independence of encoding and calculation processes. Whereas additive models suggest that manipulations of number format affect only encoding processes, interactive models assume that number format has a direct impact on calculation processes. Evidence in favor of an interactive model usually comes in the form of a size-by-format interaction on mean RTs, though this interaction is not always found (e.g., Megias & Macizo, 2016). In the present study, we modeled participants' RT distributions in an arithmetic verification task using a single-boundary accumulator model (a shifted Wald distribution; Anders et al., 2016). We found that in addition to providing a more complete description of RT distributions, the accumulator model afforded a potentially more sensitive test of format effects. Specifically, we found that format affected drift rate, which implies that problem format has a direct impact on calculation processes. These data give further support for an interactive model of mental arithmetic.
Email: Thomas J. Faulkenberry, faulkenberry@tarleton.edu

4:50-5:05 PM (130)
No Transfer of Training in Simple Addition. JAMIE I.D. CAMPBELL and YALIN CHEN, *University of Saskatchewan* — Several researchers have proposed that skilled adults may solve single-digit addition problems (e.g. 3 + 1 = 4, 4 + 3 = 7) using a fast counting procedure. Practicing a procedure often leads to transfer of learning and faster performance of unpracticed items. Such transfer has been demonstrated using a counting-based alphabet arithmetic task (e.g., B + 4 = C D E *F*) that indicated robust RT gains when untrained transfer problems at test had been implicitly practiced (e.g., practice B + 3, test B + 2 or B + 1). Here we constructed analogous simple addition problems (practice 4 + 3, test 4 + 2 or 4 + 1). In three experiments (*n* = 108) there was no evidence of generalization for these items, but there was robust speed up when the items were repeated. The results are consistent with direct retrieval of addition facts from long-term memory rather than a counting procedure.
Email: Jamie Campbell, jamie.campbell@usask.ca

5:10-5:25 PM (131)
The Psychophysics of Algebra: Mathematics Perceptual Learning Interventions Produce Measurable and Lasting Changes in the Perceptual Encoding of Mathematical Objects. PHILIP J. KELLMAN, CAROLYN A. BUFFORD and EVERETT METTLER, *University of California, Los Angeles* — Perceptual learning (PL) refers to experience-induced improvements in information extraction, including complex pattern recognition that is a hallmark of expertise. PL interventions in mathematical domains produce substantial gains on tests of mathematical competence. Here we report direct evidence that such perceptual learning modules (PLMs) improve perceptual encoding of mathematical objects, measured psychophysically. In two experiments, accuracy and speed of college students' encoding of equations was assessed in a same-different task with brief exposures. Between a pretest

and a delayed posttest, the experimental group completed a brief Algebraic Transformations PLM, which involved mapping of equations across transformations. A control group received equal exposure to equations in a non-mathematical task. On a delayed posttest, the PLM group, but not the control group, showed reliably improved encoding on a psychophysical task that depended solely on physical identity. Perceptual learning interventions accelerate expertise in complex domains and produce detectable, durable changes in perceptual encoding.
Email: Philip Kellman, Kellman@cognet.ucla.edu

Human Learning and Instruction
West Meeting Room 211, Saturday Morning, 8:00-10:00
Chaired by Robert A. Bjork, University of California, Los Angeles

8:00-8:15 AM (132)

Learning the Game From Another's Perspective: Contributions of Varied Practice to Motor Learning. SASKIA GIEBL, ELIZABETH LIGON BJORK and ROBERT A. BJORK, *University of California, Los Angeles* (Presented by Robert Bjork) — Prior research shows that varied practice of motor skills typically leads to more errors during practice, but better long-term retention and transfer (e.g., Schmidt, 1975; Kerr & Booth, 1978). We examined whether simply observing a given sports skill from another perspective might enhance learning. Participants practiced 4 blocks of 4 penalty kicks at a soccer goal. In between those blocks, a given participant observed another participant's kicks from one of three perspectives: from behind another kicker; from behind the goal; from behind both the kicker and goal; or not at all. On a delayed test, participants who got another perspective (from behind the goal) performed significantly better than participants who observed from behind another kicker. These results have theoretical and practical importance with respect to motor-skill learning: They suggest that providing another perspective may lead to better understanding of motor-skills dynamics, resulting in more durable and flexible learning.
Email: Robert A. Bjork, rabjork@psych.ucla.edu

8:20-8:35 AM (133)

Remindings vs. Comparison. JONATHAN G. TULLIS, *University of Arizona*, ROBERT GOLDSTONE, *Indiana University* — Creating long-lasting and transferrable knowledge from individual instances is vital to succeeding in a complex, ever-changing world. We compared the consequences of two prominent pedagogies (comparison and reminding) on memory and generalization. Learners studied a sequence of related, but superficially different, proverb pairs. In the comparison condition, learners studied the related proverbs together and explicitly created a generalization across them, which is theorized to allow learners to disregard superficial features and identify their shared, deep meaning. In the reminding condition, learners viewed the related proverbs separated in time; the later presentation is theorized to prompt learners to think back to the similar prior episode, retrieve it from memory, and compare across instances. Across three experiments, reminding supported better memory for individual examples and enabled more appropriate transfer to new situations than comparison.

When characteristics of stimuli allow for appropriate noticing of earlier related episodes, the benefits of reminding on memory and transfer outweigh those of comparison.
Email: Jonathan Tullis, jonathantullis@gmail.com

8:40-8:55 AM (134)

Individual Differences in Working Memory Interact With Implicit Learning Activities in Support of Mathematics Skill Acquisition. CHRISTOPHER WAS, ERIN GRAHAM, *Kent State University*, TIMOTHY C. INDAHL, *Winona State University*, DAN J. WOLTZ, *University of Utah* — Previous research suggests that well-constructed implicit learning activities may increase performance on tasks where participants make persistent errors and rely heavily on working memory. Due to the complexity of information to be learned and a relatively high error rate, mathematics represents an educational domain in which implicit learning strategies may prove especially beneficial. Although some recent evidence supports this hypothesis, other studies report conflicting results regarding the efficacy of implicit learning for complex mathematical procedures (e.g., resolving polynomial equations). One explanation for these inconclusive results is an interaction with working memory. In the present study, the implicit learning of complex mathematics was evaluated using an aptitude (working memory) by treatment (declarative learning vs. implicit learning) experimental design. Results indicate that for some participants – those with low working memory – the implicit learning intervention was ineffective. However, individuals with high working memory exhibited significant benefits following the implicit learning intervention.
Email: Chris Was, cwas@kent.edu

9:00-9:15 AM (135)

Explicit Reflection During Cultural Concept Learning. BRIDGID FINN and DELANO HEBERT, *Educational Testing Service* — In the current study participants used a game-based social simulation platform to learn how two social-cultural norms—collectivism and hierarchy—were represented in an artificial culture. Participants engaged in dynamic interactions with non-player game characters who gave verbal and facial feedback based on the cultural appropriateness of the player's verbal choices during the interaction. Learning was reflected in players' ability to respond adaptively to feedback and adjust their behavior in future interactions. We evaluated whether prompting players to explicitly reflect on their cultural beliefs had a beneficial or hindering effect on cultural concept learning. The study contrasted four belief-updating conditions that varied whether and when belief updating occurred. We tested the hypothesis that explicit reflection about cultural norms may alter how people process these concepts (Schooler, 2002; Wilson et al., 2000). We will discuss how belief updating impacted in-game learning and end-of-game post-test performance.
Email: Bridgid Finn, bfinn@ets.org

9:20-9:35 AM (136)

Does Coaching Promote Perceptual Category Learning? HAL PASHLER and JARRETT LOVELETT, *University of California, San Diego* — In the typical perceptual category