Motion and Attention
Grand Ballroom, Friday Morning, 8:00–9:40

Chaired by Gary Chon-Wen Shyi, National Chung Cheng University

8:00–8:15 (1) Differential Distribution of Visuospatial Attention in Tracking Multiple Moving Objects. GARY C.-W. SHyi & SUNG-EN CHien, National Chung Cheng University—Paying attention to a relatively complex object has shown evidence for differential distribution within the object. Here, we explored differential distribution of attention when multiple moving objects were visually tracked. In Experiments 1 and 2, we not only replicated the findings reported by Alvarez and Scholl (2005), demonstrating both attentional concentration and attentional amplification, but also generalized the effects to uniformed circular shapes. In Experiment 3, we used dart-like figures as stimuli and found evidence suggesting that (1) single uniformly connected representation (single-UC) appears to be the basic unit of visual selection, and (2) multiple-UC representation attenuated the effect of attentional concentration. Finally, in Experiment 4, we examined whether specific visual features would affect the relative salience between different parts of an object and hence attentional distribution within the object. The results revealed a reversed concentration effect when stimuli with the same shape had different colors. Implications are discussed.

8:15–8:30 (2) Semantic Constraints on the Spatial Distribution of Selective Attention. BRADLEY S. GIBSON & BRADLEY A. DOBRZENSKI, University of Notre Dame—Humans routinely use spatial language to control the spatial distribution of attention. Spatial information may be communicated from one individual to another across opposing frames of reference, which in turn can lead to inconsistent mappings between words and directions (or locations). These semantic inconsistencies may have important implications for selective attention because they can be translated into differences in cue validity, a manipulation that is known to influence the focus of attention. Consistent with this expectation, the results of three experiments suggested that spatial word cues with low-learned validity (LEFT/RIGHT) focused attention less well than did a variety of other directional cues with high-learned validity (such as ABOVE/BELLOW or ←→←→), even when the experimentally controlled validity of the cues was equal. Altogether, the present findings demonstrate important semantic-based constraints on the spatial distribution of attention and have important implications for theories of voluntary and involuntary control of attention.

8:30–8:45 (3) Feature Binding in Attentive Tracking of Distinct Objects. TAL MAKOVSKI & YUHONG V. JIANG, University of Minnesota, Twin Cities—To what degree can attentive tracking of objects’ motion benefit from increased distinctiveness in the objects’ surface features? To address this question, we asked observers to track four moving digits among a total of eight moving digits. By varying the distinctiveness of the digits’ color and identity, we found that tracking performance improved when the eight objects were all distinct in color, digit identity, or both, compared to when the eight objects were identical. However, when the eight objects were distinct in a combination of color and digit but targets and non-targets shared color or digit identity, performance enhancement was not observed. Four follow-up experiments extended the range of the feature dimensions generating the effect and ruled out alternative strategic accounts. We conclude that surface features can be used to enhance tracking performance. This enhancement is feature based, revealing a limited degree of feature binding in attentive tracking.

9:00–9:15 (4) Visuomotor Prioritization for Looming Motion. PAUL A. SKARRATT, University of Hull, ANGUS R. H. GELLATLY, Oxford Brookes University, & GEOFF G. COLE, Durham University (sponsored by Geoff G. Cole)—Several recent studies have sought to determine whether looming motion attracts attention more readily than does receding motion. At present, however, evidence for the attentional prioritization of looming motion is mixed. In the present study, target stimuli were associated with objects that loomed, receded or remained static in arrays of varying size. Results showed that both motion types received equal prioritization, as evidenced by their parallel search slopes, yet looming targets benefited from an overall reduction in reaction time (RT). Further investigation ruled out possible confounding explanations for this RT advantage, while a perceptual measure of performance confirmed the attentional equivalence of the two motion types. Taken together, these results indicate that looming and receding objects receive equal prioritization during attentional selection. However, it may be that postattentional processes, possibly those involved in motor preparation, facilitate responses to looming motion.

9:20–9:35 (5) Individual Differences in Voluntary Visual Attention. MARCIA GRABOWECKY, KATIEANN SKOGSBERG, & SATORU SUZUKI, Northwestern University—Extensive research has characterized the sensory information that can be prioritized by attention (e.g., a location, an object, a color, or a motion), and different modes in which attention can act (e.g., focused, distributed, or sustained). Neuroscientific approaches have identified both distinctive and overlapping patterns of brain activity associated with different operations of attention, suggesting interrelationships among multiple attention mechanisms. To understand how the many hypothesized attention mechanisms work together to support behavioral goals, it is essential to understand these interrelationships. To do this, we have examined performance correlations across a battery of attention tasks that test a range of voluntary attention abilities presumed to involve the neural mechanisms identified via neuroscientific investigations. Our attention battery has been administered to ~250 participants to obtain a database of between-individual variability in attention profiles. The results suggest several core attention abilities and systematic sex differences.

Language Production I
International Ballroom North, Friday Morning, 8:00–10:00

Chaired by Zenzi M. Griffin, Georgia Institute of Technology

8:00–8:15 (6) Bart, Lisa, Patty, Selma, Snowball . . . Maggie! Names Parent Call Their Children by Mistake. ZENZI M. GRIFFIN & THOMAS WANGERMANN, Georgia Institute of Technology—Words that are both semantically and phonologically similar to an intended word are particularly likely to intrude as substitutions (e.g., rat for cat) in object naming, celebrity face naming, and speech error corpora. Although retrieval of proper names differs in many ways from retrieval of object names, data collected from a Web survey indicated that these factors also influence errors in addressing people by name. Over 300 individuals answered questions about themselves, their siblings, and how often they recalled their parents accidentally calling them by various names. Respondents were significantly more likely to recall their parents calling them by the name of a sibling if the sibling had the same gender, was self-rated as physically similar, or had a name that started with the same sound. Parents also called respondents by the names of other relatives and pets.

8:20–8:35 (7) Interference From Parallel Processing During Multiple Object Naming. ANTJE S. MEYER & DEBRA MALPASS, University of Birmingham—We aimed to determine whether speakers naming object pairs processed them sequentially or in parallel. An earlier study had shown that the difficulty of processing a foeated object, which speakers named first, affected how efficiently they processed an extrafoeval object, which they named second. Complimenting that study, the present experiments examined whether the difficulty of processing an extrafoeval object (named second) affected how quickly speakers processed a foeated object (named first). The first object was always easy to identify and name, whereas the second object either had an easy name or a name that was more difficult to retrieve. The objects appeared side by side (Experiment 1) or underneath each other (Experiment 2). Gazes to the first object were longer when the second object had an easy rather than
a difficult name. This extrafoveal-onto-foveal interference effect constitutes strong evidence for parallel processing of the two objects.

**8:40—8:55 (8)** Working Memory and Vehicle Quality Predict Preference for the Metaphor Form. RUSSELL S. PIERCE, University of California, Riverside, & DAN L. CHIAPPE, California State University, Long Beach (read by Dan L. Chiappe)—This presentation examines the roles of working memory (WM), vehicle quality, topic-property aptness, and vehicle conventionality in determining whether people produce figurative statements in the form of a metaphor or a simile. We found that WM capacity and the quality of vehicles generated were the greatest predictors of selected figurative statement form. Specifically, preference for the metaphor form increased as WM increased and as the quality of the vehicles generated increased. Despite a large sample, large corpus, and powerful statistical techniques (linear mixed effect regression), we did not detect any significant bias in selection of figurative statement form directly related to either topic-property aptness or vehicle conventionality. These results are consistent with a class inclusion model but inconsistent with the career of metaphor theory.

**9:00—9:15 (9)** Language and Perceptual Sensitivity: Signal Detection Analysis of Lateralized Color Discrimination. CLARK G. OHNESORGE, JR. & KAMEKO HALFMANN, St. Olaf College—It has recently been shown that the speed of response in a color discrimination task is influenced by linguistic processing. The finding is that relative response times for within- and across-category color discriminations are modulated by the locus of this Whorfian effect. We present results from two studies that tested distinctive predictions of two models. The early locus model maintains that changes in response time result from a perceptual-level influence of language, thus predicting analogous changes in perceptual sensitivity indexed by d’. In contrast, a late locus model predicts no such change. Results from two studies—one using a 2AFC design, and the other a detection design—both disconfirm the predictions of the early locus model.

**9:20—9:35 (10)** The Unusual Language Production Errors of Amnesic H.M. DONALD G. MACKAY, UCLA, LORI E. JAMES, University of Colorado, Colorado Springs, & CHRIS HADLEY, UCLA—This study compared sentence production in amnesic H.M. and six memory-normal controls matched for age, education, and IQ. Their task was to describe what made captioned cartoons funny. Nine judges blind to speaker identity rated the responses. Ratings were relatively more negative for H.M. than for the controls on six dimensions: vagueness, comprehensibility, grammaticality, coherence, humor-description adequacy, and number of major errors, defined as uncorrected errors that reduced the comprehensibility, grammaticality, and coherence of an utterance. Frequency analyses indicated that H.M. stuttered reliably less, but produced seven types of major errors reliably more often than the controls: uncorrected inaccuracies, substitution, omission, addition, transposition, reading errors, and free association errors. Differences between H.M.'s major errors and the everyday speech errors of normal speakers are discussed. The present results bear on binding theory and systems theory accounts of H.M.'s condition and contradict recent claims that H.M.'s spoken discourse is "sophisticated" and "without major errors."

**9:40—9:55 (11)** FOXP2 Allelic Variation Is Associated With Individual Differences in Sequential Learning and Language. J. BRUCE TOMBLIN, University of Iowa, & MORTEN H. CHRISTIANSEN, Cornell University (read by Morten H. Christiansen)—Sequential learning and language both involve the extraction and further processing of discrete elements occurring in complex temporal sequences. However, little is known about the possible genetic bases of these cognitive abilities. In this study, we asked whether variations in FOXP2 might be associated with differences in sequential learning and language. A serial response time (SRT) task was used as a measure of sequential learning in a sample of adolescents with and without language impairment. Associations were tested between SRT learning and variations in six single nucleotide polymorphisms (SNPs) selected from the major haplotype blocks within FOXP2. Two SNPs were associated with SRT learning. The association between genotypic status and language status was also found to be significant. These results suggest that FOXP2 influences systems that are important to the development of both sequential learning and language, supporting the hypothesis that language may be subserved by underlying mechanisms for sequential learning.

**Task Switching**

**Chairing by Catherine M. Arrington, Lehigh University**

**9:00—8:15 (12)** The Role of Attention Networks in Task Selection and Task Performance in Voluntary Task Switching. CATHERINE M. ARRINGTON & MELISSA M. YATES, Lehigh University—At any given moment in multitask environments, individuals must select and perform a particular task from among possible tasks. The cognitive processes that govern selection and performance are likely to involve various attentional processes. The present study used the Attention Network Test (Fan et al., 2002) to examine how individual differences in specific attentional processes (alerting, orienting, and executive control) related to task performance and selection in a voluntary task-switching procedure. Task performance correlated weakly with the alerting network: As alerting scores increased (due to slower RTs on no-cue trials), switch costs increased (due primarily to slower RTs on switch trials). Task selection correlated with the executive network, measured in terms of response conflict: As response conflict scores increased, the probability of switching tasks decreased. Thus, individuals better able to resolve response conflicts were more likely to switch between tasks, but it was not necessarily faster to do so.

**8:20—8:35 (13)** Cue-Interpretation and Task-Reconfiguration Processes in Task Switching With Direct and Transition Cues. ANDRÉ VAN DIERENDONCK, BJÖRN V. VAN LOY, BAPTIST LIEFOOGHE, & FREDERICK VERBRUGGEN, Ghent University—In cued task switching, the cue can indicate either the next task (parity, magnitude) or the task transition (repeat, switch). Previous research has shown that the switch cost is larger with transition cues than with direct cues. The present study investigated the role of cue-interpretation processes and task-reconfiguration processes in this enlarged cost. Four experiments compared both types of cues in a yoked design. Experiments 1 and 2 showed that explicit and transitory cues differed essentially with respect to measures of the difficulty of cue interpretation. Experiments 3 and 4 attempted an empirical dissociation between cue interpretation and task reconfiguration by including a task indication response between the cue and the stimulus. All experiments converge on the conclusion that the difference in the size of the switch cost between transition cues and direct cues is due to cue-interpretation processes rather than task-reconfiguration processes.

**8:40—8:55 (14)** Dissociation of Cue-Switch Cost and Task-Switch Cost. MYEONG-HO SOHN & CHRIS HYDOCK, George Washington University—Task-switch cost refers to the cost of performing a new task, as opposed to repeating the same task. Because a task switch should be indicated by a cue, the task-switch cost has also been interpreted as the cost associated with simply encoding a new cue. We used 2:2 cue–task mapping (e.g., Cue 1 and Cue 2 indicating Task A and Task B, respectively, and Cue 3 and Cue 4 indicating Task C and Task D, respectively), which allowed orthogonal manipulation of cue transitions and task transitions. When each task was performed equally often (Experiment 1), the task-switch cost was mostly explained by the cue-switch cost. When each cue–task transition was performed equally often (Experiment 2), the true task-switch cost was observed beyond the cue-switch cost. These results suggest that the task-switch cost and the cue-switch cost are separable, and the task-switch cost is subject to task-set reconfiguration.
(read by Lael J. Schooler)—How do people select among different strategies? We contribute to solving this puzzle with a proposal shaped by three ecological theories: the simple heuristics framework, the ACT-R architecture, and Gibson’s theory of perception. From the heuristics framework, we adopt the thesis that people make decisions by selecting from a repertoire of heuristics that exploit regularities in the structure of our environment and in our cognitive capacities, such as memory. Gibson leads us to ask how our environment provides opportunities for selecting different heuristics. ACT-R provides a quantitative theory about how memory works. Extending the ACT-R memory model in three computer simulations and 10 studies, we show how memory determines which opportunities the environment provides for selecting different heuristics, and how, in doing so, memory guides strategy selection. In addition, we provide a method for predicting a word’s retrieval time distribution using Internet search engines.

9:00–9:15 (21)
Discounting of Smaller Sooner and Larger Later Rewards by Pigeons and Humans. AMANDA CALVERT, LEONARD GREEN, & JOEL MYERSON, Washington University (read by Leonard Green)—When choice is between an immediate and a delayed reward, the subjective value of the delayed reward decreases as the time to its receipt increases. In humans, if an additional waiting period is added prior to both rewards, thus creating a delay common to both alternatives, the rate of discounting decreases as the common delay increases. The present research examined the effect of a common delay on discounting in pigeons. When the sooner and later alternatives were differentially signaled, but the signal for the common delay was the same, the pigeons (in contrast to humans) showed substantial increases in discounting rate with increases in the common delay. When the common delay and the additional time to the later reward were differentially signaled, however, the rate of discounting decreased as the common delay increased, a result consistent with that obtained with humans, suggesting that delay discounting may rely on similar processes in both species.

9:20–9:35 (22)
Integrating Reward and Stimulus Information in Time-Limited Decisions. JAMES L. MCCLELLAND, JUAN GAO, & REBECCA K. TORTELL, Stanford University—How are reward and stimulus information integrated in time-limited decisions? Participants saw a rectangle shifted 1, 3, or 5 pixels from fixation, and indicated shift direction measured as a function of case similarity to correct prototype and of the difference between the case’s similarities to the prototypes of the correct disease and of the nearest competitor. Data from two studies of tutoring students in chest pain diagnosis (Ns = 85 and 205), with pretests and post-tests with cases of known typicality, are used to model the ease of learning cases. Several measures of similarity are compared for use in the typicality function, including correlation (similarity) and Bayesian probability.
within 250 msec of a signal at different lags post stimulus onset (0 to 2,000 msec) yielded a curve indicating which response would, if correct, receive a higher reward. Optimally, one should always choose the high reward response at the shortest lags, where identification would be at chance, then reduce reward bias to a low, fixed level as accuracy asymptotes. Participants generally showed an initially strong reward bias that tapered off to a fixed level, but the initial bias was not as strong as asymptotes. Participants generally maintain graded evidence and reward values until the arrival of the response signal.

**Metamemory**

Williford Room, Friday Morning, 8:00–10:00

**8:00–8:15 (23)**

**Delayed Judgments of Learning, Improved Restudy Decisions, and Improved Recall: A Causal Chain?** DANIEL R. KIMBALL & TROY A. SMITH, University of Oklahoma—The delayed judgment of learning (delayed JOL) effect refers to the greater relative accuracy of a JOL made contemporaneously with a retrieval attempt some time after initial study, as compared with either immediately after study or at a delay, without attempting retrieval. We examined whether—compared with these other JOL types—delayed, retrieval-based JOLs allow better restudy decisions that in turn lead to better memory performance when such restudy is permitted. For each JOL type, we randomly honored and dishonored some restudy decisions. Results revealed that the benefit of delayed, retrieval-based JOLs in final performance was almost exclusively due to the selection of more items for restudy. When final performance was instead examined as a function of an item’s history of selection and restudy, there was no consistent advantage of delayed, retrieval-based JOLs over other JOL types. At this item-history level of analysis, results were largely consistent with spacing and lag effects.

**8:20–8:35 (24)**

The Runsfeld Effect: Knowing Things for Sure: Just How Sure Is That? JAMES A. HAMPTON, BAYOAINA, MATHIAS ANDERSSON, PRIYA GORASIA, & SEJAL PARMAR, City University London—We often have the feeling that we know something to be true or false for certain—the “known known.” If we really are certain, we would expect these judgments to be very stable over time. Likewise, if we feel unsure about an answer, we would expect ourselves to remain unsure—the “known unknown.” Our results suggest that there is a surprising degree of instability in our true/false judgments that are judged definitely true, not definitely sure, or definitely false. The instability is particularly apparent in categorization judgments and judgments about personal beliefs, aspirations, or memories. Factual knowledge differs from these domains in having a separate stable category of the known unknown. An episodic recognition study also showed stable known unknowns.

**8:40–8:55 (25)**

Hindsight Bias Changes Across the Lifespan. DANIEL M. BERNSTEIN, Kwantlen Polytechnic University and University of Washington, & ANDREW N. MELTZOFF, WILLIAM PERIA, & GEOFFREY R. LOFTUS, University of Washington—Learning the outcome of a problem leads to the belief that (1) one knew the outcome all along and (2) others would have known it all along also. We examined this kind of hindsight bias across the lifespan by administering visual and verbal hindsight tasks to 188 subjects, age 3 to 96 years. Although all age groups showed hindsight bias, the bias magnitude followed a different trajectory for visual and verbal tasks. Visual hindsight bias exhibited a U-shaped curve, declining from ages 3 to 5, then remaining stable until old age, then increasing again. However, hindsight bias remained relatively stable across the lifespan for the verbal task. We conclude that hindsight bias develops early and persists throughout life. These results, combined with other work demonstrating the prevalence of hindsight bias across cultures, support the notion that hindsight bias is a universal cognitive bias.

**9:00–9:15 (26)**

Factors That Facilitate Learning and Memory for Proper Names. LORI E. JAMES, SARAH K. TAUBER, KETHERA A. FOGLER, ELIZABETH CRANDALL, & ASHLEY GUNN, University of Colorado—Our research delineates conditions that exacerbate or reduce the difficulty of learning names in association with faces. We report several experiments that identified factors that improve performance on name learning tasks. For example, forcing participants to guess when they were unsure about a person’s name (as opposed to strictly prohibiting guesses) increased correct responding. That experiment manipulated task instructions, whereas other experiments varied stimulus characteristics. For example, ambiguous stimuli (which could be names or other biographical information; e.g., “dean”) were better learned in association with faces than were nonambiguous stimuli, and physically descriptive names were easier to learn than psychologically descriptive or nondescriptive names. In each of the experiments, we tested younger and older adults, because aging has been associated with particularly dramatic declines in name learning performance. Factors that benefited younger adults also improved performance in older adults (sometimes to an even greater extent), adding to the theoretical and practical contributions of our research.

**9:20–9:35 (27)**

Expanding Retrieval Practice in Theory and Practice. NATE KORNEH & ROBERT A. BJORK, UCLA (read by Robert A. Bjork)—How opportunities to practice the retrieval of to-be-learned information should be scheduled is an issue of obvious practical importance to learners and educators. Expanding retrieval practice—that is, ever-increasing intervals between successive self-tests—which presumably prevents initial forgetting while gradually introducing the benefits of spacing, has appeared optimal, tracing back to Landauer and Bjork’s (1978) findings, but uniform-interval practice has recently been shown to be more effective under some conditions (Balota, Duchek, & Logan, 2007). Contrasts between uniform and expanding schedules have typically held total spacing constant. From a practical perspective, however, the important considerations are (1) how long can the first interval be while still insuring success, and (2) after an item is retrieved successfully, should the next interval be the same (uniform) or longer (expanding)? Our results demonstrate, from that perspective, that the optimal schedule—in both the presence and the absence of corrective feedback—is expanding retrieval practice.

**9:40–9:55 (28)**

What Determines Whether Retrieval Practice Leads to Forgetting or to Facilitation? GINO CAMP & ANIQUE DE BRUIN, Erasmus University Rotterdam—Retrieval practice with particular information in memory can result in the forgetting of related information, as demonstrated by the retrieval-induced forgetting effect. However, using educational texts, it has also been shown that retrieval practice can lead to memory improvement of related information (retrieval-induced facilitation). Two factors were investigated that may determine the direction of the effect. These were the degree of integration of the practiced and unpracticed materials at study and the amount of competition between practiced and unpracticed information at retrieval practice. In two experiments using brief narratives, it was demonstrated that high integration of the narratives at study eliminated forgetting. Also, reduced competition at retrieval practice, which was induced by varying the format of the retrieval-practice question, eliminated the forgetting effect. However, in both cases, no facilitation effect was found.

**Perception**

Waldorf Room, Friday Morning, 8:00–9:40

**8:00–8:15 (29)**

Sensory–Afffective Dimensions of Haptically Explored Materials. SOLEDAD BALLESTEROS, BEATRIZ GARCIA-RODRIGUEZ, MANUEL SEBASTIÁN, FRANCISCO MUÑOZ, & JOSE MANUEL
REALE'S, Universidad Nacional de Educación a Distancia—Previous research (Ballesteros et al., 2004, 2006) showed that binodal visual–haptic exploration of textures produced a dimensional map similar to haptic exploration alone, with smoothness/roughness, hardness/softness and slippery/sticky as the main dimensions. Moreover, the texture space of younger and older adults did not differ, although tactual spatial acuity declines with aging. In the context of the European Program SOMAPS, we investigated the relations between affective evaluation of surface textures, roughness, and brain activity. In the first study, participants explored 28 ecologically valid textures while performing free classification and hedonic rating tasks. The exploration times were related to the hedonic values attributed to the materials. Textures judged as unpleasant were explored shorter than either pleasant or neutral perceived textures. The results will be discussed in relation to the dimensional map, findings from a second study with manmade textures varying in groove width, and with brain activity during haptic exploration.

8:20–8:35 (30)
Visual Rhythms Do Not Receive Automatic Auditory Encoding. J. DEVIN MCAULEY & MOLLY J. HENRY, Bowling Green State University—The present study compared perception of auditory and visual rhythms in order to test the claim that visual rhythms receive automatic auditory encoding (Guttman, Gilroy, & Blake, 2005). Participants experienced auditory and visual rhythms and judged whether they were “speeding up” or “slowing down.” Of primary interest were test rhythms that were designed to induce the sense of a periodic beat that was implied (but not explicitly marked) by the rhythm. Proportions of “speeding up” responses were fit with a signal detection model that provided an estimate of beat-perception strength for each participant, which was distinct from a participants’ overall temporal sensitivity. In general, values of beat-perception strength were lower for visual rhythms than for auditory rhythms. Most striking was the finding that auditory and visual test rhythms with identical timings often yielded opposite perceptions about sequence timing, providing evidence that visual rhythms do not receive automatic auditory encoding.

8:40–8:55 (31)
Time As Space: Synesthetic and Conventional Representations of Months. URSINA TEUSCHER, DAVID BRANG, VILAYANUR S. RAMACHANDRAN, & SEANA COULSON, University of California, San Diego—In one type of synesthesia, people report that they associate time events, such as months of the year, with specific spatial locations. This type of synesthesia is particularly intriguing because there exist many conventional time–space mappings that we all use as explicit tools (e.g., watches, calendars) or as conceptual metaphors in everyday planning and thinking about time. In several behavioral experiments, we looked at a large number of spatial representations for the months of the year, as reported by time–space synesthetes and controls over time. In a brainwave experiment, we compared 12 synesthetes’ to 12 controls’ brain activity while they performed a spatial target detection task cued by month names. We will discuss the findings of these studies, focusing on the phenomenology of mental calendars, possible cultural influence on them, and their perceptual versus conceptual nature.

9:00–9:15 (32)
Temporal Summation and Heterotopic Suppression of Experimentally Induced Pain. GARY B. ROLLMAN, University of Western Ontario, SARI HERSHENFIELD, University of Toronto, & KOBINA QUANSAH, University of Western Ontario (sponsored by Stephen J. Lupker)—Repeated presentation of a noxious stimulus results in increasing levels of pain intensity, a phenomenon labeled temporal summation or windup. Patients suffering from chronic pain disorders often show diminished summation, suggesting that these patients have an impaired central descending inhibitory system. In this study, normal observers were tested for temporal summation of noxious electrical pulses presented in isolation to the ankle or accompanied by concurrent exposure to noxious cold stimulation at the contralateral forearm. Trains of electrical pulses produced marked temporal summation effects, both when presented alone or during cold stimulation (windup), but the pain ratings to both single pulses and trains were significantly attenuated by the concurrent stimulation, a phenomenon known as diffuse noxious inhibitory controls (DNIC). Testing 5 min after removal of the cold stimulus showed differential rates of recovery from DNIC. These data highlight the powerful effects of both windup and DNIC, as well as their interaction.

9:30–9:45 (33)
Cinema Sickness and Self-Motion Perception. FREDERICK BONATO & ANDREA BUBKA, St. Peter’s College—Can simply watching a film (e.g., Cloverfield) lead to motion sickness-like symptoms? Here we show that a video clip shot using a handheld camera leads to significantly more motion sickness symptoms than does a clip shot using a rolling platform after only 5 min of viewing. Ironically, the same handheld clip also resulted in a more compelling perception of self-motion, even though the observers were stationary. Sensory conflict could be more salient when a handheld clip is viewed and, hence, can account for cinema sickness; it may mistakenly trigger a central nervous response aimed at riding the body of neurotoxins. However, it has been suggested that sensory conflict should inhibit self-motion perception, but the opposite result was obtained. These results suggest that handheld cameras can enhance the realism of the film-watching experience and may explain why people would want to watch a film that could make them sick.

Symposium: Time and Time Again
Grand Ballroom, Friday Morning, 9:50–12:00
Chaired by Ralph R. Miller, Binghamton University

9:50–10:05 (34)
Time and Time Again. RALPH R. MILLER, Binghamton University—Recent years have seen burgeoning interest in time perception, interval generation, and the use of timing in cognition and behavioral regulation. The processing of temporal information appears so basic to living organisms that a high degree of commonality is seen across species. New data (from humans, rats, and pigeons) and theory will be presented. Evidence will be reviewed that suggests that circadian timing (hours/days), interval timing (seconds/minutes), and neural timing (milliseconds) are all based on oscillator representations. The presenters will demonstrate how time perception is influenced by attention to time when attention is manipulated by the imposition of a concurrent task or changes in task motivation. Novel cases of integration of independent temporal and spatiotemporal maps will be discussed, and the proposal will be advanced that temporal information is an intrinsic part of the content of associative learning, as opposed to temporal contiguity being a mere catalyst for the formation of associations.

10:10–10:25 (35)
Navigating Through Life Using Spatiotemporal Maps: Data From Hairy Rats and Hairless Apes. RALPH R. MILLER & MIKAEL MOLET, Binghamton University—Although most models of associative learning assume that a cue only tells subjects that a specific outcome will occur, prior research indicates that subjects learn not only that an outcome will occur and which outcome it will be, but also when and where the outcome will occur. New data from human participants will be presented demonstrating that, just as sensory preconditioning (e.g., A–B, B–outcome) creates an excitatory link between two stimuli that were never directly paired (A–outcome), the same training encodes temporal and spatial relationships between A and the outcome, despite their never having been directly paired. Additionally, data from rats will be reviewed demonstrating that, just as spatiotemporal context can serve as a discriminative stimulus that determines which of two contradictory training experiences (e.g., reinforcement vs. nonreinforcement) will be expressed at test, so too can spatiotemporal context determine which of two contradictory timing relationships will be expressed at test.

10:30–10:45 (36)
Changes in Reward Value Systematically Alter Interval Value. KIMBERLY KIRKPATRICK, Kansas State University, & TIFFANY GALTRESS, University of York—Recent research has revealed that prefeeding causes a rightward shift in the timing of responding in the peak
procedure. Two experiments assessed the source of these effects. In Experiment 1, rats received training with a 30-sec peak procedure followed by a shift in interval duration to 45 sec, or both manipulations. The interval shift resulted in the learning of the new interval, but when tested under usual food restriction, the prefed + shifted group showed a partial return to their original peak location at 30 sec, and the shifted group continued to peak at 45 sec. Experiment 2 expanded on this initial finding by prefeding rats initially and then later testing with or without prefeding and with or without an interval shift to 20 sec; this experiment revealed a pattern similar to that in Experiment 1. The results will be discussed in terms of clock speed, memory, and attention effects on timing.

10:50–11:05 (37)  
**Einstein Was Right! Time Is Relative, Even for Pigeons.** THOMAS R. ZENTALL, University of Kentucky—The prevalent view of timing by animals is that temporal judgments reflect the absolute passage of time. We have found that when pigeons discriminate between two intervals, they also judge time relationally, as do humans, as in that one is the shorter or the longer of the two, and that relative time judgments affect absolute time judgments. We have also found that the judgment of time by pigeons, as with humans, is affected by what they are doing while they are timing. When pigeons are required to perform a second task while timing (in this case, pecking at a particular rate), they tend to judge the passage of time as subjectively shorter than it actually is; that is, time flies when one is cognitively involved.

11:10–11:25 (38)  
**Oscillator Representations of Timing.** JONATHON D. CRYSTAL, University of Georgia—It is generally accepted that timing abilities are subserved by separate mechanisms dedicated to different ranges of time (daily: circadian timing; seconds to minutes: interval timing; milliseconds: neural timing). I will present evidence from several experiments with rats that documents similar properties in the timing of targets in the range of milliseconds, seconds, minutes, hours, and days. The unifying principle that emerges from this line of research is that timing abilities are based on oscillator representations.

11:30–11:45 (39)  
**Time and Informativeness in Conditioning: A Unifying Principle.** C. RANDOLPH GALLISTEL, Rutgers University—Using Shannon’s theory of information to quantify the information that a conditioned stimulus conveys regarding the timing of the next unconditioned stimulus gives a parameter-free, quantitatively rigorous account of background conditioning, blocking, overshadowing, and relative validity, while also giving (for the first time) an empirically valid specification and quantification of the notion of temporal pairing. These results strengthen the idea, dating back to the 1970s, that what drives the learning that occurs in paradigms designed to establish the laws of association formation is not temporal contiguity but rather the learning of the temporal intervals themselves. Learning those intervals is essential to extracting from a protocol the mutual information between two events. The learning that occurs should be conceptualized as the extraction of that mutual information, not the formation of a conductive connection.

**Language Production II**  
International Ballroom North, Friday Morning, 10:20–12:00  
Chaired by Benjamin Swets, Stony Brook University

10:20–10:35 (40)  
**Individual Differences in the Planning Scope of Language Production.** BENJAMIN SWETS, MATTHEW E. JACOVINA, & RICHARD J. GERRIG, Stony Brook University—The scope of speakers’ planning in language production varies in response to external pressures (e.g., time pressure, audience presence). Such results indicate a flexibly incremen
tal production system: Speakers plan utterances piece by piece, but external pressures affect the size of the pieces that speakers buffer. In the present study, speakers described picture arrays to partners in a matching game. The arrays sometimes required speakers to note a contrast between a sentence-initial object (e.g., a four-legged cat) and a sentence-final object (e.g., a three-legged cat). Based on prior screening, we selected participants who differed on working memory span. Eye movement measures revealed that high-span speakers spent more time fixating the contrasting pictures prior to articulation onset than did low-span speakers. As a result, high-span speakers were also more likely to reference the contrast early in speech. We conclude that working memory plays a substantial role in the flexibility of incremental speech planning.

10:40–10:55 (41)  
**Speaker Opportunity in Audience Design During Spoken Dialogue.** DALE J. BARR, TIMOTHY M. GANN, & RUSSELL S. PIERCE, University of California, Riverside—Successful referential depends on speakers’ giving addressees sufficient information. This requires that speakers design their utterances in consideration of the addressees’ perspective. However, this process of audience design can be cognitively demanding, and thus speakers may employ strategies to reduce this burden. How and when do speakers engage in audience design? We propose that utterance generation can use either simple memory retrieval, and ignore the audience’s perspective, or a slower audience design algorithm. We tested this model by manipulating the addressees’ knowledge of entrained precedents, stimulus conventionality, and addressee feedback in a referential task. We found that speakers are opportunistic, choosing to rely on memory when the chance of misunderstanding is low. When conditions are less favorable, such as when feedback is not available, speakers engage in more audience design.

11:00–11:15 (42)  
**Gaze Patterns As Evidence of Coordination During Face-to-Face Narrative Dialogue.** KATHLEEN M. EBERHARD, University of Notre Dame—Speakers’ and addressees’ coordination of understanding in a face-to-face narrative dialogue was investigated by recording the speakers’ eye movements. Analyses of the occurrence of addressees’ acknowledgments and exemplifications of understanding showed that nonverbal forms (e.g., head nods, facial displays, etc.) were more likely to occur when the speakers looked on the addressees’ faces than when they looked off. In contrast, the addressees’ verbal forms of evidence of understanding (e.g., saying “uh huh,” “mhm,” etc.) were equally likely whether the speaker looked on or off their face. Evidence that speakers look off addressees’ faces because of resource demands comes from the finding that more than 90% of their looks off coincided with pause fillers (“uh,” “um”), which signal delays due to difficulty in formulation (e.g., Clark & Fox Tree, 2002; Fox Tree, 2001). The results are discussed within Clark’s (1996) levels of action framework.

11:20–11:35 (43)  
**Addressees Shape Speaking: When Confederates May Be Hazardous to Your Data.** ANNA K. KUHLEN & SUSAN E. BRENNAN, Stony Brook University (read by Susan E. Brennan)—Language use and processing can be shaped by coordinated action among conversational partners. Recently, mainstream psycholinguistics research has recognized the importance of studying language in interactive dialogue contexts. For a variety of reasons, experiments often use confederates instead of naive conversational partners. Under what circumstances can the role of a conversational partner be fulfilled just as well by a confederate? And under what circumstances might a confederate change the nature of the dialogue itself? The answer depends on what the essence of spoken dialogue is assumed to be. One common concern is that a confederate’s status should be covert. We suggest that a more serious issue is that even confederates who are blind to experimental hypotheses may know too much and behave accordingly, and naive partners may pick up on this, adapting in undesirable ways. We propose that the danger of using confederates varies, depending on task roles and the phenomena being studied.

11:40–11:55 (44)  
**First Impressions Matter: The Influence of Role Switching on Conversational Speech.** JENNIFER S. PARDO, ISABEL CAJORI JAY, RISA HOSHINO, & CHANTAL SOWEMIMO-COKER, Barnard
College, Columbia University, & ROBERT M. KRAUSS, Columbia University—Acoustic-phonetic attributes of speech are highly variable, and previous studies have found that interacting talkers converge or diverge during a single conversational session. In particular, the role of a talker, the sex of the pair of talkers, and an explicit instruction to imitate have all been found to influence the degree of phonetic convergence that a talker exhibits. In the present study, 8 pairs of talkers (4 male and 4 female) participated in a conversational task in which they switched roles multiple times over the course of the session. The role-switching manipulation had significant effects on various measures of convergence. Moreover, the initial role assignments influenced discourse-level measures, such as time talking, filled pause rate, and articulation rate. This study provides additional evidence that variability in speech production is influenced by multiple aspects of a given situation, including attributes of a talker’s identity and conversational role.

Speech Perception I
Continental Ballroom, Friday Morning, 10:20–12:00
Chaired by James M. McQueen
Max Planck Institute for Psycholinguistics

10:20–10:35:45
Positional Specificity in Lexical Retuning of Speech Perception.
JAMES M. McQUEEN & ALEXANDRA JESSE, Max Planck Institute for Psycholinguistics—Listeners use lexical knowledge to retune phonetic perception (Norris, McQueen, & Cutler, 2003). Four perceptual-learning experiments examined whether this effect arises when the critical exposure sounds are in word-initial versus word-final positions, and whether learning transfers across syllabic positions. The exposure phase in all experiments was an auditory lexical-decision task; critical trials had, across experiments, the same ambiguous [f] sound in [f]-biased lexical contexts or, for another listener group, in [s]-biased contexts. The test phase in all experiments was categorization of the same [f]–[s] continuum. Position of critical exposure sound (word-initial or word-final) and position of test sounds (syllable-initial or syllable-final) were manipulated across experiments. A lexically consistent categorization shift was found only with word-final exposure sounds and was stronger for syllable-final than for syllable-initial test sounds. Lexically guided retuning appears not to arise when critical sounds are in the initial position, but retuning on the basis of word-final exposure can generalize across positions.

10:40–10:55:46
LAURA C. DILLEY, Bowling Green State University, SVEN L. MATTYS, University of Bristol, & LOUIS VINKÉ, Bowling Green State University (read by Sven L. Mattys)—Recent work shows that word segmentation is influenced by distal prosodic characteristics of the input, several syllables from the segmentation point. Here, participants heard eight-syllable sequences with a lexically ambiguous four-syllable ending (e.g., crisis turnup vs. cry sister nip). The prosodic characteristics of the initial five syllables were resynthesized in a manner predicted to favor parsing the final syllables as either a monosyllabic or a disyllabic word; the acoustic characteristics of the final three syllables were held constant. Experiments 1 and 2 replicated earlier results showing that utterance-initial prosody influences segmentation utterance-finally, even when lexical content was removed through low-pass filtering. Additional experiments pitted distal prosody against either distal semantic characteristics or the prosodic attributes of test words themselves. Although these factors jointly affected which words participants heard, distal prosody was an extremely robust segmentation cue. These findings introduce a powerful new factor for consideration in models of word segmentation and lexical access.

11:00–11:15:47
Universal Grammar and Misperception: It’s a Two-Way Street.
IRIS BERENT & TRACY LENNERTZ, Northeastern University, & EVAN BALABAN, McGill University and SISSA—It is well known that ill-formed structures tend to be misperceived (e.g., tilt–tla; Pitt, 1998), but the relationship between ill-formedness and misperception is debated: Is grammatical ill-formedness the consequence of misperception, or its cause? To address this question, we examine English speakers’ perception of onsets that are unattested in their language. The results from a task that underscores phonological structure reflected greater misperception of universally ill-formed onsets (e.g., mflf/mffb) relative to better-formed ones (e.g., mlff). But when attention to phonetic form was encouraged, the perception of ill-formed and better-formed onsets did not differ, indicating that their phonetic representation was equally precise. These results suggest that misperception is the consequence of ill-formedness, not invariably its cause: It reflects the active recoding of surface forms to abide by grammatical restrictions, rather than a passive phonetic failure. Although such phonetic biases might well shape the grammatical system, they do not subsume it.

11:20–11:35:48
Further Studies of Acoustic Variability and Vocabulary Learning.
MITCHELL S. SOMMERS & JOE BARCROFT, Washington University, & KEVIN MULQUEENY, University of Chicago—Previous research has demonstrated that some sources of acoustic variability, including variations in talkers, speaking rate, and voice type, can improve the speed and accuracy of second language (L2) vocabulary learning. The present set of experiments was designed to extend these earlier findings by examining whether the benefits of one source of variability (talker variability) will be seen in a new L2 (Russian), will generalize to learning unfamiliar first language (L1) words, and will interact with learning semantic information (novel shapes). In Experiments 1 and 2, participants learned either unfamiliar L2 Russian words (Experiment 1) or unfamiliar L1 English words (Experiment 2) via picture–word presentations. In Experiment 3, participants learned to “name” geometric shapes that were paired with Basque words. In all three experiments, increased variability improved both the speed and accuracy of word learning. Results are discussed in terms of how variability can affect the nature of lexical representations.

11:40–11:55:49
Rhythmic Speech Perception Shows How Music Novices “Compose.”
JOHN G. NEUHOFF, College of Wooster—Music and speech have long been thought to have common cognitive underpinnings, and recent work demonstrates that the music of expert classical composers reflects the speech rhythm of their native languages (Huron & Ollen, 2003; Patel & Daniele, 2003). In the present study, English-speaking music novices composed simple “English” and “French” tunes. The rhythms produced reflected speech rhythms perceived in English and French, respectively. Yet, the pattern was opposite that produced by expert English and French composers and opposite that predicted by the acoustic determinants of speech rhythm that specify English speech and French speech. The results reflect speech rhythms perceived in English and French, respectively. The results suggest that common cognitive underpinnings of music and speech rhythm are far more widespread than previously thought, and that native rhythm production in music is consistent with perceived rather than acoustically specified speech rhythms.

Divided Attention
International Ballroom South, Friday Morning, 10:00–12:00
Chaired by Todd S. Horowitz, Harvard University

10:00–10:15:50
Slots Versus Flexible Resources in Multiple Object Tracking.
TODD S. HOROWITZ, Brigham & Women’s Hospital and Harvard Medical School, & MICHAEL A. COHEN, Brigham & Women’s Hospital—In multiple object tracking experiments, observers can track a limited number of objects. Does the limit derive from a limited number of structures (“slots”), a divisible limited resource, or both? These accounts make different predictions about the precision of the representation of tracked items: In a pure slots model, precision is independent of the number of targets; in a pure resource model, precision decreases monotonically with the number of targets; in hybrid models, precision decreases with...
the number of targets up to the number of slots, then levels off. Observers tracked 1, 2, 3, or 6 of 12 disks and reported target motion direction by adjusting a probe arrow. We derived the precision of representation of correctly tracked targets using a mixture distribution analysis. Precision decreased linearly with the number of targets and did not level off. This finding is inconsistent with any role for slots and strongly supports a resources model.

10:20–10:35 (51)

Does Coactivation Occur Between Dimensions or Within Objects? J. TOBY MORDKOFF & ROSE HALTERMAN, University of Iowa (read by J. Toby Mordkoff)—Previous work has shown that redundant targets race to activate a detection response when both targets are defined by shape (or by color). In contrast, evidence of coactivation has been found when one target is a shape and the other is a color. The question is whether target shapes and colors coactivate because they are from different dimensions or because they can be seen as parts of the same perceptual object. The earliest work supported the dimensions interpretation, but more recently it has been argued that the objects view can accommodate these data. We conducted two new experiments to address this issue. The first used the typical style of display coupled with an unbiased design. The second employed a novel method. Both experiments supported the objects view. However, it is still unclear whether objects play a direct or indirect role in determining whether evidence of coactivation is observed.

10:40–10:55 (52)

When Two Objects Are Easier Than One: Object-Based Attention Reconsidered. W. TRAMMELL NEILL, PATRICK A. O’CONNOR, & YONGNA LI, University at Albany—Many studies have found that it is easier to report or compare two aspects of the same object than two aspects of two different objects (within-object superiority, WOS). However, studies by Davis and colleagues (e.g., Davis & Holmes, 2005) report the opposite result (between-object superiority, BOS). In the present experiments, we investigated variables that might determine WOS or BOS. In one experiment, subjects made same/different judgments of either two notches (triangular and/or rectangular) in the object outlines, or two shapes (triangles and/or rectangles) imbedded in the objects. Although comparing imbedded shapes yielded the typical WOS, comparing notches yielded BOS. A critical variable appears to be whether the target features are perceived as actual parts of the contextual objects or, instead, as other objects in the vicinity of the contextual objects. The results cast doubt on the common assumption that a single object is more easily attended than two objects.

11:00–11:15 (53)

The Effect of Central Processing Interference on Dual-Task Sequence Learning. ERIC H. SCHUMACHER & HILLARY SCHWARB, Georgia Institute of Technology—Some investigators report that dual-task processing impairs sequence learning; others report that it does not. One reason for this discrepancy may be the dual-task procedures used. In typical studies of dual-task sequence learning, the serial reaction time (SRT) task is paired with a tone-counting task. The tone-counting task is not ideal for studying the cognitive processes involved in sequence learning. The present experiments sought to identify the nature of the interference responsible for disrupting sequence learning in dual-task situations by modifying the tone-counting task to require a response on each trial and by manipulating the amount of central processing overlap between the tasks. The results indicate that dual-task performance disrupts sequence learning to the extent that the dual-task interference disrupts the SRT task. Additionally, the results indicate that it may be the overlap of the central processes involved in successfully performing the two tasks concurrently that leads to sequence learning deficits.

11:20–11:35 (54)

Nonautomatic Emotion Perception in a Dual-Task Situation. DAVE TOMASIK & ERIC RUTHRUFF, University of New Mexico, PHILIP A. ALLEN, University of Akron, & MEI-CHING LIEN, Oregon State University (read by Philip A. Allen)—Are emotions processed automatically? TwoPsychological refractory period experiments were carried out to determine whether emotion perception is automatic, in the sense that it does not require central resources. In Experiment 1, Task 1 required an auditory discrimination (low pure tone vs. noise), whereas Task 2 required a happy-face versus sad-face discrimination at varying levels of difficulty. The stimulus onset asynchrony (SOA) between Task 1 and Task 2 was varied. In Experiment 1, the effects of Task 2 emotion perception difficulty were additive with SOA, suggesting that emotions could not be processed while central resources were devoted to Task 1. Experiment 2 replicated this additive relationship with a stronger manipulation of emotion perception difficulty. Using locus-of-slack logic, we found that emotion perception was subject to the central bottleneck. Thus, our findings suggest that emotion perception is not fully automatic.
differentiated diagnosis from prediction, using matched scenarios and both choice and estimation response modes.

11:00—11:15 (58)

Base Rates, Contingencies, and Prediction Behavior. YAACKOV KAR-EEV, Hebrew University, KLAUS FIEDLER, University of Heidelberg, & JUDITH AVRAHAMI, Hebrew University—A skew in the base rate of upcoming events can often provide a better cue for accurate predictions than can a contingency between signals and events. Here we study prediction behavior and test people's sensitivity to both base rate and contingency; we also examine their ability to compare the benefits of both for prediction. We formalize these notions and propose a new measure of the regularity in the environment (ExpPA). In two experiments, we test whether the notions underlying this measure capture prediction behavior. In the first, we compare participants' prediction behavior, preference, and assessment of contingencies in two data sets that differ only in their base rate. In the second, in which the contribution of contingency over base rate is manipulated, we study participants' willingness to forget a costly predictor. The results indicate a close correspondence between ExpPA and behavior.

11:20—11:35 (59)

The Mediating Role of Retrieval and Attentional Control on Probability Judgment. MICHAEL R. DOUGHERTY, University of Maryland, AMBER SPRENGER, Johns Hopkins University, SHARONATAKINS, University of Maryland, ANA M. FRANCO-WATKINS, Auburn University, & RICK THOMAS, University of Oklahoma (read by Michael R. Dougherty) —This research tested the HyGene's (Thomas et al., 2008, Psychological Review) prediction that constraints on memory processes and hypothesis generation can cascade into errors and biases in probability judgment. Using a learning-based paradigm, we manipulated hypothesis generation by directing attention at encoding and dividing attention during judgment and examined the degree to which participants provided excessive probability judgments. The results from two experiments revealed that divided attention during judgment leads to an increase in subadditivity, suggesting that the comparison process for probability judgments is capacity limited. In a third experiment, we showed that divided attention during encoding affects subsequent probability judgment made under full attention, but that this effect is fully mediated by recall. In addition, individual differences in response inhibition and working memory capacity were independent predictors of probability judgment.

11:40—11:55 (60)

Neural Correlates of Decision Field Theory With Learning: A Model-Based Approach to fMRI. EILAN K. JESSUP, JEROME R. BUSEMEYER, & JOSHUA W. BROWN, Indiana University (read by Jerome R. Bussemeyer)—Model-based fMRI enables a unique opportunity to constrain neuroimaging datasets while simultaneously producing more informative results. This method involves fitting a model to behavioral data and then correlating with concurrent neural data (i.e., BOLD response). Here we study the resultant time series of data produced by those model fits. Consequently, this procedure informs “how” a cognitive process is implemented in the brain, and not merely “where” (O'Doherty et al., 2007). Here, we present a model that bridges decision field theory (Bussemeyer & Townsend, 1993) with reinforcement learning—where learning takes place on the probabilities—using a preferential choice paradigm. The results implicate several regions, including the anterior cingulate cortex, in feedback-based updating of a probability prediction error.

Recognition Memory
Waldorf Room, Friday Morning, 10:00—12:00

Chair by Douglas J. K. Mewhort, Queen's University

10:00—10:15 (61)

Serial-Position Curves for Lures in Recognition Memory. DOUGLAS J. K. MEWHORT & ELIZABETH E. JOHNS, Queen's University—We report short-term recognition memory experiments in which each lure was an orthographic neighbor of a studied item. We assigned the serial position of the related study item to each lure. The serial-position curves for hits and for correct rejections were parallel, with marked recency. Familiarity theory anticipates that hits will benefit from increased familiarity, but that correct rejections will suffer from the same manipulation. Hence, the parallel curves indicate that lures are not rejected because they are unfamiliar; rather, they are rejected because they contradict particular studied items, as in dual-process models and the iterative resonance model (Mewhort & Johns, 2005, Memory). In subsequent experiments, we manipulated familiarity using lures that overlapped one or two different studied items. The serial-position curves across the levels of familiarity did not support independent familiarity and retrieval processes, as is required by dual-process theory.

10:20—10:35 (62)

Is “Short-Term Consolidation” Simply “Deep Processing”? FER-GUS I. M. CRAIK, Rotman Research Institute, EROL ÖZCELIK, Middle East Technical University, & LIN LUO, York University (read by Fergus I. M. Craik)—Many studies over the last 30 years have shown that a rapidly presented series of pictures or words can be perceived at the moment of presentation, but are not remembered later. The general understanding is that, whereas only a brief time (100 msec) is required for perception, a further unfilled interval (300 msec) is necessary to consolidate the percept into an episodic memory trace. The present experiments first confirm and illustrate the notion that attentional resources are necessary for the formation of episodic records. Further experiments combine a levels-of-processing manipulation with the short-term consolidation paradigm to explore the idea that the time necessary for “consolidation” or “vulcanization” is essentially needed to carry out deeper conceptual processing. The findings support this speculation. The potential value of this result is that the somewhat mysterious notion of short-term consolidation may be better integrated with concepts in the general memory literature.

10:40—10:55 (63)

Recognition of Categorized Words: A Strength-Based Criterion Shift. MURRAY SINGER, University of Manitoba—Many recognition models, both single- and dual-process, encompass a signal-detection mechanism in which probe strength is compared with a decision criterion. Setting different criteria for stimulus classes of different strengths is a criterion shift. I recently measured a more lenient criterion in the recognition of weak versus strong story statements when the two were intermixed in one recognition list. Such an outcome has been elusive in recognition memory for random and categorized words. The text-recognition procedure was adapted for recognition of word sets that originated in taxonomic categories, such as cities and occupations. Each stimulus category was encountered either once (weak) or twice (strong). Regardless of whether strong or weak categories were separated (Experiment 1) or intermixed (Experiment 2) during study, a criterion shift resulted. Implications will be considered for the factors that regulate criterion shifts and the cognitive feasibility of frequent criterion changes.

11:00—11:15 (64)

Recognition Memory for Who and With Whom. TODD C. JONES, Victoria University of Wellington, JAMES C. BARTLETT, University of Texas, Dallas, & BO WANG, Victoria University of Wellington—In two experiments, we examined recognition memory for naturalistic individual faces (Experiment 1) or face pairs (Experiment 2) with a standard study-test procedure that used confidence judgments. Individual faces or face pairs were presented one or eight times during a study phase. On a recognition test for individuals, features from two studied faces were sometimes recombined to produce conjunction lures. On a recognition test for face pairs, individuals from separate study pairs were sometimes recombined to produce rearrangement lures. For both experiments, study repetition increased hit rates but, ironically, also increased error rates to the critical lures. The proportion of confident correct rejections of critical lures was not higher for the repeated study condition than for the nonrepeated study condition. The results indicate that subjects could not clearly control conjunction or rearrangement errors to naturalistic, unknown faces, and that performance was based heavily, if not solely, on familiarity.
Semantic Transparency Affects Memory Conjunction Errors.
MUNGCHEN WONG & CAREN M. ROTELLO, University of Massachusetts, Amherst (read by Caren M. Rotello)—Memory conjunction errors occur when aspects of two different events are falsely recognized or recalled as having occurred within the same event. One theoretical account of conjunction errors is rooted in traditional dual-process models of recognition judgments, in which responses are based on an item’s familiarity or the retrieval of recollected details associated with the encoding of that item. We manipulated the familiarity of test probes by varying their semantic overlap with studied items, taking advantage of the inherent semantic transparency of compound words. Transparent compounds, unlike opaque compounds, are those whose component parts are semantically related to the meaning of the entire word. We show that the familiarity of conjunction and feature lures created from semantically transparent parents is greater than the familiarity of lures created from semantically opaque parents, supporting familiarity theory. The use of a recall-to-reject process was not evident for either semantically transparent or opaque lures.

Associative Memory Is Familiarity- (Not Recollection-) Based: Evidence From Automatic Versus Controlled Slowdown in Recognition.
JERWEN JOU, University of Texas, Pan American—Associative memory is assumed to be strongly recollection-based. The present study demonstrated that it may actually be familiarity-driven. Subjects studied pairs of words but were instructed to respond “Yes” to both intact and rearranged pairs as fast as possible. However, they responded “Yes” to the rearranged pairs consistently more slowly than did other subjects, who were instructed to respond “Yes” to the intact pairs only. This suggests that association between two words is an integrated feature of the episodic complex, and the response slowdown was driven by an automatic familiarity process. In another single-word recognition experiment, the upper/lower case of the letters of words was varied from study to test. Unlike in the above finding, subjects were able to respond as fast to case-changed old words as to case-intact old words. However, when instructed to respond “Yes” to only case-intact old words, they responded significantly more slowly. This suggests that the slowdown from case verification is driven by a slow and controlled recollection process.
Groups of older adults and Alzheimer’s patients heard sentences that were presented by either a female or a male speaker. On a subsequent memory test, participants first made an old–new judgment, and for items judged “old,” they then made a source judgment about who presented the item at encoding (i.e., male or female?). For each of these judgments, participants also rated the likely accuracy of their response on a scale from 0 (guessing) to 100 (certain).

2:50–3:05 (71)
Predicting Verbmatic Loss and Gist Sparing in the Aged and Cognitively Impaired. CHARLES J. BRAINERD & VALERIE F. REYNA, Cornell University—Recall is sensitive to memory declines during healthy aging and during transitions to cognitive impairment. The most commonly used clinical test of memory decline is a free recall procedure (the RAVLT). The recall data of young adults are well-fit by a model that contains two retrieval operations—gist-based reconstruction and direct access of verbmatic traces—plus a slave judgment operation that decides whether subjects’ confidence in reconstructed items is sufficient to output them. This model also gives excellent accounts of the RAVLT performance of healthy-aged subjects, of Alzheimer’s patients, of Parkinson’s patients, and of control patients with other neurological diseases. Comparisons of younger versus older healthy-aged subjects and of different patient groups reveal that (1) direct access declines during healthy aging, whereas gist-based reconstruction is spared; (2) metacognitive judgment declines during healthy aging, even though the accuracy of reconstruction does not; and (3) reconstruction declines during transitions to impairment.

3:10–3:25 (72)
The Gist of the Session, Implications, and Future Directions. ELIZABETH A. KENSINGER, Boston College—In this presentation, I discuss how a cognitive neuroscience perspective has shed light on older adults’ reliance on gist, emphasizing the important role of both encoding and retrieval monitoring processes. In addition to reviewing the main themes that have emerged during the session, I discuss the broader implications of older adults’ reliance on gist and highlight a few promising avenues for future research.

Reasoning/Problem Solving
International Ballroom North, Friday Afternoon, 1:30–3:30

Chaired by Trina C. Kershaw, University of Massachusetts, Dartmouth

1:30–1:45 (73)
Multiple Paths to Transfer in Insight Problem Solving. CHRISTOPHER K. FLYNN & TRINA C. KERSHAW, University of Massachusetts, Dartmouth (read by Trina C. Kershaw)—Multiple paths to transfer (Nokes & Ohlsson, 2005) were used to relieve constraints identified in the four-tree insight problem (deBono, 1967). One single training condition used an analogy sequence to activate the strategy of reconstructing the problem space from a two-dimensional into a three-dimensional representation. Another single training condition used direct instruction to correct misconceptions of fundamental geometric concepts that inhibit insight. A third condition received both types of training, and a fourth condition (control) only received the target four-tree problem. Participants in the combined training condition were 20 times more likely to solve the target problem and attempted significantly fewer incorrect solution strategies than did the participants who received no training. The single training geometry condition was not different from the combined condition, and the single training analog condition did not differ significantly from the control condition. Implications for theories of constraint alleviation and transfer in problem solving are discussed.

1:50–2:05 (74)
Is Problem Solving Goal-Directed? A Selective Attention Model of Performance in the Tower of Hanoi. ELENA G. PATSENSKO & ERIK M. ALTMANN, Michigan State University (read by Erik M. Altmann)—Problem solving has traditionally been viewed as a goal-directed activity, with moves in the problem space guided by goals arising from the application of such heuristics as means–ends analysis. The question addressed here is whether specific, move-related goals are necessary to
account for behavior in a canonical problem-solving task, the Tower of Hanoi. An alternative model is presented in which task performance is guided by selective attention to task-related objects (disks) combined with a few general rules instantiated online with the attended objects. In three experiments, disks were added, deleted, and had their positions changed using a saccade-contingent display-updating paradigm. Response latencies and move patterns conflicted with the predictions of goal-based models and supported the selective attention model.

2:10–2:25 (75)

Primate Decision Making in the Monty Hall Three-Door Problem. EMILY D. KLEIN, MICHAEL J. BERAN, THEODORE A. EVANS, & NATASHA A. BARRETT, Georgia State University—The three-door problem is a well-known probability puzzle in which players try to guess which of three doors conceals a prize. After selecting a door, players are shown that there is no prize behind one of the remaining doors. Players are then given a choice to stay with their door or switch to the other unopened door. Most people stay, even though switching doubles the probability of winning. The present experiment presented monkeys and humans with a computerized version of the three-door problem. We were interested in whether monkeys were more likely to engage in a switching strategy and whether all subjects could learn to switch with repeated trials. The results support previous findings that most humans have an initial stay bias. However, this tendency may be uniquely human, because the monkeys did not show such a bias. With experience, humans and rhesus monkeys learned to use the switch strategy.

2:30–2:45 (76)

How Mapping Similarities and Differences Affects Creativity During Analogical Problem Solving, CYNTHIA M. SIFONIS, Oakland University—During analogical mapping, similarities and differences between domains are identified, allowing the solution to a problem in the source domain to be “carried over” and applied to the target domain. The present study examined how this mapping process affects creativity during analogical problem solving. Participants identified three similarities and differences between parking at the mall (source domain) and parking on campus (target domain). They then used each correspondence to generate a solution to the parking problem on campus. Solutions were rated on practicality and creativity. Two measures of creativity were used: objective creativity (average of the practicality rating and frequency in sample) and perceived creativity (creativity rating). Listing similarities before differences resulted in higher scores for the objective and perceived creativity of solutions than did listing differences before similarities. Objective creativity was higher for solutions generated from similarities than for those from differences. The opposite was true for perceived creativity. Potential explanations for these results are discussed.

2:50–3:05 (77)

Deductive Reasoning With Generic Premises: The Generic-Over-Generalization Effect, SANGEET KHEMLANI, SAM GLUCKSBERG, & SARAH-JANE LESLIE, Princeton University (read by Sam Glucksberg)—Genetics are statements that are not explicitly quantified and that express generalizations, such as “ducks lay eggs.” Intuitively, the generic (nonquantified) form of such statements seems to be true. Furthermore, people seem to be prone to an interesting error: treating the universal form of characteristic generic assertions (e.g., “all ducks lay eggs”) as true, even though they are, upon a moment’s reflection, patently false. How would people interpret generic assertions when they are used as premises in a syllogistic reasoning task? Although the normative strategy to optimize production of valid conclusions would be to treat generics as existential assertions, people displayed a strong tendency to assimilate generics to universal assertions. As in prior comprehension studies, generics behaved as the prototypical default form for demanding processes to deductively reason, whereas the probability heuristics model (PHM; Chater & O’Rard, 1999) proposes that people use fast and frugal heuristics to judge the validity of conclusions. In order to test the predictions of these two theories, 57 participants were given two working memory (WM) span tasks and were asked to verify the validity of conclusions to a set of multimodel syllogisms. MMt predicts a positive correlation between WM and reasoning performance, whereas PHM does not suggest that WM should relate to verification performance. Results revealed an interaction between WM span and average solving time in predicting reasoning performance: Slower solvers showed a large correlation between WM and reasoning performance, and faster solvers showed no relationship. The results suggest that some people may use resource-demanding processes to reason and others may use heuristic approaches.

Speech Perception II
Continental Ballroom, Friday Afternoon, 1:30–3:50

Chaired by Delphine Dahan, University of Pennsylvania

1:30–1:45 (79)

Listeners’ Use of Context-Specific Cue Distributions During Spoken-Word Recognition. DELPHINE DAHAN, University of Pennsylvania—Participants were instructed to click on one of four words as their eye movements were monitored. The words consisted of pairs that differed in the final consonant’s voicing (e.g., bat, bad, doze, dose). On critical trials, the duration of the spoken word’s vowel, typically longer before a voiced than a voiceless consonant, had been changed to an intermediate value. When the word was played in isolation, eye movements revealed a bias for voiced interpretation (e.g., bad). However, when the same stimulus was heard in its original, utterance-final, context, the voiced bias was significantly smaller. These results concur with the fact that, overall, the range of vowel durations is greater before a voiced than before a voiceless consonant. However, within a given context (e.g., in utterance-final position), these distributions have smaller and more similar variances. Thus, this study reveals that the likelihood distributions associated with words or their subcomponents can be context-specific.

1:50–2:05 (80)

Perceptual Learning of Phonological Talker Idiosyncrasies. ALEX-ANDRA JESSE & HOLGER MITTERER, Max Planck Institute for Psycholinguistics—Listeners adjust to phonetic speaker idiosyncrasies through lexically guided perceptual learning (Norris, McQueen, & Cutler, 2003). We investigated whether listeners also adjust to speakers’ phonological choices, such as optional epenthetic schwa insertion in Dutch (e.g., [mɛlɪk] pronounced as [mɛlɔk] “milk”). In an eyetracking paradigm, Dutch listeners were verbally instructed to click on one of four printed words. During exposure, one of two speakers pronounced the critical targets with the optional epenthetic schwa. During critical test trials, listeners heard words with obligatory schwa (such as [kɛrɛvɑn] “caravan”), and words with a possible epenthetic schwa that were not presented during exposure served as phonological competitors (e.g., [kɛragef]) “notch”). These competitors were more attractive if the speaker had previously produced epenthetic schwas, reflecting the larger phonological overlap of the target [kɛrɛvɑn] with the epenthized [kɛragef] than with the unepenthized [kɛrf] version. This shows adaptation of the listener to speakers’ phonological choices.

2:10–2:25 (81)

An Event-Related-Potential Index of Segmenting Speech and Non-linguistic Auditory Streams. LISA D. SANDERS, University of Massachusetts, Amherst—To understand speech, listeners must first segment the continuous streams of sounds into units that can be mapped onto stored representations. Event-related-potential (ERP) evidence indicates that listeners differentially process the initial and medial portions of words in continuous speech as early as 50 msec after syllable onsets. Specifically, word onsets elicit a negativity of larger amplitude than acoustically similar word-medial syllable onsets. The timing and distribution of this effect are remarkably similar, regardless of the type of information used to segment the speech. Further, the onsets of nonlinguistic sound
sequences presented in continuous streams elicit a larger early negativity after listeners are trained to recognize the sequences. Evidence of the same effect across linguistic and nonlinguistic domains implicates a more general cognitive process. Listeners may direct temporally selective attention toward sequence onsets in continuous streams in order to preferentially process information that cannot be predicted on the basis of previous sounds.

2:30–2:45 (82)
Where in Processing Do Auditory and Visual Speech Get Combined? ARTHUR G. SAMUEL & JERROLD LIEBLICH, Stony Brook University—In the “McGurk” effect, a visually presented face producing one syllable (e.g., /ga/) is paired with a conflicting auditory stimulus (e.g., /ba/); with such pairings, subjects hear something other than the auditory stimulus (e.g., /da/). Although the McGurk percept is compelling, it is not fully functional: Repeated presentation of a McGurk /d/ produces (contrastive) adaptation shifts consistent with its auditory component (e.g., /b/), rather than the conscious percept (e.g., /d/). In contrast, phonemes produced through phonemic restoration (e.g., the /d/ perceived when white noise replaces the /d/ in “armadillo”) do cause concomitant adaptation shifts. We report a series of experiments that test whether adding lexical support for the McGurk percept makes it an effective adaptor, and whether full functionality of an induced phoneme depends on the absence of a conflict between the visual and auditory cues. The results help to clarify where audiovisual speech integration takes place in the chain of processing.

2:50–3:05 (83)
Is Asynchrony Tolerable Adaptable in the Perceptual Organization of Speech? ROBERT E. REMEZ, DARIA F. FERRO, KATHRYN R. DUBOWSKI, JUDITH MEER, ROBIN BRODER, & MORGANA DAVIDS, Barnard College, Columbia University—In audiovisual presentations, large asynchronies in visible and audible speech streams are tolerated without the loss of perceptual integration. Evidence has shown that the upper limit of audiovisual asynchrony that permits integration is adaptable. In unimodal auditory presentations, tolerance of asynchrony is narrower, and inconsistent desynchrony is taxing, perhaps indicating susceptibility to adaptation to consistent desynchrony. A new project directly investigated the potential for adaptation to consistent desynchrony in unimodal auditory speech. Listeners aimed to transcribe sine-wave sentences that could be resolved at 95% correct when temporal properties were veridical. At 50-msec steps ranging from a 250-msec lead to a 250-msec lag, the tone analogue of the second formant was desynchronized from the rest of the tones comprising the sentences. In blocked trials, listeners exhibited no adaptation to consistent desynchrony, contrasting with reports of adaptation in multimodal desynchrony of speech. Implications for an account of perceptual organization are discussed.

3:10–3:25 (84)
Visual Speech Restoration Effect: Preliminary Findings in Older Children and Adults. SUSAN JERGER & DEREK HAMMONS, University of Texas, Dallas; NANCY TYE-MURRAY, Washington University, HERVE ABDI, University of Texas, Dallas, & MARKUS F. DAMIAN, University of Bristol—This research assessed whether visual speech can restore missing auditory input. Results were gathered with our children’s multimodal picture-word task using auditory/visual speech distractors. Participants named pictures while attempting to ignore auditory-only or auditory/visual nonsense syllables that were either phonologically onset-related or unrelated to the pictures. The visual speech track was always intact; the auditory track was intact or degraded—that is, approximately 50 msec were spliced off of the onsets. In general, intact congruent distractors speeded naming and intact conflicting distractors slowed naming. A set of carefully constructed auditory/visual speech distractors (e.g., /buh/buh and /uh/buh/) allowed us to operationally classify naming times for the degraded distractors (e.g., /buh/buh/uh/buh/uh/buh/ as ranging from complete restoration [effects of /buh/buh/ = /buh/buh/uh/buh/uh/buh/] to no restoration [ /buh/buh/ = /buh/buh/uh/buh/uh/buh/]. Naming times for the degraded distractors indicated partial restoration. In closing, we discuss visual speech restoration in terms of age, place of articulation, and auditory coarticulatory influences.

3:30–3:45 (85)
Now You Hear It, Now You Don’t: Effects of Speech Rate on Function Word Perception. LAURA C. DILLEY, Bowling Green State University, & MARK A. PITT, Ohio State University—Function words are the pillars of syntax, providing the relational information among words that is necessary for successful communication. In casual speech, their pronunciation can be so reduced that the acoustic evidence associated with them appears insufficient for perception, let alone accurate identification. How are such function words recognized? We tested the hypothesis that in such cases, both proximal and distal speech rates play a critical role in function word perception. Short phrases were constructed that contained a function word, but were grammatical with or without one. Resynthesized versions of these phrases were created by varying the rate of surrounding speech material. Results showed that function word perception was strongly affected by proximal and distal speech rates, demonstrating the important role of timing in perceiving highly reduced speech.

Scene/Object Processing
International Ballroom South, Friday Afternoon, 1:30–3:30
Chaired by Glyn W. Humphreys, University of Birmingham

1:30–1:45 (86)
The Paired Object Affordance Effect. GLYN W. HUMPHREYS, EUN YOUNG YOON, & JANE RIDDOCH, University of Birmingham—We present evidence that affordances for action between pairs of objects influence the time to judge whether objects can be used and whether they co-occur. The effects depend on the reference frame in which the objects appear, and they increase in size when agents are shown using the objects. The data suggest that affordance for action influences the retrieval of stored knowledge about objects.

1:50–2:05 (87)
Spatial Associations Affect Object Recognition. ZACHARY ESTES, University of Warwick—Some objects tend to occur in a particular region of the visual field. For instance, birds and hats typically occur in the upper half of the visual field, whereas snakes and shoes typically are seen in the lower half. We tested whether (and how) such spatial regularities affect object recognition. We found that typically high objects (e.g., birds) were recognized faster at the top of a display, whereas typically low objects (e.g., snakes) were recognized faster at the bottom. We also found that this effect of spatial location on object recognition was associative rather than oculomotor in nature. Implications of these results for models of object recognition are discussed.

2:10–2:25 (88)
Task-irrelevant Visual Novelty Delays the Disengagement of Overt Attention. JAMES R. BROCKMOLE, University of Edinburgh, & WALTER R. BOOT, Florida State University—Distinctive aspects of a scene can capture attention, even when they are irrelevant to our goals. However, considerations of attention allocation should not be limited to where attention goes, but also how long it stays in any particular place. We addressed whether visually unique but task-irrelevant features also tend to hold attention. Observers searched through homogeneously colored displays or displays in which one item was a task-irrelevant color singleton. This singleton was revealed at the fovea during a fixation. Saccade latency revealed the time required to disengage attention from this object. Singletons generated longer latencies, but this effect depended on the frequency with which singletons occurred. Thus, within-trial distinctiveness played a lesser role in attentional disengagement than did the violation of perceptual expectations. Nevertheless, this result is the first to demonstrate that the time spent overtly attending to an object is determined, at least in part, by task-irrelevant stimulus properties.

2:30–2:45 (89)
Computational Modeling of Fixation Durations in Scene Viewing. ANJIE NUTHMANN, TIM J. SMITH, & JOHN M. HENDERSON, University of Edinburgh (sponsored by John M. Henderson)—Eye-movement control during scene viewing can be represented as a series
of individual decisions about where and when to move the eyes. Here, we propose a computational model to account for variations in fixation durations. First, we assume an autonomous (i.e., random) saccade timer; timing signals are modeled as random-walk diffusion processes. Second, difficulties at the levels of visual and cognitive processing can inhibit, and thus modulate, the timer. Third, saccade programming is completed in two stages: an initial, labile stage that is subject to cancellation, and an ensuing, nonlabile stage. These model assumptions are consistent with current evidence concerning basic oculomotor control. The model was successfully tested on experimental data. We conclude (1) that fixation durations are sensitive to moment-to-moment processing demands and (2) that viable models of gaze control in scene perception should be able to account for variations in fixation durations.

2:50–3:05 (90)
Context Effects Reveal That Figure–Ground Perception Is an Instance of Biased Competition. MARY A. PETERSON, ELIZABETH SALVAGIO, & ANDREW J. MOJICA, University of Arizona—We found that context modulates the effectiveness of the configural cues of convexity and small area: Convex regions alternating with concave regions were increasingly likely to be seen as figures as the number of regions increased from two to eight. The same was true of small-area versus large-area regions. We interpret these results within a competitive model in which adjacent regions with different shape properties compete: The winning region is perceived as a shape bounded by the common edge; the losing shape properties are suppressed. Concave (large-area) regions are weaker competitors than convex (small-area) regions. In addition, context effects are obtained only when the weaker competitors are homogeneous in color, implicating spreading suppression among the weak contenders as the mechanism. Recent experiments have revealed context effects only when suppression was applied at multiple scene locations. These results call for a reinterpretation of figure–ground perception within the biased competition model of shape perception.

3:10–3:25 (91)
Object Individuation and Identification in the Brain: A Neural Object File Theory. YAODA XU, Harvard University, & MARVIN M. CHUN, Yale University—Many everyday activities, such as driving on a busy street, require the encoding of multiple distinctive visual objects from crowded scenes. Extending previous theories and incorporating new data, we describe here a neural object-file theory to explain how multiple visual objects are attended and encoded. We argue that, given processing limitations, the visual system may first select a fixed number of about four objects from a crowded scene on the basis of their spatial/temporal information (object individuation) and then encode their details (object identification). We present evidence showing the involvement of the intraparietal sulcus (IPS) in object individuation and the superior IPS and higher visual areas in object identification. These two stages of operation may underlie the variety of ways that visual processing is capacity limited, such as in visual short-term memory, enumeration, and multiple-object tracking.

Selective Attention I
Willford Room, Friday Afternoon, 1:30–2:50
Chaired by Jules Davidoff, Goldsmiths, University of London
1:30–1:45 (92)
Local and Global Processing: Observations From a Remote Culture. JULES DAVIDOFF, Goldsmiths, University of London, ELISABETH FONTENEAU, MRC Cognition and Brain Sciences Unit, Cambridge, & JOËL FAGOT, INCM, CNRS—A normal adult population drawn from a remote culture (Himba) in northern Namibia made similarity matches to Navon (1977) hierarchical figures. The Himba showed a local bias stronger than has been previously observed in any other nonclinical human population. However, their recognition of normal or distorted (“Thatcherized”) faces did not appear to have been affected by their attention to detail, as has been suggested for autistic populations. The data are consistent with a cultural/experiential origin for population differences in local processing, and they suggest that attention to the local and global properties of stimuli may differ for hierarchical figures and faces.

1:50–2:05 (93)
Feature-Contingent On-the-Fly Adjustment of Selectivity in the Flanker Task. RONALD HÜBNER & CAROLA LEHLE, University of Konstanz—Flanker congruency effects show that selectivity in the flanker task increases with the ratio of incongruent to congruent trials. Moreover, participants can even adjust their selectivity to different ratios on a trial-by-trial basis, if the stimulus location indicates the specific ratio. Recently, we have shown that stimulus color can also be utilized for such an on-the-fly adjustment. However, unlike with location, this is only the case if the contingency between color and ratio has been learned with blocked ratios (Lehle & Hübner, in press, Psychonomic Bulletin & Review). Here, we report an experiment in which we used numbers and letters as stimuli. Each stimulus category was associated with a specific ratio of incongruent to congruent trials. It turned out that participants could utilize these categories for their attentional adjustments without specific learning conditions. These results suggest that some stimulus features can more easily be used for controlling selective attention than others.

2:10–2:25 (94)
Prime Retrieval of Motor Responses in Negative Priming: Findings in a Go/No-Go Task Paradigm. SUSANNE MAYR & AXEL BUCHNER, Heinrich Heine University Düsseldorf (sponsored by Axel Buchner)—The prime–response retrieval model of negative priming (Mayr & Buchner, 2006) assumes that the transfer-inappropriate prime response is retrieved in ignored-repetition-probe trials and interferes with responding. In three auditory identification experiments, a cue in the prime signaled whether participants were to respond or not. Go/no-go cues were either simple cues or selective cues, necessitating a motor discrimination in no-go trials in order to decide upon prime response execution/suppression. Negative priming was found for all cue types, but an increase in prime response errors to the probes of ignored repetition trials was found only for go trials and for no-go trials in which a prime response had been executed. This implies that execution of the prime response is a precondition for prime-response retrieval, whereas a response preparation plan or a response description in task-specific terms is not sufficient.

2:30–2:45 (95)
When Attention and Motivation Collide: How Value Learning Modulates Visual Selection. JANE E. RAYMOND, JENNIFER L. O’BRIEN, & HELENA J. RUTHERFORD, Bangor University—Value learning allows the brain to acquire codes for predicting the value (e.g., gain, loss, or no outcome) of interacting with specific visual objects. We asked whether previously established value prediction (i.e., motivation) codes for specific stimuli could influence top-down visual selection processes that are widely thought to be driven by relevance to a current, ongoing task. After value learning (implemented using a choice task among neutral face stimuli that resulted in monetary wins, losses, or no outcomes), participants completed spatial and temporal visual search tasks with target and distractor stimuli that had been previously associated with gain, loss, or no outcome. Even though all stimuli were equally task relevant or irrelevant, equally familiar, and had the same low-level visual features, we found that selective attention depended on prior value associations. Selection of visual information thus depends on an interaction between attention and motivation.

Individual Differences in Memory
Waldorf Room, Friday Afternoon, 1:30–3:10
Chaired by Scott D. Gronlund, University of Oklahoma
1:30–1:45 (96)
The Is the Sequential Lineup Advantage Robust? SCOTT D. GRONLUND, CURT A. CARLSON, SARAH B. DAILEY, & CHARLES A. GOODSELL, University of Oklahoma—There is a national movement to conduct eyewitness lineups in a sequential manner (i.e., to view faces one at a time and to make a decision about one before seeing the next). Carlson,
Gronlund, and Clark (2008) raised concerns about the robustness of the sequential lineup advantage regarding lineup fairness and suspect position. In a large online sample viewed a mock crime video and then tried to identify the suspect from a lineup. Across participants, we varied whether the perpetrator was in the lineup, how the lineup was conducted (simultaneous or sequential), the position of the suspect (2nd or 5th in the sequence), lineup fairness, and suspect quality (how well the guilty or innocent suspect resembled the perpetrator). Of the resulting 48 sequential-versus-simultaneous comparisons, the sequential lineup resulted in better performance only twice. Both of these instances involved biased lineups with the suspect placed late in the sequential lineup.

1:50–2:05 (97) Effects of Victim Impact Statement on Lay People’s Judicial Decisions. MAKIKO NAKA, Hokkaido University—In some criminal cases, victims give a victim impact statement (VIS) to convey how the crime affected their lives. In some cases, a message is given by words (e.g., a letter), in other cases, it is given by photo (e.g., a photo of deceased is brought in court). In this study, we investigated how verbal versus visual messages affected decision making by a prospective juror. A total of 137 students were assigned to one of four conditions: PL, where a VIS was given by photo and letter; P, where only a photo was shown; L, where only a letter was shown; and a control. After watching a mock trial with or without VIS, participants rated the likelihood that the suspect was convicted. They also rated how they were emotionally affected by VIS. Results showed that a photo elevated the rating of conviction, but no difference was found for emotion, suggesting that participants were affected but were not necessarily aware of it.

2:10–2:25 (98) Higher Social Intelligence Can Impair Memory. SARAH J. BARBER & NANCY FRANKLIN, Stony Brook University, & MAKIKO NAKA & HIROKI YOSHIMURA, Hokkaido University (read by Nancy Franklin)—Source monitoring is made difficult when the similarity between candidate sources increases. Individual differences in social intelligence and perspective-taking abilities should thus impact source memory, such that high social intelligence increases source similarity and reduces source accuracy. Pairs of strangers first engaged in a cooperative storytelling task. On each trial, a single word was shown to both participants, with one designated to add the next story sentence using this word. Later, participants completed a source monitoring test. As predicted, social intelligence correlated negatively with source accuracy. In a second study, in which people were precluded from anticipating their partner’s next contribution to the story, the effect disappeared. In third study, the perspective-taking version was given to participants, in which participants, in which participants, living in a collectivist culture (Japan). These participants scored lower in social intelligence, on average, than Americans, and their source accuracy most resembled that of Americans who had scored low on social intelligence.

2:30–2:45 (99) Declarative Metamemory Knowledge in Patients With Schizophrenia. ELISABETH BACON, INSELM 905, Strasbourg, & NATHALIE HUET, CLLE-LTC, UMR 5264, CNRS—Schizophrenia patients suffer a wide range of deficits affecting their insight of several aspects of daily life. These include deficits in memory function. This study investigated the metamemory knowledge of patients and of matched controls with the Metamemory in Adulthood questionnaire (Dixon et al., 1988). This multidimensional questionnaire gives a rating of metamemory beliefs and knowledge concerning seven domains of daily cognitive function: strategy, task, capacity, change, anxiety, achievement, and locus. Patients reported a lower use of strategies. They expressed a higher level of anxiety relative to memory, and they also perceived themselves as having lower capacity and less controllability over their memory. Nevertheless, their knowledge about memory functioning and their motivation to succeed in a memory task were normal. Finally, they felt age-related declines in memory similarly to controls. Thus, patients did not suffer a general and nonspecific impairment of metamemory knowledge. These results may provide perspectives for cognitive remediation.
Evidence for a Role of Dopamine in Integrating Perception and Action. LORENZA S. COLZATO & BERNHARD HOMMEL, Leiden University. The primate cortex represents perceived and produced events in a distributed way, which calls for a mechanism that integrates their features and integrates the events themselves into coherent structures. Animal, drug, and patient studies suggest that visuomotor integration seems to be driven by dopamine. Consistent with this picture, we present evidence that the visuomotor integration is modulated by affect (induced by affective pictures), which induces phasic increases of the dopamine level, and stress (induced by the cold pressor test), which causes an excessive dopamine turnover in prefrontal cortex. Both manipulations affected visuomotor binding, supporting claims that dopamine impacts long-distance integration. The outcome pattern, including measures of the spontaneous eyeblink rate, suggests that the relation between dopamine level and visuomotor performance follows an inverted U-shaped function, with the strongest binding being associated with average dopamine levels.

Idiomotor Action Control: How the Brain Does It. BERNHARD HOMMEL, Leiden Institute for Brain & Cognition, TOBIAS MELCHER, Göteborg University; MAIKE WEIDEMA & RENA M. EENSHIUISTRA, Leiden Institute for Brain & Cognition, & OLIVER GRUBER, Göteborg University—Voluntary action is goal-directed and therefore depends on the ability to learn associations between actions and their perceivable effects. This discussion provides an overview of several neuroscientific studies from our lab (using PET, fMRI, and EEG) that investigated the neural mechanisms underlying action–effect acquisition and representation. Participants first acquired novel action–effect pairs and were then presented with these effects in independent tasks. Perceived action effects more or less automatically activated the caudal supplementary motor area, which presumably houses the action plans, and the right hippocampus, which seems to store the action–effect relationship. Our observations provide strong support for idiomotor approaches to action control.

Semantic Effects on Complex Working Memory Span. ELISABET SERVICE, McMaster University and University of Helsinki, & ANNI SIMULA & SINI MAURY, University of Helsinki—The sentence span task by Daneman and Carpenter (1980) has been central in research estimating total working memory capacity, since it combines a processing task (sentence comprehension) and a storage task (remembering a set of words). In previous research, it has been sensitive to phonological variables such as word length and phonological similarity. We tested the effect of semantics on participants who read sets of five sentences that either did or did not form a story. In one condition, they had to report all the last words at the end of the set, in another they memorized an additional separate word with each sentence. Both the relatedness of the sentences (the story condition) and the inclusion of the words into sentences helped memory. An interaction showed that the story condition had a greater effect on last words than on separate words. This result is compatible with the words being encoded to long-term memory during the task.

Linguistic Familiarity and Short-Term Memory: The Role of Articulatory Fluency. WILLIAM J. MACKEN, AMELIA J. WOODWARD, & DYLAN M. JONES, Cardiff University—Effects of linguistic familiarity on short-term serial recall have been attributed to a redintegrative process, whereby partially decayed short-term phonological traces are “cleaned up” for retrieval via support from long-term phonological representations of the target items. We argue instead that the effects of linguistic variables on short-term memory reflect the operation of articulatory mechanisms in serial recall; the more readily a set of verbal material can be encoded as a sequence of articulatory gestures, the better memory for that material is. Evidence is presented from the effects of familiarization on memory and articulatory fluency for items in isolation and in sequence. We also show that the differences in fluency between sets of material emerge when fluency of sequence production is assessed, whereas such differences are absent with other measures of fluency. Results indicate that articulatory fluency has been prematurely excluded as a source of linguistic familiarity effects in short-term memory.
The first series showed the increase in efficiency of the refreshment mechanism from age 5 to adolescence. The second series explored the qualitative change that occurs between ages 5 and 7 in maintenance mechanisms.

**JUDGMENT/DECISION MAKING III**
Continental Ballroom, Friday Afternoon, 4:10–5:30

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

**4:10–4:25 (111)**

**Verbal and Nonverbal Cues in Risk Communication and Risky Choice.** X. T. WANG & MINGLiYANG, University of South Dakota—Much research has been done to study the separate effects of verbal framing, facial expression, and tone of voice on risk perception and risky choice. Little is known about the conjoint effects of these communication variables. This study examined how consistent and inconsistent hedonic cues affect risk preference in different hypothetical risk domains. Verbal framing significantly affected risk preference in a task-domain-specific manner. Nonverbal cues also significantly affected risk preference and altered the verbal framing effects. In general, positive facial and vocal cues facilitated risk-seeking preference, and vice versa for negative nonverbal cues. Facial cues were most effective in the health domain, whereas verbal cues were most effective in the business and monetary domains. Consistent with a cheating detection hypothesis of risk communication, when the facial and vocal cues were inconsistent, participants became more risk seeking, discounted both nonverbal cues, and resorted to the verbal cue, showing a significant framing effect.

**4:30–4:45 (112)**

**Temporal Discounting, Risk, and the Slope Reversal Effect.** MARY KAY STEVENSON, California State University, East Bay; SUSANN FIEDLER, University of Erfurt; & SHARON ALKIRE & STEPHEN HONG, California State University, East Bay—Using two distinctly different decision tasks—attractiveness ratings and strength of preference ratings—a systematic change in processing has been found to occur for negative outcomes. This change is termed a slope reversal effect. Slope reversals have not occurred with positive outcomes. A series of studies were completed to determine the conditions that produce a slope reversal effect. We describe these results, with an explanation of the processing mechanisms that might lead to this effect. Individual differences were also assessed for each study. This research may be used to provide a framework for generalizing the effects of time and probability on gains and losses across experimental tasks.

**4:50–5:05 (113)**

**Framing, Inhibition, and Risk Taking in Adolescents and Adults.** VALERIE F. REYNA, STEVEN ESTRADA, JESSICA DiMARINIS, REGINA MYERS, & JANINE STANISZ, Cornell University—Results from laboratory tasks (e.g., framing) and surveys of real-life risk taking support fuzzy trace theory’s predicted developmental shift away from verbatim-based analysis (which is risk-promoting when benefits outweigh risks) toward gist-based risk avoidance (Reyna & Farley, 2006). However, no studies directly compare laboratory framing tasks to real-life risk taking. We administered 18 risky-choice, monetary framing tasks in counterbalanced order (9 gain-framed, 9 loss-framed) to 153 subjects (51 adolescents and 102 young adults). Consistent with predictions, adolescents demonstrated a reverse framing pattern (more risk taking for gains than losses), especially when stakes were high, whereas adults demonstrated the standard pattern (more risk taking for losses than gains). Furthermore, reverse framing predicted real-life risk taking (e.g., number of sexual partners), even when age and behavioral inhibition were partialled out. The results support a dichotomy of risky reactors (low inhibition), risky deliberators, and gist-based risk avoiders, which violates traditional dual-process (two-system) theories.

**5:10–5:25 (114)**

**The Use of Heuristic Cues in Intuitive Mathematical Judgment.** ROLF REBER, MORTEN BRUN, & KAROLINE MITTENORDFER, University of Bergen—Anecdotal evidence points to the use of beauty as an indication for truth in mathematical problem solving. Two experiments examined the use of heuristics and tested the assumption that participants use symmetry as a cue for correctness in an arithmetic verification task. We presented additions of patterns and manipulated the symmetry of the patterns. Speeded decisions about their correctness led to higher endorsements of additions with symmetric patterns, both for correct and incorrect additions. This finding cannot be explained by a facilitating effect of symmetry on calculation or estimation. We found systematic evidence for the use of heuristics in solving mathematical tasks and relate these findings to a processing fluency account of intuition in mathematical judgment.

**SPATIAL ATTENTION**
International Ballroom South, Friday Afternoon, 3:50–5:30

Chaired by Reinhold Kleigl, University of Potsdam

**4:30–4:45 (115)**

**When Microsaccades Follow Spatial Attention.** REINHOLD KlieGL & JOCHEN LAUBROCK, University of Potsdam, MARtIN RolFS, Universität Paris Descartes, & RALF ENGBERT, University of Potsdam—There is a dispute about the role of microsaccades in spatial attention (Horowitz et al., 2007a, 2007b; Laubrock et al., 2007, Psychological Science). Here, we show with a multinomial model for Posner spatial cuing that, on the assumption that attention goes with cues with the probability matching cue validity, microsaccades go with attention 100% of the time (1) when saccadic responses are required, (2) when they include the first microsaccade in the cue–target interval (CTI), and (3) when they occur between 200 and 400 msec after the cue. The time window corresponds to the part of the CTI with the highest probability of cue-congruent microsaccades. The relation between spatial attention and the direction of microsaccades drops to chance level for unselected microsaccades collected during manual-response conditions. Thus, the link between spatial attention and the direction of microsaccades depends on the experimental condition and time of occurrence, but it can be very strong.

**4:40–4:55 (116)**

**Predictive Coupling Between Attention and Saccadic Eye Movements.** ARTEM V. BELOPOLSky & JAN THEEUWES, Frij University, Amsterdam—The present study investigated the relationship between the mechanisms subserving endogenous spatial attention and saccades. A novel paradigm allowing simultaneous measurement of attentional allocation and oculomotor preparation was used. If maintenance of attention results in activation of an oculomotor program, it should also result in facilitation of saccades to that location. In Experiment 1, the probability of making a saccade to the attended location was 50%, and we found that saccades were executed faster to the attended location than to the unattended location. However, when the probability was decreased to 25% in Experiment 2, saccades were executed more slowly to the attended location than to the unattended location. The results suggest that effects of endogenous attention can be dissociated from oculomotor preparation. The oculomotor system is engaged during attentional allocation but can either be activated or inhibited, depending on the need for making an eye movement to the attended location.

**4:50–5:05 (117)**

**Spatially Selective Attention to Impossible Locations.** Bruce BRIDGEMAN & Cassidy Sterling, University of California, Santa Cruz—Auditory attention can be directed to locations in the space surrounding an observer. However, sounds can also be perceived at physically impossible locations inside the head, when earphones suppress spatial filtering by the pinnae. Intensity differences or time onset differences can move the apparent location of a sound on a line between the ears, inside the head. Normally, the spatial map of sound locations in the auditory cortex is not considered to include these locations. We investigated attentional shifts to locations inside the head on the left or the right of the center line by manipulating the intensities of high-frequency tones in earphones. Observers could reliably localize these tones. In a modified Posner paradigm, we found faster reaction times to tones in the
same location as a cue than to tones in a different location, indicating that selective attention to particular locations inside the head is possible.

4:50–5:05 (118)  Spatial Filtering and Partially Valid Cuing Reveal Different Kinds of Selection. SERAP YIGIT, University of Washington, CATHLEEN M. MOORE, University of Iowa, & JOHN PALMER, University of Washington (read by Cathleen M. Moore)—A spatial-filtering paradigm was used to investigate selective attention. Observers detected stimuli at task-relevant locations while ignoring otherwise identical stimuli at task-irrelevant locations. The distance between these stimuli varied. The innovation was to estimate psychometric functions of contrast for stimuli at uncued locations. This allows one to estimate the spatial extent of attention and distinguish different mechanisms of selection. In particular, one can distinguish whether information from unattended stimuli is attenuated or completely blocked. Results from filtering were consistent with blocking and a relatively narrow spatial extent of attention. Results from partially valid cuing, however, yielded evidence of attenuation and a relatively broad spatial extent of attention. We suggest that selection can act through attenuation, but that selection is limited by the imprecise targeting of an all-or-none blocking mechanism. This imprecision is obscured by tasks that broaden the spatial extent of attention.

5:10–5:25 (119)  Negative Priming Following the Observation and Performance of a Selection Task. TIMOTHY N. WELSH & LAURA M. MCDougall, University of Calgary—We suggest that, during action observation, observers simulate observed actions, and that the simulated action codes influence information processing systems in a manner consistent with action performance. In support of this hypothesis, Experiment 1 revealed no differences in negative priming (NP) effects following the observation or performance of a selection. Importantly, the magnitude of NP from observation was correlated with NP from performance. To test whether NP on observation and performance tasks develops via different mechanisms, participants in Experiment 2 completed NP tasks that did or did not require responses to prime displays. NP effects on tasks without prime responses did not correlate with NP effects on tasks with prime responses. Overall, the data suggest that inhibition may be responsible for NP on tasks requiring prime selection (whether performed or observed), whereas feature mismatch may be responsible for NP on tasks in which prime selection is not required.

Skill Acquisition

Willford Room, Friday Afternoon, 3:10–5:30

Chaired by Bradley C. Love, University of Texas, Austin

3:10–3:25 (120)  Anticipating Information Needs: Adaptive Display in Dynamic Environments. BRADLEY C. LOVE, University of Texas, Austin, MATT JONES, University of Colorado, Boulder, & MARC TOMLINSON & MICHAEL HOWE, University of Texas, Austin—Here, we leverage models of human sequential learning to understand how people make effective decisions in dynamic environments, to improve these decisions, and to transition people from novice- to expert-level performance. A domain-general system, “responsive adaptive display anticipates requests” (RADAR), is presented that learns to highlight the information a user would select if the user searched through all possible options. By offloading this selection process to RADAR, the user can concentrate on the primary task. Tests with human subjects in a tank video game environment, which required monitoring several information channels while maintaining situation awareness, revealed that players performed better with RADAR selecting which channel to display. RADAR can customize its predictions to a user to take into account individual differences and changes within a user over time. RADAR’s emphasis on learning by observing minimizes the need for explicit guidance from subject-matter experts.

3:30–3:45 (121)  Robust Learning From Diverse Training. ANGELA BRUNSTEIN & CLEOTILDE GONZALEZ, Carnegie Mellon University—In many task domains, successful performance not only has to be fast and error free but also has to apply robustly acquired skills to novel conditions. This study investigated the trade-off between specificity and variability of experiences during training for fostering performance during transfer. A group of 84 participants were trained to detect weapons in a luggage-screening task with varying degrees of categorical (number of kinds of weapons) and exemplar (number of items per category) diversity before applying their skills to novel targets. Whereas low exemplar diversity enhanced performance during both training and transfer, as compared with high exemplar diversity, high categorical diversity resulted in better transfer performance than did low categorical diversity. It seems that low exemplar diversity constitutes a precondition for successful learning during training. In contrast, high categorical diversity seems to enhance “deep” learning of task-relevant features that make performance robust against changing conditions for performing the task at hand.

3:50–4:05 (122)  Skill Generalization to Novel Stimuli Over Time. SHARON L. BERTSCH & ROBERT J. ZEGLIN, University of Pittsburgh, Johnstown—Previous research has suggested that subjects (human and animal) generalize new skills to novel contexts more accurately after an extended retention interval. Our present study establishes that this pattern also applies to novel stimuli. In Experiment 1, participants who were trained to trace a mirror-reflected figure transferred this skill more accurately to a novel figure after 2 days, as compared with those who were tested immediately following training. In Experiment 2, participants trained using variable stimuli transferred their tracing skill more accurately immediately than after 2 days. Those who trained on a single stimulus were less accurate on transfer tests immediately, but had better performance after 2 days. We believe that these patterns can be explained by the existence of a temporary bond between the stimuli (or context) involved in skill acquisition and the behavior itself. This bond guides initial acquisition of the learned behavior but must be weakened before generalization can occur.

4:10–4:25 (123)  Optimal Experimental Design for Model Discrimination. JAY I. MYUNG & MARK A. PITI, Ohio State University—We discuss statistical methods for optimizing an experimental design to distinguish between quantitative models of cognition. Information about model performance and about the experimental design must be integrated to identify variable settings that will maximally discriminate the models. The problem of design optimization is challenging because of the many, sometimes arbitrary, choices that must be made when designing an experiment. For example, in designing an experiment that investigates retention, the experimenter must choose the number of time intervals between the study and test sessions and the actual time values when memory is probed. Design optimization methods provide a framework for exploiting this information for the purpose of improving model discrimination. We present results from a Bayesian approach to solving the design optimization problem for discriminating between models of retention, as well as between models of categorization, if time permits.

4:30–4:45 (124)  Eye Movements and Strategy Shift in Skill Acquisition: Adult Age Differences. DANYA R. TOURON, University of North Carolina, Greensboro, & CHRISTOPHER HERTZOG, Georgia Institute of Technology—We compared eye movements by young and older adults during the noun-pair lookup (NP) task. After multiple noun-pair repetitions, individuals can verify target pairs (e.g., TV—urso) by memory rather than by searching an array. Our goals were (1) to validate strategy self-reports, which should demonstrate search of the lookup table when scanning is reported, but not when retrieval is reported, and (2) to consider whether eye movements to the lookup table might be automatic as well as information-seeking. Participants completed trials in which the lookup table was either included (standard trials) or removed (memory probes); the trial type was indicated pretrial. In one condition, the lookup table contained placeholders on memory probe trials (e.g., xxxx–xxxx). For standard trials, gazes to the lookup table on reported retrieval trials occurred, but were infrequent with reported scan trials. For memory probes, gazes to the lookup table occurred only in the condition with placeholders.
Perceptual and Motoric Specificity in Training of Speeded Aiming Movements. ERICA L. WOHLDMANN, California State University, Northridge, & ALICE F. HEALY, University of Colorado, Boulder—Subjects were trained and then tested immediately at moving a mouse cursor from a start position to target locations in a perceptual—motor reversal condition, for which horizontal, but not vertical, movements were reversed. During training, subjects practiced moving to two locations along the diagonal axis. For half of the subjects (single), each location was along the same diagonal, whereas for the remaining half (double), the two locations involved different diagonals. Testing involved moving to all locations, including the two unpracticed as well as the two practiced diagonal locations. The time required to move from the start position to the target location was measured. Movement time was faster on trained than on untrained locations, but the difference was larger for the single than for the double condition. These results provide support for training specificity to the practiced locations, in terms of both the manual movements required and the perceptual features of the locations.

DUAL LEARNING PROCESSES IN SKILL ACQUISITION. WAI-TAT FU, University of Illinois, Urbana-Champaign, & JOHN ANDERSON, Carnegie Mellon University—Acquisition of interactive skills involves the use of internal and external cues. Experiment 1 showed that when actions were interdependent, learning was effective with and without external cues in the single-task condition, but was effective only with the presence of external cues in the dual-task condition. In the dual-task condition, actions closer to the feedback were learned faster than those farther away, but this difference was reversed in the single-task condition. Experiment 2 tested how knowledge acquired in single- and dual-task conditions would transfer to a new reward structure. Results confirmed two forms of learning mediated by the secondary task: a declarative memory encoding process, which simultaneously assigned credits to actions, and a reinforcement-learning process, which slowly propagated credits backward from the feedback. The results showed that both forms of learning were engaged during training, but at the response selection stage, one form of knowledge may dominate over the other, depending on the availability of attentional resources.

COMPLEX COGNITION
Waldorf Room, Friday Afternoon, 3:30–5:30
Chaired by William B. Whitten II, Fordham University

GUIDED COGNITION OF UNSUPERVISED LEARNING: DESIGNING EFFECTIVE HOMEWORK, PART 3. WILLIAM B. WHITTEN II, MITCHELL RABINOWITZ, SANDRA E. WHITTEN, & LINDSAY B. PORTNOY, Fordham University—Guided cognition 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 commonly occur in classrooms and that have correlates in the experimental literature, then designed some into homework. Initially, we reported that quiz performance was better after guided cognition study are not due to specific content, time spent on a task, teaching effects, or novelty. Our most recent experiment, with twelfth-grade average and advanced placement English literature students studying Shakespeare’s Macbeth, determined that cognitive events consisting of metacognitive/plotting/evaluative activities did not improve learning from homework, but it also indicated that visualizing, role-playing, brainstorming, divergent thinking, and relating to prior experience, when focused on the to-be-learned content, may each contribute to the guided cognition learning advantage.

INCREASING ATTENTION TO POTENTIAL CAUSES INCREASES THEIR PERCEIVED EFFECTIVENESS. KELLY M. GOEDERT & LINDSEY CZARNECKI, Seton Hall University—When learning about two potential causes of a common event, participants control for alternative causes and discount a moderately effective cause in the presence of a highly effective one (i.e., conditionalization; Goeßert & Spellman, 2005). A potential mechanism for these effects is “learned inattention,” in which participants learn to attend to predictive cues in their environment at the expense of less predictive cues (Kruschke et al., 2005). We investigated whether changes in attention subsequently induce changes in the perceived effectiveness of a cause. Participants performed an attentional cuing task while simultaneously acquiring contingency information. The cuing task preferentially cued one of two potential causes of a common outcome. Cuing attention to a moderately effective cause mitigated both discounting and conditionalization effects. In both cases, participants assigned higher causal ratings to the moderately effective cause when it was preferentially cued. This effect of attention was greater earlier, as opposed to later, in learning.

STRATEGY PRIMING DURING STRATEGY SELECTION AND STRATEGY EXECUTION. PATRICK LEMAIRE & MIREILLE LECACHEUR, CNRS and University of Provence—Participants were asked to do computational estimation tasks on two-digit problems (e.g., giving approximate answers to 38 × 74) with either rounding-down (doing 30 × 70 = 2,100) or rounding-up (doing 40 × 80 = 3,200) strategies. On each problem, they were free to choose one of the two rounding strategies (Experiment 1) or were told which strategy to use (Experiment 2). Participants had better performance when they executed the same strategy on two consecutive problems than when they applied a different strategy. Moreover, they tended to use the same strategy on two consecutive trials more often than to change strategies. These strategy priming effects interacted with the type of strategy and the problems, as well as with the delay between two problems. Also, priming effects correlated with participants’ ability to select the best strategy on a given problem (Experiment 3). Implications of these findings on strategy selection models are discussed.

UNDERSTANDING THE TREE OF LIFE: REASONING FROM EVOLUTIONARY HIERARCHIES. LAURA R. NOVICK, Vanderbilt University, & KEFYN M. CATLEY, Western Carolina University—Biologists depict cladograms (evolutionary histories among taxa) in two formats—tree and ladder. Although trees are more common in professional practice, ladders are more common in high school and college textbooks. This study investigated differences in the ease of comprehending and reasoning from information presented in these two formats, as well as the effects of several cognitive/perceptual factors on reasoning. University students with weaker versus stronger backgrounds in biology answered comprehension, relational, and inference questions about familiar taxa represented in both formats. Biology background, cladogram format, and several cognitive/perceptual factors impacted on comprehension and reasoning (both individually and interactively). The results have implications for both biology textbook designers and classroom teachers, who need to take into account the cognitive difficulties associated with comprehending the ladder format. More broadly, accomplishing the educational goal of producing scientifically literate students requires that learners be familiar with cladograms as tools for thinking and learning about biology.

HOW SKETCHES SHAPE THOUGHT: AFFORDANCES AND CONSTRAINTS. BARBARA TVERSKY, Stanford University, & JEFF NICKERSON, JIM CORTER, DORIS ZAHNER, & YIN JIN RHO, Teachers College, Columbia University, and Stevens Institute of Technology—Diagrams have affordances and constraints: They are Euclidean in two dimensions and consist of marks such as lines, points, shapes, and words. The interplay of affordances and constraints on thought is shown in designers’ sketches of information systems. Although connectivity, expressed as lines, is sufficient, designers use irrelevant affordances, proximity and position. In contrast, hierarchical system organization is not readily afforded and yields conceptual difficulties. Diagrams, ostensibly only tools for thought, shape thought.
Conceptualization of Spatial Altitude Guided by Language and Perception.

TIMOTHY C. CLAUSNER, *University of Maryland, College Park*, EVAN M. PALMER, *Wichita State University*, & PHILIP J. KELLMAN, *UCLA*—We studied the relation of language and perception in visual search of air traffic control displays by representing aircraft altitude as icons whose size and contrast varied in correspondence with ecological depth cues. Participants searched for potential aircraft collisions imagined from above. Relative to no-cue trials (only numeric altitude), the perceptual cues improved search performance. Conceptualizing graphical symbols that are larger or darker as meaning more altitude may have helped participants apprehend altitude information. Next, we controlled whether depth cues were consistent with imagined vantage points. Participants were instructed while viewing model displays from below or above. Interestingly, performance in the from-above, depth-consistent condition was better than in the from-below, depth-inconsistent condition, even though these two displays were physically identical. Explanations for performance improvements include the following: Perceptual cues may have engaged conceptual metaphors linking space and magnitude, some perceptual encodings could have been more natural/conventional than others, or visual depth processes could have been affected by assumed perspective.
Vision I
Grand Ballroom, Saturday Morning, 8:00–9:40

Chaired by Gregory Francis, Purdue University

8:00–8:15 (133)

Exogenous Attention Strengthens Illusory Contours. GREGORY FRANCIS & JOSH WEDE, Purdue University—Previous research has found that attention increases the perceived contrast of visual stimuli. We used a similar methodological approach to measure attentional effects on illusory contour stimuli that do not produce a perceived contrast. We used offset gratings to produce Kanizsa-like illusory squares, whose strength could be manipulated by varying the phase angle of the offset gratings. We first verified that these illusory contours do not introduce a brightness enhancement. To measure attention effects, a cue was presented at fixation or centered on one of a pair of briefly flashed illusory contours. Participants reported which illusionary contour had greater clarity. The pair of illusory contours was shown for 100 msec and included a standard (108° phase angle) and a test (variable phase angle) stimulus. Cuing the test stimulus reduced the phase angle required to match the standard stimulus, effectively increasing the strength of the illusionary contour.

8:20–8:35 (134)

Object Trimming: When Masking Dots Alter Rather Than Replace Target Representations. TODD A. KAHAN, Bates College, & JAMES T. ENNS, University of British Columbia—Five experiments demonstrate that when dots appear beside a briefly presented target object, and persist longer than the target, the flanked object is perceptually altered by the dots. Three methods are used to explore this object trimming effect. Experiment 1 examines the perception of apparent motion in trimmed targets, Experiments 2–4 assess participants’ conscious reports of trimmed digits, and Experiment 5 uses repetition priming to explore the target representation. Results of all three methods indicate that object trimming is influenced by mechanisms of perceptual grouping that operate on target representations prior to conscious access. Separate contributions from visual crowding and backward masking are also identified. These results imply that common-onset masking does not always result from the target being substituted by the mask, but that target and mask can sometimes maintain separate mental representations.

8:40–8:55 (135)

The Onset Repulsion Effect and Illusory Line Motion. TIMOTHY L. HUBBARD, Texas Christian University—In illusory line motion (ILM), a stationary line is presented, and if attention was previously cued to either end of the line, the line appears to unfold from the cued end. Whether illusory motion results from biases in localization of the line was examined. In Experiments 1 and 2, an ILM display was shown. A probe line was then shown, and participants judged whether the probe line was the same as the original line. In Experiment 1, probe lines were the same length as the original line, and if attention was previously cued to either end of the line, the line then appeared to unfold from the cued end. In Experiment 2, the ends of probe lines closest or most distant from the cue were shifted forward or backward relative to illusory motion. Memory for the line (Experiment 1) and both ends (Experiment 2) was displaced toward the cue. Implications for the onset repulsion effect and effects of attention on localization are considered.

9:00–9:15 (136)

Estimating the Center of Multibody Displays. JAY FRIEDENBERG & BRUCE LIBY, Manhattan College—We investigate center of mass estimation for displays with multiple, spatially separated objects. Center location in this context can be used to balance objects on a surface, track group location, and perform other perceptual tasks. In a first experiment, participants judged the center of a triangle of black-filled dots arranged to form the points of a right triangle. Triangle orientation (vertical or horizontal) and axis (length of one side) were varied. Errors increased linearly with an increase in axis length. Response distributions pointed downward, indicating a gravitational influence. In a second experiment, the dots formed quadrilaterals presented at vertical, horizontal, and oblique orientations at different axis lengths. The results for accuracy and response direction were replicated with this new class of stimuli.

The data are interpreted in a model in which observers utilize the intersection of the median lines and symmetric shape properties to judge center location.

9:20–9:35 (137)

Contrast, Assimilation, and Scene Segmentation in Lightness Perception: The Surround Similarity Effect. MICHAEL E. RUDD, University of Washington—Lightness contrast is a well-known phenomenon: a grey patch viewed against a black background looks lighter than an identical patch viewed against a white background. The opposite effect, lightness assimilation, also sometimes occurs: A target bordered by a lighter region looks lighter than one bordered by a darker region. Here I show, using a matching technique, that assimilation is part of a larger perceptual grouping phenomenon in which lightness depends on the degree of similarity between the surroundings in which the target and matching stimuli are embedded (surround similarity effect). The effect violates a standard assumption of matching studies: that manipulating the target surround does not affect the perception of the matching stimulus, and vice versa. The effect can be switched on and off by attentional manipulations that favor a scene interpretation in which the target and matching patches belong either to a single illumination framework or to separate frameworks.

Cognitive Control I
International Ballroom North, Saturday Morning, 8:00–10:00

Chaired by Thomas H. Carr, Michigan State University

8:00–8:15 (138)

On the Phenomenology of Executive Control: Perceptions of Causal Agency During Task Performance. JOHN DEWEY, Michigan State University, ADRIANE E. SEIFFERT, Vanderbilt University, & THOMAS H. CARR, Michigan State University (read by Thomas H. Carr)—In goal-directed action, how do we determine that we are in control of how our actions are progressing? The present study uses subjective ratings of degree of perceived control to investigate factors that influence the sense of causal agency, both during individual task performance and in competition with another potentially causal agent. We find that success is a powerful determinant, even when the performer knows that outside forces helped, and that competition increases the sense of agency, possibly by the same mechanism: Performance improves under competition, and when performance improves, so do ratings of control, especially when the competitor is also doing well.

8:20–8:35 (139)

The Concept of “Task”—S–R Mapping Versus Mental Set. ANDREA KIESSEL, University of Würzburg, & MIKE WENDT, Helmut Schmidt University, Hamburg—Human behavior is determined by environmental stimulation and by intentions of the actor. Accordingly, the term “task” has been conceptualized differently. On the one hand, it has been defined as a set of S–R mappings that are required in a current experimental setting, whereas on the other hand it was conceptualized as the mental set that is adopted to reach an intended goal (Rogers & Monsell, 1995). Both determinants on task performance are observable in task-switching settings: Target congruency effects (TCEs) are increased for stimuli that are more frequently presented in the alternative task, reflecting item-specific S–R links. These item-specific links largely determine TCEs even when the task instructions change. On the other hand, the mental set—that is, implemented task instructions—determine whether stimuli trigger responses. Within this line of reasoning, it is interesting to note that stimuli that never occurred in the alternative task context nevertheless induce TCEs.

8:40–8:55 (140)

Threaded Cognition: From Multitasking to a New Theory of Skill Acquisition. NIELS A. TAATGEN, Carnegie Mellon University, DARIO D. SALVUCCI, Drexel University, & JELMER P. BORST, University of Groningen—Threaded cognition (Salvucci & Taatgen, 2008) is a general theory and model of multitasking that can make predictions on how any two tasks interact when they are executed concurrently. The central
idea is that cognition can be considered as a set of cognitive modules that operate in parallel, but each individual module is serial. The theory has been very successful in explaining multitasking in PRP paradigms, driver distraction situations, and some classical multitasking studies. Our recent work on the theory has focused on determining the identity of the cognitive modules, focusing on a module that represents the current state of the problem, and on extending the work to skill acquisition. When a new task is considered as a combination of several elementary subtasks, learning a new task becomes like multitasking that can be modeled by threaded cognition. An example of this is a model of the attentional blink.

9:00–9:15 (141)
When Mental Inflexibility Facilitates Cognitive Control: Two Dissociable Mechanisms for Goal Neglect. LEE J. ALTAMIRANO, AKIRA MIYAKE, & ANSON J. WHITMER, University of Colorado, Boulder (read by Akira Miyake)—Goal neglect (GN) refers to people's temporarily ignoring a task requirement despite being able to describe it. Although it is often characterized as a unitary construct, we propose that two dissociable mechanisms underlie GN, one associated with rapid switching between multiple goals and the other with active maintenance of a single goal. We tested this hypothesis by exploiting the finding that individuals with high ruminative tendencies are less cognitively flexible than those with low ruminative tendencies (Davis & Nolen-Hoeksema, 2000). Ninety-eight undergraduates completed two GN tasks, one emphasizing rapid switching (Duncan et al., 1996) and one emphasizing active maintenance (Kane & Engle, 2003). Consistent with our hypothesis, higher ruminative tendencies were associated with more GN on the rapid-switching task, but less GN on the single-goal-maintenance task. These results suggest that mental inflexibility is not always detrimental; it could facilitate cognitive control by preventing a task goal from slipping away.

9:20–9:35 (142)
Simon Says Show Me Your Tail: Individual Differences in Working Memory Capacity and Cognitive Control. JASON M. WATSON, A. EVE MILLER, ANN E. LAMBERT, & DAVID L. STRAYER, University of Utah—Individual differences in working memory capacity (WMC) influence cognitive control and the ability to actively maintain task goals in the face of interfering information. In the present experiment, to increase reliance on internal goal maintenance, high- and low-WMC participants performed a Simon task in which there was a high proportion of congruent trials (a right-facing arrow in the right side of space) and a low proportion of incongruent trials (a right-facing arrow in the left side of space) in three test blocks. An ex-Gaussian analysis for high-WMC participants revealed (1) a decreased Simon effect in the tail of the underlying response time distribution, and (2) an increased Simon effect in the modal portion of the distribution across blocks. By contrast, low-WMC participants showed the opposite Simon pattern with practice, increasing the tail and decreasing the shift. These results suggest there may be dual mechanisms of cognitive control.

9:40–9:55 (143)
Attentional Capture in an Accessory Signal Simon Task. ERIC SOETENS, KATHERINE MAETENS, DAVID HENDERICKX, & PETER ZEISCHKA, Vrije Universiteit Brussels.—To understand how the brain shields a planned action against irrelevant attentional capture, we conducted a series of five accessory signal (AS) Simon tasks, in which an irrelevant peripheral stimulus is presented on different points in time, relative to the response signal. Response information (color) was presented centrally, either 600 msec prior to or together with a go/no-go signal (shape). When it was presented just before or simultaneously with the go signal, the AS elicited a Simon effect. When it was presented 150 msec after the go signal and color was presented prior to the go signal, the Simon effect reversed. When color and go/no-go information were presented together, the reversal disappeared. If only one stimulus dimension (color) was used for both decisions, the reversed Simon effect reappeared when the AS was presented 300 msec after the go signal. The results are interpreted in terms of event-file binding and inhibition of the exogenous AS activation.
and fairy tales is different in dreams. In dreams, perceptual similarity seems more important than conceptual similarity; however, the notion of representation is also important.

9:20–9:35 (148)
How Physical Copresence Affects Jazz Musicians’ Coordination.
MICHÉLLE F. LEVINE & MICHAEL F. SCHOBER, New School for Social Research (read by Michael F. Schober)—To what extent does musical coordination require physical copresence? How do different degrees of presence affect coordinated musical performance? We compared performances of 25 experienced jazz piano and saxophone duos (new to working with each other) when they played in the same physical space, in separate spaces with video mediation, and in separate spaces with only audio mediation. All duos rehearsed and played the same piece, which had been composed to allow precise measurement of the accuracy of various aspects of musical coordination, including simultaneous attacks and releases, tempo and meter shifts, and improvised sections. Although many musicians reported feeling most comfortable and “with” their partner when physically copresent, a surprising percentage of duos reported little or no difference across the settings, and partners did not necessarily report the same experience. Detailed measures show which aspects of coordinated musical performance are particularly affected by seeing one’s partner.

Categories and Concepts I
International Ballroom South, Saturday Morning, 8:00–9:40
Chaired by Todd M. Gureckis, New York University

8:00–8:15 (149)
Errors, Attention, or Structure? Changes in Perceptual Discriminability As a Result of Unsupervised Category Learning. TODD M. GURECKIS, New York University, & ROBERT L. GOLDSTONE, Indiana University, Bloomington—Accounts of learned categorical perception (CP) generally suggest that improved discrimination of category members along a category boundary is related to either error-driven feedback or the application of selective attention to a category-relevant dimension. A set of empirical studies is presented exploring the effect that learning internally organized categories has on the ability to subsequently discriminate category members. The results demonstrate the standard finding that discrimination of stimuli that belong to different categories is improved following supervised category learning. However, we also find that category members that share the same category label but fall into different “subclusters” within that category are better discriminated than items that share the same category and cluster. The results show that learners are sensitive to multiple sources of structure beyond simply the labels provided during supervised training. We conclude that changes in the ability to discriminate items can occur even in the absence of direct feedback and can be influenced by the unsupervised clustering of stimuli into groups.

8:20–8:35 (150)
ATRIUM-RT: An Account of Stimulus-Dependent Representation and Its Relation to Executive Attention and Task Switching in Category Learning. MICHAEL A. ERICKSON & JUSTIN C. ESTEP, University of California, Riverside—Erickson (2008) provided evidence that within a single category-learning task, people can learn to utilize different systems with different category representations to classify different stimuli. This is referred to as stimulus-dependent representation (SDR). The use of SDR can be assessed via slowed response times (RTs) following a representation switch, and via the relation between working memory capacity (WMC) and learning accuracy. I present results from two new experiments that examine these relations using new assays of SDR and new category structures. I also describe a computational model based on ATRIUM that can account for the pattern of RTs as well as the relation between WMC and learning accuracy. The implications of these results and the predictions of the model are discussed.

8:40–8:55 (151)
Advances in Modeling Human Category Learning With DIVA. KENNETH J. KURTZ, Binghamton University—The DIVA (divergent autoencoder) model of category learning (Kurtz, 2007) provides a framework for exploring the acquisition, organization, and use of categories as coordinated statistical models. Rather than categorizing items, DIVA enforces structural similarity to stored reference points (i.e., exemplars, prototypes, rules), DIVA builds a task-constrained statistical model of the regularities underlying each learned category. A concept is represented as a set of network weights that support a process much like principle component analysis. Classification is based on the degree of success in reconstructing an input with minimal distortion. A new design feature has been incorporated called unidimensional evaluation, whereby classification can depend on the reconstructive success for a single feature, not the whole stimulus. Simulation results reveal the power of this version of DIVA to account for behavioral phenomena widely thought to require a hybrid or separate system approach and/or constructs such as exemplar storage, selective attention, and logical rules.

9:00–9:15 (152)
Selective Attention and the Development of Categorization. VLADIMIR M. SLOTSKY, Ohio State University—The ability to categorize appears early in development. Some aspects of early categorization persist throughout development (e.g., the ability to rely on perceptual similarity when forming categories), whereas other aspects do change in the course of development. For example, adults (but not infants and young children) can acquire and use abstract, “similarity-free” categories. How does the ability to acquire similarity-free categories develop? And what changes in the course of development? We propose that the development of categorization is driven by the development of deliberate selective attention that enables focusing on the category-relevant features and ignoring irrelevant ones. This proposal was tested in the reported experiments. Although preschoolers had no difficulty focusing on the overall similarity, they had difficulty focusing on a single category-relevant property. In addition, the ability to focus on a single property develops gradually, and this ability predicts the ability to acquire abstract, similarity-free categories.

9:20–9:35 (153)
Attentional Allocations During Feedback in Category Learning. MARK R. BLAIR & MARCUS R. WATSON, Simon Fraser University—In many situations both inside and outside the laboratory, feedback is critical to efficient learning. In two experiments, we used eyetracking to record participants’ allocations of attention during the response and feedback portions of categorization trials. Results show that the represented stimulus, rather than the feedback itself, gets the vast majority of eye fixations. Participants spend more time reprocessing the stimulus on incorrect trials than on correct ones, and the time spent fixating on stimulus features during these incorrect trials is strongly predictive of learning success, even within the first 10 trials of the experiment. Finally, the relationship between the allocations of attention during the response and feedback phases changes with learning. These data provide new insights into the important role stimulus reprocessing plays in category learning.

Memory
Williford Room, Saturday Morning, 8:00–10:00
Chaired by Elizabeth J. Marsh, Duke University

8:00–8:15 (154)
Ironic Effects of Story Reading. ELIZABETH J. MARSH & LISA K. FAZIO, Duke University, PATRICK O. DOLAN, Drew University, & ANDREA N. ESLICK, Duke University—Short stories, novels, and movies often mix facts about real people, places, and issues with imaginary ones. Readers therefore learn both true and false information from fictional sources. Manipulations designed to reduce suggestibility, such as slowed presentation and specific warnings, backfire and increase suggestibility. One interpretation is that anything that increases attention to errors will increase suggestibility, and this was supported in two experiments. In the first, suggestibility increased after subjects read a story with the errors highlighted in a red font. In Experiment 2, suggestibility increased when subjects had to insert letters that had been deleted from the words, a manipulation known to increase item-specific processing. Reading an erroneous reference to “Wilmin ton, the capi t_of D_laware” led to more
false beliefs than did reading “Wilmington, the capital of Delaware.” Readers often fail to compare story information with their knowledge bases, even in situations that draw attention to the errors.

Bartlett Revisited: Direct Comparison of Repeated Reproduction and Serial Reproduction Techniques. HENRY L. ROEDIGER III, Washington University, MICHELLE L. MEADE, Montana State University; DAVID A. GALLO, University of Chicago, & KRISTINA R. OLSON, Yale University—Bartlett (1932) performed informal demonstrations comparing repeated reproduction (the same person repeatedly calling material) with serial reproduction (material being transmitted from person to person). However, no one has ever developed a procedure to directly compare repeated and serial reproduction in a controlled experiment. We report a technique that meets this criterion and helps to answer interesting questions that Bartlett raised. Briefly, subjects studied materials for which both accurate and illusory recollections could be obtained. One group repeatedly recalled the materials four times, with breaks in between (repeated reproduction). Serial reproduction involved 1 subject studying and recalling the list, but then 3 later subjects studying and recalling previous subjects’ recall protocols (so 4 subjects were involved in serial reproduction). The results showed greater declines in accuracy across repeated tests for serial reproduction subjects, although whether greater false recall occurs with this technique depends on the scoring criterion used.

Irrelevant Speech Effects in Younger and Older Adults. RAOUl BELL, AXEL BUCHNER, & IRIS MUND, Heinrich Heine University Düsseldorf (sponsored by Edgar Erdfelder)—According to the inhibition deficit theory of cognitive aging, the efficiency of inhibitory control over the contents of working memory diminishes across the adult life span, allowing more irrelevant information to enter working memory. To test this hypothesis, we examined age-related differences in irrelevant-speech effects. Older and younger adults were required to recall short prose texts or lists of semantically related words, presented visually together with distractor speech. Older adults made more intrusion errors from semantically related irrelevant speech than did younger adults. Results of a source memory test suggest that these age-related differences in irrelevant-speech interference are most likely due to both inhibitory deficits and source-monitoring problems.

Choice-Supportive Memory: Memory Illusion or Judgment Bias? EDGAR ERDFELDER & MONIKA EรノORD, University of Mannheim—Memory for features of choice options favors positive features of chosen options and negative features of options not chosen previously. This choice-supportive memory effect has been replicated many times. Conditions that tend to boost or eliminate the effect have been studied intensively. However, a still largely unresolved issue is whether choice-supportive memory is caused by (1) item or source memory illusions, or (2) judgment bias in case of memory failure. We report three experiments designed to address this problem in the framework of multi-nominal source-monitoring models. The results support the judgment bias explanation and contradict the memory illusion account.

Imagination Leads to False Recognition But Not Priming of Pictures. DAVID R. SHANKS & YANA WEINSTEIN, University College London—We have developed a new procedure in which false memories for rich pictorial stimuli are accessed directly and indirectly. Participants label pictures in a study phase, imagine other pictures in response to words in an imagery phase, and at test perform both a direct recognition test and an indirect perceptual identification test on pictorial stimuli. In the direct test, we found substantially higher false recognition rates for imagined than for new pictures, whereas on the indirect test, no priming was found for these items. We discuss the implication that the false memories reported on direct tests are not perceptually based.

Letter/Word Processing I

Early Morphological Processing Is Morpho-Semantic and Not Simply Morpho-Orthographic. LAURIE B. FELDMAN, University at Albany and Haskins Laboratories, & PATRICK A. O’CONNOR, University at Albany—To determine if ease of parsing into stem and suffix (morphological decomposition) varies with degree of semantic similarity (transparency) in the forward-masked priming variant of the lexical decision paradigm, we compared patterns of facilitation between semantically transparent (e.g., coolant—cool) and opaque (e.g., rampant-ramp) prime-target pairs. Properties of the stem (frequency, neighborhood size, letter overlap in prime and target), as well as affixes on related and unrelated primes for transparent and opaque stems, were matched. Parsability of a word’s orthographic structure into stem and affix alone did not predict morphological facilitation when primes were forward masked. Rather, morphological facilitation was significantly greater for the semantically transparent pairs than for the opaque pairs. Results violate form-then-semantics models of word recognition and demonstrate that semantic similarity can influence even early stages of morphological processing. Ongoing research explores the reliability of this pattern across various types of filler trials.

Cortical Effects of Orthographic and Phonological Consistency in Spoken Word Tasks. DONALD J. BOLGER, DOUGLAS BURMAN, & JAMES R. BOOTH, Northwestern University (sponsored by James R. Booth)—The consistency of mapping from spelling to sound (phonological consistency) is found to have dramatic impact on written word tasks such as lexical decision and word naming (Jared et al., 1990). However, inconsistent mapping from sound to spelling (orthographic consistency) has also been found to result in lower accuracy and longer response time (Lacruz & Folk, 2004; Ziegler et al., 1997). In a previous neuroimaging study of consistency effects (Bolger et al., in press), we found greater activation across brain regions involved in word reading for both phonological and orthographic consistency in written word tasks. In the present study, we investigated whether consistency effects in the cortex could be observed in spoken word tasks, and whether orthographic and phonological consistency would result in activation of similar regions. In an fMRI study of 44 children (ages 9–15 years) performing an auditory rhyming and spelling task, we found greater activation across the “reading network” for both types of consistency. These effects differed by task (spelling vs. rhyming) and by individual differences in subtests of reading and spelling skill.

Does Nonword Difficulty Affect Lexical Processing? STEPHEN J. LUPKER, University of Western Ontario, PENNY M. PEXMAN, University of Calgary, & SACHIKO KINOSHITA, Macquarie University—Both frequency effects and homophone effects increase when using
The Intervenor Effect in Masked Priming. KENNETH I. FORSTER, University of Arizona—Most models of word recognition explain masked priming as persisting activation from the prime, and predict no priming when a visible word intervenes between the prime and target (due to a necessary system reset between words). However, priming is maintained under these conditions, although reduced in magnitude. Moreover, the effect of the intervenor interacts in interesting ways with the type of priming (repetition priming vs. form priming), and the duration of the intervening word. It is suggested that identity priming consists of two effects, one that depends on the prime being adjacent to the target (a semantic effect), and one that is independent of adjacency (a form effect). Some support for this hypothesis is provided by the fact that an intervening pattern mask has no differential effect on identity and form priming.

The Effects of Target Degradation on Semantic Priming: Do We Have It All Backward? JAMES H. NEELY, MATTHEW A. THOMAS, & PATRICK A. O’CONNOR, University at Albany—When the proportion of related primes and targets is high, semantic priming for symmetrically associated primes and targets is enhanced for degraded targets. In a lexical decision task, we found that (1) target degradation enhanced priming of related primes and targets and (2) priming was greater for backward asymmetrically and symmetrically associated primes and targets and nonwords, homophone effects did not, causing a problem for models that attempt to account for the impact of nonword difficulty in terms of a single principle. Further experiments indicated that a third effect that is often assumed to be a lexical effect, semantic priming, is not affected by introducing either pseudohomophones or TL nonwords. These results appear to provide a strong challenge for models that assume that nonword difficulty has a unitary impact within the lexical system.

Eyewitness Memory: Quantitative Versus Qualitative Conclusions. GEOFFREY R. LOFTUS, University of Washington—Memory researchers are increasingly being asked to testify in court about the reliability of eyewitness memories—for example, of a criminal’s appearance. Reliability is determined by two broad sets of factors: perceptual factors relevant at the time of the original event and memory reconstruction factors relevant at varying times following the event. Examples of perceptual factors include (but are by no means limited to) illumination, witness–criminal distance, witness attention, witness stress, witness sobriety, and so on. Conclusions about effects of some of these factors can only be made qualitatively—for example, “when there is a weapon in the scene, the witness is less likely to attend to and remember the criminal’s appearance.” Conclusions about other factors, however, such as effects of illumination and distance, can be made quantitatively. I will discuss the difference between these two kinds of factors, with examples of what an expert witness, testifying in court, can say about them.

How Do We Have It All Backward? JAMES H. NEELY, MATTHEW A. THOMAS, & PATRICK A. O’CONNOR, University at Albany—When the proportion of related primes and targets is high, semantic priming for symmetrically associated primes and targets is enhanced for degraded targets. In a lexical decision task, we found that (1) target degradation enhanced priming for backward asymmetrically and symmetrically associated primes and targets to the same degree but did not enhance priming for forward asymmetrically associated primes and targets and (2) priming was greater for symmetrically associated primes and targets than for backward asymmetrically and forward asymmetrically associated primes and targets, which produced equivalent priming effects for nondegraded targets. We discuss the implications these results have for various accounts of semantic priming.

Beyond Single Syllables: Simulating Reading Aloud of Disyllabic Words With CDP+. CONRAD PERRY, Swinburne University of Technology, JOHANNE S. ZIEGLER, LPC, CNRS, University of Provence, & MARCO ZORZI, University of Padua (read by Johannes C. Ziegler)—We present an updated version of the connectionist dual-process model (Perry, Ziegler, & Zorzi, 2007, Psychological Review) that is able to simulate the reading aloud of disyllabic words. The new model is fully backward compatible because it still accounts for all major monosyllabic benchmark effects. The new model is also able to simulate a number of key findings with disyllabic words, including the effects of syllable length, spelling–sound consistency, and orthography on stress assignment. It accounts for around 30% of the individual item variance in a large-scale database of over 20,000 disyllabic items.


Grand Ballroom, Saturday Morning, 9:50–12:00

Chairied by Barbara A. Spellman, University of Virginia

9:50–10:05 (166)
Psychology and the Law: Emerging Trends Addressed by Empirical Studies. BARBARA A. SPELLMAN, University of Virginia—This symposium provides five examples of researchers who have bridged the domains of psychology and law, and who motivate research questions using current controversies in legal cases. Recent advances in technology, such as DNA technology, have raised the bar for other evidence, such as eyewitness testimony and fingerprints. As courts struggle to separate real and junk science, judges and jurors must decide what constitutes acceptable standards for scientific evidence. We provide different examples of how psychologists can study the reliability of evidence as well as the interpretation of evidence by jurors. Each talk will include a discussion of new directions of research that we see emerging, as well as how research in this real-world domain guides basic psychological studies and provides a testing ground for psychological theories. The discussion will include advice on how to interact with members of the legal community.

9:00–9:15 (163)
The Intervenor Effect in Masked Priming. KENNETH I. FORSTER, University of Arizona—Most models of word recognition explain masked priming as persisting activation from the prime, and predict no priming when a visible word intervenes between the prime and target (due to a necessary system reset between words). However, priming is maintained under these conditions, although reduced in magnitude. Moreover, the effect of the intervenor interacts in interesting ways with the type of priming (repetition priming vs. form priming), and the duration of the intervening word. It is suggested that identity priming consists of two effects, one that depends on the prime being adjacent to the target (a semantic effect), and one that is independent of adjacency (a form effect). Some support for this hypothesis is provided by the fact that an intervening pattern mask has no differential effect on identity and form priming.

9:20–9:35 (164)
The Effects of Target Degradation on Semantic Priming: Do We Have It All Backward? JAMES H. NEELY, MATTHEW A. THOMAS, & PATRICK A. O’CONNOR, University at Albany—When the proportion of related primes and targets is high, semantic priming for symmetrically associated primes and targets is enhanced for degraded targets. In a lexical decision task, we found that (1) target degradation enhanced priming for backward asymmetrically and symmetrically associated primes and targets to the same degree but did not enhance priming for forward asymmetrically associated primes and targets and (2) priming was greater for symmetrically associated primes and targets than for backward asymmetrically and forward asymmetrically associated primes and targets, which produced equivalent priming effects for nondegraded targets. We discuss the implications these results have for various accounts of semantic priming.

9:40–9:55 (165)
Beyond Single Syllables: Simulating Reading Aloud of Disyllabic Words With CDP+. CONRAD PERRY, Swinburne University of Technology, JOHANNE S. ZIEGLER, LPC, CNRS, University of Provence, & MARCO ZORZI, University of Padua (read by Johannes C. Ziegler)—We present an updated version of the connectionist dual-process model (Perry, Ziegler, & Zorzi, 2007, Psychological Review) that is able to simulate the reading aloud of disyllabic words. The new model is fully backward compatible because it still accounts for all major monosyllabic benchmark effects. The new model is also able to simulate a number of key findings with disyllabic words, including the effects of syllable length, spelling–sound consistency, and orthography on stress assignment. It accounts for around 30% of the individual item variance in a large-scale database of over 20,000 disyllabic items.

10:00–10:15 (167)
Psychology and the Law: Emerging Trends Addressed by Empirical Studies. BARBARA A. SPELLMAN, University of Virginia—This symposium provides five examples of researchers who have bridged the domains of psychology and law, and who motivate research questions using current controversies in legal cases. Recent advances in technology, such as DNA technology, have raised the bar for other evidence, such as eyewitness testimony and fingerprints. As courts struggle to separate real and junk science, judges and jurors must decide what constitutes acceptable standards for scientific evidence. We provide different examples of how psychologists can study the reliability of evidence as well as the interpretation of evidence by jurors. Each talk will include a discussion of new directions of research that we see emerging, as well as how research in this real-world domain guides basic psychological studies and provides a testing ground for psychological theories. The discussion will include advice on how to interact with members of the legal community.

10:10–10:25 (167)
Evaluating Witnesses’ Believability by Assessing Calibration. BARBARA A. SPELLMAN & ELIZABETH R. TENNEY, University of Virginia—How do jurors decide which witnesses to believe? The law encourages jurors to consider many factors in that decision—including witness confidence. Previous psychology research shows that jurors often overuse confidence as a proxy for accuracy; however, we demonstrate that when people are given confidence and accuracy information together, they will use the confidence–accuracy relation to assess the witness’s calibration and use that calibration information to judge credibility. We show that mock jurors prefer the testimony of well-calibrated to poorly calibrated witnesses; that they prefer well-calibrated witnesses to more “modest” witnesses; and that they recognize that justified errors, and understandable lies, do not detract from someone’s calibration. We show that 5- to 6-year-old children do not evaluate calibration even though they recognize confidence and accuracy alone. We suspect that assessing calibration is very important for suitors (because it involves binding). These findings have several implications for improving courtroom rules of evidence.

10:30–10:45 (168)
How Jurors Think About the Law: Evidence From Deliberations by Real Juries. SHARI SEIDMAN DIAMOND, Northwestern University, BETH MURPHY, American Bar Foundation, & MARY ROSE, University of Texas, Austin—Juries often perform poorly on tests of comprehension for jury instructions, in both laboratory experiments and in surveys taken at the end of jury service. Yet courts assume that deliberating jurors understand the relevant law. We studied how jurors discussed legal issues and how they used jury instructions during deliberations of 50 actual civil trials. We tracked juror mentions of instructions: (1) explicit or conceptual; (2) accurate or inaccurate; and (3) references to instructions. We tracked juror mentions of instructions: (1) explicit or conceptual; (2) accurate or inaccurate; and (3) references to instructions. Our results showed that jurors paid substantial attention to the instructions they received on the law and that their references to these legal guides during deliberations were generally accurate. Yet the instructions sometimes failed in predictable ways to provide adequate legal guidance. Recent efforts to improve juror comprehension of jury instructions have focused primarily on the need
to simplify the language used in the instructions. Our results show in
addition some structural and conceptual gaps that should be addressed
when laypersons are called upon to apply legal principles.

11:10–11:25 (170)
Expertise in Latent Print Examiners As Revealed by Behavior, 
Electrophysiology, and Eyetracking. THOMAS A. BUSEY, Indiana 
University, Bloomington—In recent court cases, hearings, and publica-
tions, a diverse group of scientists and legal scholars has questioned
the methodologies and expertise of latent print examiners. In this talk, I
address the specific question of whether, and how, latent print examiners
differ from novices. Using data from behavioral studies, eyetracking, and
electrophysiological recording, I detail the differences between the two
groups. The challenge when working with this complex perceptual and
cognitive task is to find a set of focused, answerable questions, with-
out giving up generalizability. While the work by latent print examiners
serves as an example, this talk will also suggest how psychologists can
find motivation for scientific studies from the legal setting, and then gen-
eralize these results back to the courtroom. Special care must be taken to
ensure that the results are not overgeneralized, and caution is required to
avoid overconfidence on the part of examiners.

11:30–11:45 (171)
Forensics in the Courtroom: An Objective Tool or a Subjective Prop? 
ITIEL E. DROR, University of Southampton—Psychological research
and real miscarriages of justice clearly put in question the reliability of eyewitness testimony. These, along with “the CSI effect,” have made the
court increasingly more reliant on “objective” forensic evidence. How-
ever, anecdotal criminal cases have shown that “objective and definite
scientific forensic evidence” was actually erroneous. Are these cases an
anomaly or do they reflect a more fundamental problem? We investi-
gated this question by examining the reliability and biasability of foren-
sic experts. Using a within-subjects design, we investigated fingerprint
experts’ judgments. The data demonstrated that their decision making
was not based solely on the prints themselves. Examination of other forensic domains has suggested that they too are susceptible to motiva-
tional and confirmation bias. Many forensic experts deny the existence
of such psychological influences, and therefore it is not surprising that
there is generally a lack of sufficient methods, procedures, and training
to minimize these effects.

Vision II

International Ballroom North, Saturday Morning, 10:20–12:00

Chairled by Margaret M. Shiffrar, Rutgers University, Newark

10:20–10:35 (172)
Is There a Relationship Between the Perception of Human Motion and
Social Behavior? MARTHA KAISER & MARGARET M. SHIFFRAR, 
Rutgers University, Newark (read by Margaret M. Shiffrar)—Psychologi-
cal and neurophysiological researchers commonly assume that the accurate
perception of human motion is critical for successful social behavior.
But is it? In a series of psychophysical experiments, we investigated the
relationships between visual sensitivity to point-light displays of human
movement and social behavior. Observers viewed dynamic point-light
displays of people and objects that were coherent or scrambled. In 2AFC
tasks, observers reported whether the point-light were stuck to a person
(human motion condition) or a tractor (object motion condition). Mask-
ing was used. Social skill level was assessed with the Autism Spectrum
Quotient (Baron-Cohen et al., 2001), which measures the extent of an indi-
vidual’s autistic traits. Across studies, visual sensitivity to coherent human
motion was inversely related to social skill level, whereas visual sensitivity
to object motion was unrelated to social skill level. These results suggest
that visual sensitivity to human movement is linked to social behavior.

10:40–10:55 (173)
Evaluating Emergent Features and Topological Properties With
Multiple Tools. MARY C. PORTILLO & JAMES R. POMERantz, 
Rice University (read by James R. Pomerantz)—Previously we have
shown evidence that emergent features (EFs), arising when elements
combine into gestalt configurations, behave as basic features in human
vision. EFs derived from dot arrangements produce configuralt superi-
ority effects (CSEs)—that is, performance gains when identical
(thus informationless) context elements are added to stimuli to be dis-
criminated. We have also reported search asymmetries, in which perceiv-
ers take longer to localize EFs such as linear targets among nonlinear
distractors than they take for the reverse. Now, we vary display size to
determine whether EFs produce flat search slopes (pop out), which is
often considered a hallmark of features. We apply the same (meth-
odology to look for CSEs, search asymmetries, and flat slopes with such
topological properties (TPs) as connectivity, number of wholes, and the
inside–outside relationship, which are also proposed as primitive in vi-
sion. These converging operations should allow stronger conclusions
regarding the status of EFs and TPs in the visual system.

11:00–11:15 (174)
Stochastic Accumulator Model of Saccade Response Time and
Neurophysiology. THOMAS J. PALMERI, BRADen PURcELL, JER-
EMIAH Y. COHEN, RICHARD P. HEITZ, JEFFREY D. SCHALL, &
GORDON D. LOGAN, Vanderbilt University—A stochastic accumula-
tor model of perceptual decision making accounted for response time
distributions observed in awake-behaving monkeys engaged in a saccade
visual search task. In most models in this class, the rate of stochastic
accumulation is either a free parameter (e.g., drift diffusion model) or is
determined by other model mechanisms (e.g., exemplar-based random
walk). We instead developed a hybrid approach, in which the stochastic
accumulation in the model was driven by neural recordings obtained
during the task. Specifically, visually responsive neurons in the frontal
eye field (FEF) were recorded when the target or a distractor appeared in
the cell’s receptive field. Trial-by-trial variability in neural activity
was used to generate trial-by-trial variability in stochastic accumulation.
In addition to accounting for behavioral data, we also accounted for the
temporal dynamics of another class of FEF neurons by mapping the pat-
terns of stochastic accumulation in the model with stochastic accumula-
mation in movement-related neurons.

11:20–11:35 (175)
Spatiotemporal Dynamics of Natural and Unnatural Face Changes
Revealed Through Event-Related Brain Potentials. LUC BOUTSEN, 
Aston University, TRACY WARBRICK, Heinrich Heine University Dü-
seldorf, & GLYN W. HUMPHREYS, University of Birmingham—Event-
related brain potential (ERP) studies of face perception have revealed that
the face-sensitive occipitotemporal N170 component is affected by
to changes to the spatial configuration of face features. We measured ERPs
to compare the effect of two types of configural changes on the N170. Par-
ticipants judged the gender of faces in which expression (neutral, happy,
angry), inversion of face features (creating the “Thatcher illusion”), and
face inversion were manipulated. Whereas face feature inversion reflects
an unnatural change to faces, changes in expression are natural. ERP and
dipole source model analyses showed that the N170 was modulated by face
inversion and by feature inversion; this effect was stronger for nonneutral
expressions. Face expression modulated post-N170 components through
differences between neutral and nonneutral (happy or angry) faces. These
results suggest distinct processing stages and time courses for the percep-
tual encoding of the basic face configuration and of face expression.

11:40–11:55 (176)
Moving Backgrounds Alter Baseball Fielder Running Paths Consistent
With Usage of an Optical Control Strategy. MICHAEL K. McBEATH,
WEI WANG, THOMAS G. SUGAR, & IGOR DOLGON, Arizona State
University—Skilled fielders effortlessly navigate to catch fly balls under a
variety of background conditions. Yet research with virtual environments
supports the hypothesis that background flow should influence such navi-
gational tasks. We projected random-dot textures that moved in various
directions and speeds along the entire wall of a gymnasium. This served as
a backdrop for fielders running to intercept real fly balls that varied in
the direction and direction they traveled. Findings confirm that even though
attention is clearly focused on the target ball, moving background texture
systematically alters fielder running path. When the background moves
rapidly with the ball, fielders initially run up more, and when it opposes

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the ball, fielders initially run laterally more. The findings are consistent with usage of an optical control strategy relative to a background that carries with it the earlier perceived ball location. This confirms that large-scale background motion can systematically influence the normally robust perception–action system during real-world interception tasks.

Letter/Word Processing II
Continental Ballroom, Saturday Morning, 10:00–12:00

Chaired by Catherine L. Caldwell-Harris, Boston University

10:00–10:15 (177)
Fast Pairs: A Visual Word Recognition Paradigm for Measuring Entrainment, Top-Down Effects, and Subjective Phenomenology. CATHERINE L. CALDWELL-HARRIS, Boston University, & ALISON L. MORRIS, Iowa State University—When word pairs having a familiar order are sequentially flashed on a computer in their nonfamiliar order ("code zip"), observers have a strong phenomenology of seeing them in familiar order ("zip code"). Reversal errors were reduced but not eliminated when participants began the experiment with a block of longer duration trials, suggesting that one’s immediately prior history of exposure can influence perceptual judgment, consistent with the Bayesian approach to word recognition (Norris, 2006). A forced-choice order-detection procedure also did not eliminate reversal errors, showing that "fast pairs" is a robust perceptual illusion. The fast pairs illusion is consistent with a strong role for statistical processing in reading and word recognition.

10:20–10:35 (178)
Learned Internal Representations and Letter Position Information: A Connectionist Approach. JAY G. RUECKL & SHIN-YI FANG, University of Connecticut and Haskins Laboratories, & KRISTEN T. BEGOSHI, ANURAG RIMZHIHIM, & STEPHEN J. TOBIN, University of Connecticut—A growing body of evidence involving letter representations (e.g., JUDGE/JUDGE) and other manipulations indicates that readers code letter position information in an imprecise manner. This evidence is considered problematic for connectionist models that use slot- or context-based orthographic representations as inputs to the word recognition process. In this paper, we consider the implications of treating the “orthographic” level as a hidden layer in a network that maps visual forms onto representations of phonological structure. Simulation results indicate that these learned hidden representations are similar to slot-based representations in that they encode the conjunction of letter identity and letter position. However, in contrast to the slot-based approach, in this approach, tokens of the same letter in different positions are coded as more similar than tokens of different letters in those positions, with this difference diminishing as the distance between the positions increases. The relationship between the model and a variety of representative empirical findings will be discussed.

10:40–10:55 (179)
Crowding Affects Letters and Symbols Differently. JONATHAN GRAINGER, LPC, CNRS, and Aix-Marseille University, & ILSE TYDGAT, Ghent University—Letters at the first and last position of a string of random consonants are more accurately identified than letters at the second and penultimate positions. This is typically explained as the result of reduced crowding at the outer positions. One problem for this account is that symbol stimuli (e.g., # % & ? £) and simple geometric shapes do not reveal the same outer position advantage. In order to save the crowding interpretation, we hypothesized that crowding effects are stronger with symbol stimuli than with letter stimuli, and in particular that there is less release from crowding in symbol stimuli when one of the two flanking characters is removed. Support for this hypothesis was found in four experiments examining effects of crowding in letter and symbol stimuli while varying the number of flankers.

11:00–11:15 (180)
Orthographic Similarity of Anagrams Revealed Through Repetition Blindness and Masked Priming. ALISON L. MORRIS & MARY L. STILL, Iowa State University—Orthographic repetition blindness (RB) is the finding that when two words sharing letters (e.g., rock, shock) are displayed in close temporal proximity within a rapid serial visual presentation (RSVP) stream, the second word often fails to be identified. Similarly, in primed lexical decision, when primes and targets are orthographic neighbors (e.g., able, axle), response latencies to the target are often lengthened. Our experiments demonstrate that both of these effects can be partially sublexical and insensitive to letter position. Using three-word RSVP displays, strong RB was found for successively displayed anagrams sharing no letters in the same position (e.g., paws, swap). Large inhibitory effects in lexical decision were also found using the same word pairs as primes and targets, with primes displayed for 100 msec. When primes were displayed for only 30 msec, inhibitory effects were smaller but still reliable. Results will be discussed in the context of the competition model of orthographic priming.

11:20–11:35 (181)
The Long and Short of Transposed Letter Priming Effects. SA-CHIKO KINOSHITA, Macquarie University, & DENNIS NORRIS, MRC Cognition & Brain Sciences Unit—We report two experiments testing the idea that the order of letters in words is represented in terms of open bigrams (e.g., Grainger et al., 2006; Schoonhaert & Grainger, 2004; Whitney, 2001, 2007). Open bigram coding is often justified in terms of its ability to explain why primes containing transposed letters produce substantial priming in masked priming (e.g., jugde–JUDGE). In a lexical decision experiment using eight-letter words, we found robust priming from identity primes and primes with two internal adjacent letters transposed, but no priming by transposition primes in which no letter retained its original position. In a same–different task using two- and three-letter words, two-letter words with transposed letters (i.e., where the prime and target do not share bigrams) showed equally robust priming as three-letter words. These results are incompatible with open bigram coding. The results are successfully simulated by the Bayesian reader model (Norris, 2006), incorporating noisy position coding assumption.

11:40–11:55 (182)
Differential Processing of Consonants and Vowels in the Relative Position Priming Effect. MANUEL CARREIRAS, JON ANDONI DUNABEITIA, & NICOLA MOLINARO, University of La Laguna—We investigated whether letter type modulates the relative position (RP) priming effect. In a first set of masked priming lexical decision experiments, we showed that the RP priming effect vanished when prime strings consisted of only vowels (aia–animal), whereas the effect was preserved when primes were composed of only consonants (csn–casino). We also showed that this vanishing of the RP priming effect is not due to the higher frequency of vowels, since high- and low-frequency consonants produced similar RP priming effects. In another experiment, we recorded ERPs in a masked priming semantic categorization task, with the same manipulation (consonant vs. vowel RP). Results showed a modulation of the N250 component that interacted with letter type. Consonant RP primes produced similar effects to identical primes, whereas vowel RP primes produced similar effects to unrelated primes. Our results show that letter type modulates the process of letter position assignment.

Cognitive Control II
International Ballroom South, Saturday Morning, 10:00–12:00

Chaired by Ulrich Mayr, University of Oregon

10:00–10:15 (183)
Inhibition and Binding During Sequential Task Control. ULRICH MAYR, University of Oregon—Recent findings of large lag 2 task repetition costs in hierarchically organized task sequences (e.g., ABC–ACB), with greater costs for within- than across-chunk repetitions (e.g., Koch et al., 2006, Psychological Science; Schneider, 2007, PB&R), have been interpreted in terms of task set inhibition, modulated through sequential structure. Alternatively, I propose that large lag 2 costs reflect two different processes: (1) inhibition on the level of task set representations that does not differ much between externally cued and sequentially controlled task selection, and (2) the resolution of interference between competing bindings of sequential “slots” and sequential elements (tasks). In
sequences used thus far, lag 2 repetitions and the point of interference resolution happened to coincide. Several experiments that avoid this confound reveal both an actual lag 2 backward inhibition effect and a cross-chunk interference cost that seems to be modulated by sequential position. Results have implications for attempts to merge models of sequential representation and serial-order control.

10:20–10:35 (184)

Control Adjustments Before and After Errors: Is It All Just Strategy? INES JENTZSCH & CAROLIN DUDSCHIG, University of St Andrews—People are usually faster before and slower after errors. This finding has traditionally been interpreted as strategic changes of response criteria to more or less conservative thresholds. In the context of recent cognitive control frameworks, it has been proposed that high or low levels of processing conflict can dynamically change these response thresholds to achieve optimal performance. Here, we suggest that evaluation of conflict is time consuming and can potentially interfere with subsequent processing. In two experiments, we investigated effects of response stimulus interval (RSI) and stimulus contrast on pre- and post-error performance using choice reaction time tasks. Speed-up in preerror trials was unaffected by RSI and contrast, whereas posterior slowing increased with decreasing RSI, and effects of contrast manipulation disappeared for short RSIs. The results suggest that, although regulations of response criteria are possible when RSI is short, processing of response conflict can produce substantial interference.

10:40–10:55 (185)

Proactive Adjustments of Response Strategies in the Stop-Signal Paradigm. FREDERICK VERBRUGGEN, Ghent University and VANDERBILT UNIVERSITY, & GORDON D. LOGAN, Vanderbilt University—In the stop-signal paradigm, fast responses are harder to inhibit than slow responses, so subjects must balance speed on the go task with successful stopping in the stop task. In theory, subjects achieve this balance by adjusting response thresholds for the go task, making proactive adjustments in response to instructions that indicate that relevant stop signals are likely to occur. We report five experiments that tested this theoretical claim, presenting cues that indicated whether or not stop signals were relevant for the next few trials. Subjects made proactive response-strategy adjustments in each experiment. Diffusion-model fits showed that response threshold increased when subjects expected stop signals to occur, slowing go responses and increasing accuracy. Furthermore, our results show that subjects can make proactive response-strategy adjustments on a trial-by-trial basis, suggesting a flexible cognitive system that can proactively adjust itself in changing environments.

11:00–11:15 (186)

Conditional Automaticity of Goal Priming in Simple Tasks. GORDON D. LOGAN, Vanderbilt University, & FREDERICK VERBRUGGEN, Ghent University and Vanderbilt University—Can goals for simple actions in reaction time (RT) tasks be activated by irrelevant primes? The short answer is “yes.” Subjects discriminated geometric forms with the primes stop and go inside them. Experiment 1 used a stop-signal procedure; occasional tones instructed subjects to withhold their responses. We found goal priming: RT was slower for stop than for go primes. Experiment 2 used a choice task with no stop signals. We found no goal priming. RT was faster than in Experiment 1, suggesting a floor effect. Experiment 3 used a go/no-go task; subjects responded to one form and withheld responses to the other. We found goal priming. RT was faster than in Experiment 2, suggesting that goal relevance was responsible for the difference between Experiments 1 and 2. Experiment 4 used a stop-signal task including neutral primes. We found cost for stop primes but no benefit for go primes.

11:40–11:55 (187)

Representation and Embodiment for Cognitive Control. RICHARD A. CARLSON & LESLIE A. ADERHOLD, Pennsylvania State University—Representations for control of routine cognitive performances are schematic and streamlined, depending on cognitive and environmental regularities that support brief binding of elements. We elaborate this hypothesis, emphasizing the role of embodiment in achieving coordination. Results from a number of experiments using simple arithmetic tasks provide support for the hypothesis. In counting and adding tasks, extrinsic actions such as keypresses, pointing, manipulation, and private speech may serve both epistemic and coordinative functions. Individuals often time and sequence these actions in a manner that reflects the dynamic structure of control representations, anticipating the sequence and timing with which external elements are assimilated to schemas guiding cognitive processes. Details of the environmental consequences of these actions determine their effectiveness—for example, individuals more effectively count events when they control the onsets rather than the offsets of those events. Taken together, these results illustrate the role that embodiment plays in cognitive control.

11:10–11:25 (188)

Causal-Based Property Generalization. BOB REHDER, New York University—A central question in cognitive research concerns how new properties are generalized to categories. This article introduces a model of how generalizations involve a process of causal inference in which people estimate the likely presence of the new property in individual category exemplars and then the prevalence of the property among all category members. Evidence in favor of this causal-based generalization view included effects of an existing feature’s base rate, the direction of the causal relations, the number of those relations, and the distribution of features among category members. The results provided no support for an alternative view that generalizations are promoted by the centrality of the to-be-generalized feature. However, there was evidence that a minority of participants based their judgments on simpler associative (noncausal) reasoning processes.

11:40–11:55 (189)

Between-Category Similarity Determines Basic-Level Superiority. OLGA F. LAZAREVA, Drake University, & FABBIAN A. SOTO & EDWARD A. WASSERMAN, University of Iowa—Children often learn to categorize at the basic level faster than at the superordinate level, although the opposite trend has also been reported. We hypothesized that between-category similarity affects this basic-level superiority. Dissimilar categories are easy to distinguish at the basic level but hard to group at the superordinate level, whereas similar categories are easy to group at the superordinate level but difficult to distinguish at the basic level. We first assessed similarity among four basic-level categories (cars, chairs, and persons) using multiple-extinction training. Then, we combined two similar basic-level categories into one higher level category with two pairs of categories (cars and persons; chairs and flowers) and trained pigeons to concurrently classify photos into either the proper basic-level category or the proper higher level category. We found that pigeons learned the higher level discrimination faster than the
basic-level discrimination, confirming our hypothesis that basic-level superiority is affected by between-category similarity.

Nonidentical Items From the Same Category: Same or Different? EDWARD A. WASSERMAN & LEYRE CASTRO, University of Iowa—Nonidentical items from the same category can be treated as same, because of their similar categorical properties, or different, because of their dissimilar perceptual properties. We investigated pigeons' and people's discrimination of 12-item arrays containing identical items (same), nonidentical items from the same category (category), and non-identical items from different categories (different). In Experiment 1, subjects were trained to discriminate same from different arrays; in testing, they were shown category arrays and they had to choose either the response associated with same or the response associated with different. Both pigeons and people chose each response option about 50% of the time. In Experiment 2, subjects had to discriminate all three types of arrays. Pigeons again considered category arrays to be equidistant from same and different arrays, but people now considered category arrays to be more similar to same than to different arrays. Implications for same–different discrimination theories are discussed.

The Ups and Downs of Nonmonotonic Extrapolation. MICHAEL L. KALISH, University of Louisiana, Lafayette—The problem of learning metric mappings—functions—from examples is analogous to that of learning category mappings, yet far less is known about function learning. It is not even clear, given the variety of results and paradigms in experimental tasks, that function learning coheres as a topic of study. An example of this diversity can be found in learning of nonmonotonic (cyclical) functions, which under some conditions show robust extrapolation and under others fail to even show learning. In category learning, this sort of apparent difference has given rise to multiple-systems hypotheses. In this talk, I will present several experiments in function learning that begin to identify the factors that enable nonmonotonic extrapolation. I will attempt to unify the results under a general theoretical framework.

Caution and the Uses of Similarity in the Medical Decisions of Novices. MEREDITH E. YOUNG, GEOFFREY R. NORMAN, & LEE R. BROOKS, McMaster University (read by Lee R. Brooks)—Medical students start training with the best available rules, standard diagnostic rules likely to be used in future practice. In the reported experiments, participants are trained to competence on the rules and prototypical written case vignettes of pseudopsychiatric diagnoses. Participants then evaluate case vignettes in which either diagnostic features or nondiagnostic identity information is similar to those seen in training. The results of these experiments indicate a strong reliance on familiar feature instantiations (i.e., attention-delimited similarity), whether diagnostic or not, the disambiguation of features following previous experience with that feature, and a strong influence of familiar but nondiagnostic patient identity context on the use and interpretation of features. Possible normative uses of similarity, despite knowledge of an authoritative rule, will be discussed.

Binding in Memory Waldorf Room, Saturday Morning, 10:20–12:00

Chair: Michael C. Anderson, University of St Andrews

10:20–10:35 (194)

Cue-Independent Impairment in Retrieval-Induced Forgetting Reflects Inhibition, Not Associative Interference. JUSTIN HULBERT & MICHAEL C. ANDERSON, University of St Andrews (read by Michael C. Anderson)—According to the inhibition account of retrieval-induced forgetting (RIF), retrieving a target in response to a cue (e.g., recalling “Orange” to Fruit–Or___) activates competing memories (e.g., Fruit–Banana) that are inhibited to retrieve the target. One key finding supporting the inhibition view is cue independence, in which RIF generalizes to novel test cues used to access the impaired competitor (e.g., Monkey–B__). Recently, it has been suggested that cue-independent impairment reflects associative interference that arises because participants covertly retrieve study cues (e.g., Fruit) when accessing the competitor from the novel cue (e.g., Monkey–B__), allowing strengthened competitors (e.g., Fruit–Orange) to impede retrieval. In three experiments, we show that associative blocking is insufficient as an account of cue-independent impairment, by establishing that strengthening a target in the absence of retrieval fails to generate the predicted impairment. These results further show that RIF is cue independent, retrieval specific, and interference dependent, consistent with an inhibition account.

10:40–10:55 (195)

Directed Forgetting and the Role of Retrieval Processes. KARL-HEINZ BAUM & ANUSCHEH SAMENIEH, Regensburg University—People can intentionally forget previously studied information (List 1) if, after study, a forget instruction is provided and new material (List 2) is encoded. In a series of experiments, we examined whether part-list cuing and part-list retrieval can modulate such directed forgetting. List 1 items were divided into target and nontarget items; target recall was examined in the presence of the nontargets serving as retrieval cues (part-list cuing) and after prior guided cued recall of the nontarget items (part-list retrieval). As expected, in the remember condition, part-list cuing and part-list retrieval reduced target recall. In contrast, in the forget condition, part-list cuing and part-list retrieval enhanced target recall, ironically leading to higher recall levels than in the remember condition. Following the view that part-list cuing induces covert retrieval processes, these findings indicate that (covert and overt) retrieval processes can undo directed forgetting and may even cause unwanted recall enhancement.

11:00–11:15 (196)

Unitization and Binding: Complementary Associative Memory Processes. ANDREW P. YONELINAS & COLLEEN M. PARKS, University of California, Davis—In order to remember one’s past, it is necessary to successfully encode the arbitrary associations that make up an event (e.g., who was present during a specific meeting). There are two ways in which we can form new associations. One way is that two separate items may be identified and then bound together. Alternatively, two items may be encoded as parts of a single coherent whole, and thus they may be unitized, or conceptually fused. Here, we argue that the distinction between unitizing and binding is critical in understanding the nature of recognition memory. We report several new experiments examining the effects of unitizing and binding on recollection, familiarity, and implicit memory, and show that these two forms of memory encoding are functionally and neuroanatomically distinct.

11:20–11:35 (197)

Nonstrategic Binding, Word Frequency, and Destructive Interference. MICHAEL S. HUMPHREYS, ANGELA M. MAGUIRE, SCOTT W. BOLLAND, JENNIFER S. BURT, KRISTA L. MURRAY, & RYAN DUNN, University of Queensland—The binding process is difficult to study in humans because of the uncontrolled use of strategies and because of interference from the other list items. In order to control strategies, participants studied a list of four digits and then rehearsed a pair of words before being tested for digit recall and, after many such lists, for pair recognition. Performance was very poor with massed rehearsals but improved to a usable level with distributed rehearsals. Contrary to previous findings, the hit rates as well as the false alarm rates were higher for pairs of low-frequency than for high-frequency words. This pattern can be explained if low-frequency words are less similar than high-frequency words. Converging evidence on the relative similarity of low- and high-frequency words is obtained from finding a correlation between the probability of forming a binding and a reduction in digit recall.

11:40–11:55 (198)

Memory Conflict Enhances Memory Control. ELISA CIARAMELLI, University of Toronto, GIUSEPPE PANELLEGRINO, University of Bologna, KATHY LI & MICHAEL TAU, University of Toronto, & MORRIS MOSCOVITCH, Rotman Research Institute (sponsored by Morris Moscovitch)—Cognitive conflict triggers adjustments in cognitive
control. For example, in the Simon task, interference from task-irrelevant spatial information is reduced following incongruent (high-conflict) compared with congruent (low-conflict) trials (Botvinick et al., 1999). Here, we investigated whether comparable conflict-induced adjustments in control occur in memory. Participants studied lists of semantically related words and underwent a task involving “memory trials” interleaved with “Simon trials.” In memory trials, participants had to respond “old” to studied items and “new” to semantically related (high-conflict) or unrelated (low-conflict) lures. In Simon trials, participants had to respond to the color of probes whose location was congruent or incongruent with the required response. In the Simon task, interference was reduced following incongruent compared with congruent trials. Analogously, in the memory task, rejection of semantically related lures improved following semantically related lures (from different thematic categories), compared with targets or unrelated lures. Conflict-related improvements in control were task specific.
The Relationship Between Language and Numerical Cognition: The support a view of language as a cognitive technology: a tool for creating ber quantity information without using language. Together, these data same pattern applies for English speakers tested under verbal interfer- transfer quantity information across space or time, they rely on a strategy objects into one-to-one correspondence. However, when they need to have no words for exact quantities—not even a word for “one.” Despite people of Brazil (an isolated, hunter–gatherer tribe) suggesting that they —What is the relationship between language and cognition? We use EVELINA FEDORENKO, REBECCA SAXE, & EDWAR GIBSON, Hopkins University and Deaf Children.

2:10–2:25 (211) 

Spatial Language Potentiates Spatial Cognition: Evidence From Hear- and Deaf Children. DDERE GENTNER, Northwestern University, ASLI ÖZYÜREK, Max Planck Institute for Psycholinguistics, SUSAN GOLDIN-MEADOW, University of Chicago, ÖZGE GÜRÇANLI, Johns Hopkins University, & JEFF LOEWENSTEN, University of Texas, Austin—Young English-speaking children perform better on a simple spatial mapping task between two three-tiered boxes if they first hear spatial terms that partition the spaces—for example, top, middle, bottom (Loewenstein & Gentner, 2005). Older children (around 6 years) perform well even when no spatial language is used, suggesting that, over time, the semantic distinctions become automatic. To test this, we investigated a similar age group of children who lacked conventional spatial language: 5- to 7-year-old deaf children of hearing parents in Istanbul, whose deafness precluded learning spoken language and who had not been taught a sign language. An elicited production task indicated that they largely lacked ways to label spatial relations. We gave the deaf children and a matched group of hearing Turkish children the three-tiered mapping task, using no spatial language for either group. The deaf children performed significantly worse than the hearing children, suggesting that spatial lan- guage is instrumental in the development of spatial cognition.

2:10–2:25 (211) 

Numerical Cognition in the Absence (or Temporary Unavailability) of Language for Number. MICHAEL C. FRANK, PETER LAI, EVELINA FEDORENKO, REBECCA SAXE, & EDWARD GIBSON, MIT—What is the relationship between language and cognition? We use numerical data as a case study. We present new data from the Pirahã people of Brazil (an isolated, hunter–gatherer tribe) suggesting that they have no words for exact quantities—not even a word for “one.” Despite this, they understand the concept of exact quantity and are able to put objects into one-to-one correspondence. However, when they need to transfer quantity information across space or time, they rely on a strategy of analogue magnitude estimation (Gordon, 2004). We show that the same pattern applies for English speakers tested under verbal interfer- ence: They are able to succeed in one-to-one matching tasks, but—like the Pirahã—they resort to magnitude estimation when they must remem- ber quantity information without using language. Together, these data support a view of language as a cognitive technology: a tool for creating abstractions for efficient storage and processing of information.

2:30–2:45 (212) 

The Relationship Between Language and Numerical Cognition: The Case of Nicaraguan Homesigners. ELIZABET SPAEPEN & MARIE COPPOLA, University of Chicago, ELIZABETH SPELKE & SUSAN CAREY, Harvard University, & SUSAN GOLDIN-MEADOW, University of Chicago—Data from cross-linguistic and cross-cultural studies suggest that representations of large exact numbers may require access to a conventional count list. Because cultures that lack a conventional counting system differ in many ways from those that have these devices, however, the effects of language and culture are difficult to disentangle. In this talk, we examine deaf adults in Nicaragua who receive no con- ventional sign language input but still participate in a numerate culture. These adults’ use of number gestures (i.e., finger configurations), as well as their nonverbal numerical cognition, is consistent with the thesis that a conventionalized count list is critical to representing and using the system of exact integer concepts. Even adults who are well integrated into a numerate society do not spontaneously use exact integer concepts in communicative or cognitive tasks, in the absence of these linguistic devices.
meanings show an advantage in lexical decision (LD), but not in semantic categorization (SC), whereas homonymous words with unrelated meanings show a disadvantage in SC, but not in LD. Hino, Pexman, and Lupker (2006, *JMcL*) argued that these results cannot be explained by the semantic coding process as instantiated by PDP networks, because this process is assumed to be identical across tasks. We argue, instead, that the observed task differences reflect different time points in the same semantic settling process. Computationally, a simple PDP model of word comprehension shows a polysemy advantage early in settling and a homonymy disadvantage late in settling. Empirically, using only LD but controlling difficulty by varying the wordlikeliness of nonwords, easy LD yields a polysemy advantage, whereas difficult LD yields a homonymy disadvantage (like SC) and—consistent with the model’s predictions—intermediate-difficult LD yields both effects.

2:10–2:25 (207)

**Words Translated in Context Produce Long-Term Repetition Priming**, WENDY S. FRANCIS, ALEJANDRA CAMACHO, & EVA M. DE LA RIVA, University of Texas, El Paso—Previous research with words encoded in sentence contexts has shown little, if any, long-term repetition priming, perhaps because of substantial task differences from encoding to test. In Experiment 1, 96 Spanish–English bilinguals translated words in isolation or in sentence contexts at encoding. At test, they translated words or named pictures corresponding to words produced at encoding and control words. Repetition priming was reliable in all conditions. In translation, contextualized words produced about two thirds of the priming observed for isolated words. Repetition priming in picture naming indicated priming from production in context. A componental analysis also indicated priming from comprehension in context, but only in the nondominant language. Experiment 2 replicated this paradigm with auditory stimuli. These results suggest that repetition priming reflects the long-term learning that occurs with comprehension and production exposures to words in the context of natural language.

2:30–2:45 (208)

**Processing Morphologically Complex and Morphologically Simple Words in Hebrew: Evidence for Two Independent Lexical Systems**, RAM FROST & HADAS VELAN, Hebrew University—The “universal” view of reading posits that similar principles of lexical organization and processing apply to different languages. Current models of visual word recognition, therefore, are not language specific. However, previous studies comparing word recognition in Hebrew and English have shown marked differences in processing words in Indo-European versus Semitic languages. These studies, which have assessed the effects of orthographic priming, parafoveal preview benefits, or the impact of letter transpositions, have led us to promote an “ecological” view of reading, suggesting that even within the Hebrew language, “Semitic” words that are composed of root derivations are processed and organized in the mental lexicon differently than “English-like” words that do not have a clear root morpheme. Implications for the modeling of morphological processing are discussed.

2:50–3:05 (209)

**Body Part or Baby Cow? Ambiguous Words Like “Calf” Are Harder to Learn**, NATASHA TOKOWICZ & TAMAR DEGANI, University of Pittsburgh—Translation ambiguity occurs when a word in one language has more than one translation in another language. Previous research has demonstrated that such ambiguity is quite prevalent (e.g., Tokowicz et al., 2002) and that it slows translation performance and makes it less accurate (e.g., Tokowicz & Kroll, 2007). Furthermore, this decrement worsens with increased second-language proficiency (Tokowicz, 2005). The present study investigated the effect of translation ambiguity at the earliest stages of second-language word learning by teaching native English speakers a set of Dutch vocabulary, some of which had multiple translations. Participants were trained in two sessions and tested in three, including a longer-term retention test. Preliminary results demonstrate that translation-ambiguous words are more difficult to learn even when they are presented twice as often as translation-unambiguous words.

We further explored the difference in learning words that are translation ambiguous due to multiple synonyms versus multiple meanings.

3:10–3:25 (210)

**Behavioral and Electrophysiological Studies of Semantic Satiation**, XING TIAN, University of Maryland, College Park, & DAVID E. HUBER, University of California, San Diego (read by David E. Huber)—A series of experiments tested the claim that semantic satiation is neither a loss of meaning nor a loss of perception for the word form but is, instead, a loss of association between the word form and its meaning. To control for fatigue between repeated and nonrepeated words, all experiments used a speeded matching task that contained a randomly ordered mix of repeating and nonrepeating cue words. When the task was category matching and the cue was the category label, there was a slowing for the repeating category. When the repeating category was indicated by continually new exemplars, there was only facilitation. When the matching task was for the word form, there was only facilitation. As predicted by assuming that detection of novel semantics identifies mismatches, MEG revealed that this satiation corresponds to decreased M170 and M400 responses to a repeated cue but increased M400 responses to a matching target.

**Categories and Concepts III**

**Continental Ballroom, Saturday Afternoon, 1:30–3:10**

Chairied by Evan Heit, University of California, Merced

1:30–1:45 (211)

**Multidimensional Models of Inductive and Deductive Reasoning**, EVAN HEIT, University of California, Merced, & CAREN M. ROTELLO, University of Massachusetts, Amherst—This research addressed the relations between inductive reasoning and deductive reasoning. We evaluated the ideas that the same cognitive mechanisms are applied to both types of judgments and that different processes lead induction and deduction to use different information. In an experiment, subjects judged either inductive strength or deductive validity for a common set of arguments. A finding from Heit and Rotello (2005), greater sensitivity to validity for deduction, was replicated. A new finding was greater sensitivity to number of premises for induction. The results were analyzed using signal detection theory (SDT) and receiver-operating characteristic curves and were modeled using both one-dimensional and multidimensional versions of SDT. The most successful model for the entire pattern of results assumed two underlying dimensions, deductive correctness and associative strength, with different proportions making up either induction or deduction judgments. Related results, showing different effects of similarity on induction versus deduction, are also described.

1:50–2:05 (212)

**An Ideal Vector Model of Typicality**, GERT STORMS, WOUTER VOORSPOELS, & MATTHEW J. DRY, Katholieke Universiteit Leuven—In this study, we propose an ideal-vector model to account for the typicality gradient in spatial representations of natural language categories. In this model, the predicted typicality of an exemplar is derived from its value along an optimal ideal dimension, which is looked for in the similarity space. The higher the value on this dimension, the more typical an exemplar is predicted to be. The vector model is compared with more traditional, similarity-based accounts of typicality: a straightforward prototype model and an exemplar model (the GCM). Using a Bayesian approach, the models’ performance is compared for 25 superordinate categories in two semantic domains—*clothes* and *animals*—and on two levels of abstraction (typicality for the domain, and typicality for superordinate categories within the domain). The results indicate that the vector model clearly outperforms the other models in the prediction of typicality for the semantic domain, as well as for the superordinate categories.

2:10–2:25 (213)

**Distinguishing Facts and Beliefs: A Comparison Across Domains**, MITCHELL RABINOWITZ, MARIA ACEVEDO, LINDSAY BLAU PORTNOY, SARA CASEN, & MYRIAH ROSENGARTEN, Fordham
What features do people use to distinguish facts from beliefs? In prior research, we showed that facts can take on one of two characteristics: (1) something that you think is true and you think other people think it is true, and (2) something that you think is true and you expect others might or might not think is true. Beliefs are things that can vary in terms of expectations of how much you and others think they are true. This characterization is observed with materials related to general knowledge and newspaper articles. In the present presentation, we investigate information taken from two domains: psychology (memory and relationships) and science (circulatory system and evolution). We find that domains vary in terms of whether they are fact based or belief based (as perceived by the participants) but that the characteristics of what distinguishes facts from beliefs are stable across domains.

2:30–2:45 (214)
What Judgments of Really Reveal About How People Think About Artifacts. BARBARA C. MALT & MICHAEL R. PAQUET, Lehigh University—We investigated what drives judgments of what an artifact really is and what these judgments reveal about how people think about artifacts. We contrasted an essentialist perspective with a pragmatics perspective. Experiment 1 used objects from online sales catalogs and the names given by the vendor (stool, bench, chair, etc.). The typicality of the objects with respect to their name varied, and we posed the name as being given by either the creator or a person who found the object at a garage sale. Experiment 2 used photos of household objects presented with short story contexts in which the current use was altered from the original intended use. In both experiments, participants judged whether each object was really an example of the specified name. The results from both experiments favor the pragmatics perspective that judgments of really reflect how well properties of the object match properties evoked by the name in question.

2:50–3:05 (215)
Category Invention in Linguistic Category Induction. ROMAN TARABAN, Texas Tech University—Induction of linguistic categories is a significant issue in language acquisition research. Two experiments using an artificial language with two gender-like noun categories tested the category invention hypothesis of Clapper and Bower (2002) that early experiences with category exemplars determine category boundaries and either strongly facilitate or hinder category induction. Transfer results for novel phrases in Experiment 1 supported the category invention hypothesis. Experiment 2 tested the central principle of category invention—that is, that early mixed presentation of exemplars from both categories would block category induction—against the importance of exemplar frequency. Contrary to the category invention hypothesis, there was a significant transfer to novel phrases in the experimental condition. The findings from both experiments corroborate the importance of the distribution and frequency of exemplars in acquiring L1 or L2 and indicate that category invention is not an explanation.

Implicit and Explicit Memory
International Ballroom South, Saturday Afternoon, 1:30–3:30
Chaired by John C. Trueswell, University of Pennsylvania

1:30–1:45 (216)
In a Manner of Speaking, Thinking, and Seeing: Attention Allocation During Event Perception. JOHN C. TRUESWELL, University of Pennsylvania, & ANNA PAPAFRAGOU, University of Delaware—What role does language play in attention allocation during event perception? What role does language play in remembering events? Eye movements were recorded from 140 adults viewing animated motion events (e.g., a duck skating to a building) that they later recalled via a nonlinguistic video-recognition task. Half were native speakers of Greek, a language that tends to describe motions as goal-directed paths (approaching), and half were native speakers of English, which prefers manner/instruments (skating). Expected language differences occurred in the recognition task, but only if the subjects had previously described the events at encoding. However, even when no description was required, eye movements during initial encoding showed language differences, most of which were compensatory in nature: Greeks inspected instruments more; English-speakers inspected goals more. Language compensation was accentuated with a nonlinguistic interference task and was eliminated with a linguistic interference task. Implications for event perception, encoding, and memory are discussed.

1:50–2:05 (217)
The Production Effect: Support for a Distinctiveness Account. COLIN M. Msc.LEOD, NIGEL GOPIE, & JASON D. OZUBKO, University of Waterloo—The production effect is the substantial memory benefit that accrues from saying a word aloud versus silently during study. We describe two series of experiments investigating the cause of this effect. In both series, half of the items in the critical study list were spoken and half were read silently. In one series, using a list discrimination paradigm, (1) when all the words on the other list were read silently, there was a robust production effect, but (2) when all the words on the other list were spoken, the production effect disappeared. In the other series, (1) source memory for whether a word was studied aloud or silently was considerably better for words studied aloud, and (2) the production effect was limited to words designated as “remembered” using the remember/know procedure. These results support a distinctiveness account of the production effect: The differentiation of produced items at study is useful for discriminating these produced items from other items at test.

2:10–2:25 (218)
Accurate Recognition Based on Explicit Versus Implicit Memory. KEN A. PALLER & JOEL L. VOSS, Northwestern University—Accurate memory responses in recognition tests are universally characterized as resulting from explicit memory; they involve decision confidence and the awareness of memory retrieval, and are diminished due to organic amnesia. In contrast, we observed behavioral and electrophysiological evidence for the existence of implicit recognition, which refers to accurate recognition that lacks hallmark explicit memory features. We found higher forced choice recognition accuracy for kaleidoscope images when they were encoded under a divided-attention condition than when encoded with full attention. Furthermore, remarkably accurate responding in this memory test occurred on trials when phenomenological awareness of memory retrieval was minimal. Brain potentials recorded from the scalp while people performed the test dissociated a contribution from implicit memory from the explicit-memory influences that are commonly associated with experiences of recollection or of familiarity. These results provide new insights into the multiple neurocognitive processes that can guide recognition memory.

2:30–2:45 (219)
List-Strength Effect in Recall: Competition or Retrieval Inhibition? MICHAEL F. VERDE, University of Plymouth—The list-strength effect, in which strengthening some items makes it more difficult to recall related items, has often been interpreted in terms of relative-strength competition among memories. However, many studies in the retrieval-induced forgetting literature have shown that when output position is controlled, only retrieval practice, and not additional study, leads to forgetting of competitors, consistent with retrieval inhibition, but not relative-strength competition. In the present study, a robust list-strength effect in cued recall was observed that is not easily attributed to inhibition. As simulations of the SAM–REM model of recall (Malmberg & Shiffrin, 2005) show, the relationship between strengthening and competitor interference in a competition model depends on how strength is defined.

2:50–3:05 (220)
Implicit Benefits of Susceptibility to Distraction. RUTHANN C. THOMAS, KAREN CAMPBELL, & LYNN HASHER, University of Toronto (read by Lynn Hasher)—The presence of distraction ordinarily slows performance on a target task, increases errors, or does both, and does so more so for some individuals and groups than for others. Here, we report an unexpected benefit of heightened susceptibility to distraction: Encoding of distraction in one task can facilitate performance on a subsequent memory task in which the distraction becomes to-be-learned
information. That is, information that occurred as distraction in the context of one task can boost performance on a subsequent task—although participants fail to recognize any connection between the two tasks. Furthermore, older adults, who are more susceptible to distraction than are younger adults, show greater positive carryover effects from distraction, resulting in performance that is at least as good as that of young adults, as we show in several demanding learning situations.

3:10–3:25 (221)
Aging Impairs New Episodic Priming While Sparing Long-Term Associative Priming. CHRISTOPHER HERTZOG, ELIZABETH P. KIRK, STARLETTE SINCLAIR, & JARROD HINES, Georgia Institute of Technology.—We studied associative and episodic priming in a single task, using groups of younger adults and older adults. Participants began with an incidental associative encoding task and then were tested for explicit memory. Subsequently, a lexical decision task used visible primes that were drawn from a 2 (old, new) × 2 (related, unrelated) design. Primes preceded word and nonword targets by 1 sec, an SOA that has produced semantic priming for young and old adults. Robust episodic priming was observed for younger adults, but not for older adults. Conversely, older adults showed larger associative priming effects for related and unstudied primes than did younger adults, consistent with earlier studies. Episodic priming was larger for previously recalled cue–target pairs, but nonword trials showed no effects of old versus new cues, inconsistent with a top-down strategic set based on explicit memory for old cues.

Object Attention
Williford Room, Saturday Afternoon, 1:30–2:50
Chaired by Shaun P. Vecera, University of Iowa

1:30–1:45 (222)
The Perceptual Fate of New Objects. JOSHUA D. COSMAN & SHAU P. VECERA, University of Iowa (read by Shaun P. Vecera) —New, abruptly appearing objects capture attention and prioritize visual search. However, little is known about changes in perceptual processing with new objects. Are new, abruptly appearing objects perceived more easily than other objects? Participants performed a demanding perceptual discrimination task in which an array of placeholders appeared briefly before the presentation of a single target stimulus. Importantly, the target was either a new, abruptly appearing object or an old object that appeared at a placeholder location. The participants were significantly more accurate performing perceptual discriminations on new objects than on old objects. In control experiments, we ruled out forward masking and other alternatives as possible explanations for these results. We conclude that new, abruptly appearing objects receive a benefit in perceptual processing as a result of their status as new objects.

1:50–2:05 (223)
Object-Based Attention: Reward Driven Prioritization. SARAH SHOMSTEIN & JACOBA JOHNSON, George Washington University.—Much of the evidence accumulated over the past decade suggests that visual attention is often object based. However, some recent studies have suggested that strategic effects such as priority-based scanning (based on local probabilities of the scene) can contribute to object-based effects. In the present experiment, we further explored constraints on the mechanisms of object-based selection by setting two strategies, object based and reward based, against each other. Although presenting exactly the same visual stimuli to the observer, in a set of four experiments we manipulated what was rewarded (same object targets or different object targets) and the type of reward received (money based or point based). It was observed that reward alone guided attentional selection—in some cases, completely reversing object-based effects. These results suggest that internal factors alone (i.e., reward based) can contribute to attentional prioritization, providing further constraints on the mechanisms of object-based selection.

1:10–2:25 (224)
The Role of Top-Down Information on Object Segmentation During Selective Attention. XINGSHAN LI & GORDON D. LOGAN, Vanderbilt University.—It is usually thought that visual attention selects bottom-up segmented objects for further processing. However, object segmentation sometimes uses top-down information. We conducted an experiment that asked whether top-down information could influence object segmentation during object selection. We briefly presented four Chinese characters spaced equally in the four corners of a square and asked subjects to report as many characters as possible. The display in four fifths of the trials contained one two-character word, arrayed horizontally or vertically. The other one fifth of the trials were controls, in which no characters constituted a word. We found that the characters belonging to a word were more likely to be reported and were reported earlier in time. These results suggested that top-down information can influence object segmentation during selective attention. Attentional selection is a dynamic process that involves the interaction of top-down and bottom-up factors.

2:30–2:45 (225)
Split Vision in Normal Brain. ANNE GIERSC H, INSERM, MITSOUKO VAN ASSCHE, Université Louis Pasteur, Strasbourg, & PIERRE GOS, École Normale Supérieure, Lyon.—The literature and everyday experience suggest that processing information across the two hemifields is efficient. We observed, however, a large cost of selecting targets across hemifields. Circles and squares were drawn in alternation around a fixation point, whose fixation was ensured by continuous eye-tracking. Only two adjacent figures were identical and had to be identified. Due to manipulation of grouping factors (Beck & Palmer, 2002, JEP:HPP), targets were within-group or between two groups. RTs were slower for between- than for within-group targets and increased further when between-group targets were in different hemifields, by around 150 msec. There was no such cost for targets grouped by a connector. Attention manipulation improved search for between-group targets in all positions, but the RT cost observed for presentation across, rather than within, hemifields remained stable, suggesting that top-down control helps to select both figures of between-group pairs independently, without directly regrouping them.

Spatial Cognition
Waldorf Room, Saturday Afternoon, 1:30–3:50
Chaired by Holly A. Taylor, Tufts University

1:30–1:45 (226)
Thinking About Space: Contributions of Cognitive Style and Information Preference. A. REYYAN BILGE & HOLLY A. TAYLOR, Tufts University (read by Holly A. Taylor) —Do individual differences in cognitive style and preference interface with holistic and piecemeal mental rotation strategies? The present work examined the relationship between mental rotation strategies (holistic and piecemeal) and individual cognitive style differences (spatial information preference and mental representation style). Participants completed mental rotation trials with standard stimuli and “cut” versions of these stimuli, designed to encourage a piecemeal strategy. Two experiments, one with 3-D and one with 2-D stimuli, showed the classic mental rotation finding: increases in angular error and reaction time with increased angular disparity. Additionally, both spatial information preference and mental representation style interacted with stimulus type (whole or cut), suggesting their role in mental rotation strategies. Map preference and survey representation style, both of which emphasize the overall layout, showed responses consistent with a holistic strategy. Both verbal direction preference and landmark representation style emphasized serial spatial information processing and showed responses consistent with a piecemeal strategy.

1:50–2:05 (227)
What Do Spatial Abilities Tests Really Measure? MARY HEGARTY, KRISTA DIÉLEEUW, & BAILEY BONURA, University of California, Santa Barbara.—Spatial ability tests are often interpreted as measuring facility with imagined spatial transformations of objects. But most spatial abilities tests can be solved by analytic strategies as well as by imagistic strategies. In this study, participants completed a mental rotation test, a paper folding test, and a three-dimensional perspective-taking test and then gave verbal protocols while completing additional items from
Does It Matter to Be Pictured From Below (or From Above)?

Discrepancies in previous and the present findings. Anchored at the shoulder joint. However, length judgments are also effective to the extent of the field of possible tangential movements that are at the elbow, than are tangential movements for horizontal lengths, relative larger, relative to the total extent of radial movements that are anchored.

Immediate Reversal Learning Produced by a Spatial Pattern.

Michael F. Brown, Villanova University, Bradley R. Sturz, Armstrong Atlantic State University, & Katherine L. Andriole, Villanova University—In a reversal learning paradigm, human participants learned to choose 8 target locations in a display of 16 locations. There were 10 reversals of target and nontarget locations. When the two sets of locations were defined by a structured pattern (i.e., a checkerboard pattern), choices were controlled by the reversed contingencies immediately following the first choice made after the first reversal. When the two sets of locations were not defined by a structured spatial pattern, several reversals were required before reversal performance was evident. Furthermore, in the absence of a structured pattern, spatial reversal learning did not differ from reversal learning based on stimulus identity. These results are interpreted in terms of precedence for learned representations of spatial configurations, rather than of individual spatial locations, produced by a structured pattern among the locations.

Spatial and Shape Cues in Length Judgments. Susanna Millar, University of Oxford—Findings on separate and comparative length judgments for vertical and horizontal stimuli are considered. The hypothesis that overestimations of vertical lengths are due to the shape of a vertically compressed (elliptical) perceptual field suggests that isolated vertical lengths are also judged to be longer than isolated horizontal stimuli. Moreover, the same explanation should apply in active touch.

Radial movements in scanning vertical lengths are proportionately larger, relative to the total extent of radial movements that are anchored at the elbow, than are tangential movements for horizontal lengths, relative to the extent of the field of possible tangential movements that are anchored at the shoulder joint. However, length judgments are also affected by the range of comparison stimuli, by surrounding shape cues, and by variability in start–end locations. These, as well as the task effects of comparative judgments, may need to be taken into account to explain discrepancies in previous and the present findings.

Does It Matter to Be Pictured From Below (or From Above)? Géry t’YdeWalle, Katholieke Universiteit Leuven—Experiments 1–9 explore the relationships between the vertical camera position and the assessment (using the semantic differential scales), status, and perceived size of a depicted person (as a picture or as an actor in a movie). Camera position influences strongly the potency ratings but not the activity and evaluation ratings: A person is seen as less powerful when filmed from above, in comparison with when filmed from below or from eye level. Similarly, observers underestimate the height of a person when he or she is filmed from above, as compared with when he or she is filmed from below. Older studies (Dannenmaier & Thumin, 1964; Wilson, 1968) showed that people with a high status are perceived as being taller; low-status persons are perceived as shorter. Manipulating independently status and camera position enables us to disentangle the size distortion as depending on perceived potency (or vice versa).

Perceptual Simulation of Verbs and Pictures. Michéle Verges, Indiana University, South Bend, & Sean Duffy, Rutgers University, Camden—Perceptual symbol systems (Barsalou, 1999) posit an analogue representation between symbols and corresponding referents. These perceptual simulations occur when constituent percepts (e.g., shape, color) and orientations (e.g., up, down) cohere into a unified representation. Prior work has demonstrated perceptual-interference effects for object words and literal sentences. Spatial primes that evoked an upward location delayed responses to targets presented at the top of the visual field, whereas spatial primes that evoked a downward location delayed responses to targets presented at the bottom of the visual field. In two experiments, we examined whether perceptual-interference effects would occur for actions and images. Participants identified targets shown at the top or bottom of the computer screen following the presentation of verbs or pictures that varied in spatial cues. The perceptual-interference effect obtained for verbs, but not for pictures. The results suggest that perceptual interference occurs when symbols and referents overlap spatially in language comprehension.

Effects of Presenting Navigation Instructions Twice in the Same or Different Modalities. Vivian J. Schneider, Alice F. Healy, & Carolyn J. Buck-GenGler, University of Colorado, Immanual Barsh, NASA Ames Research Center, & Lyle E. Bourne, Jr., University of Colorado—An experiment investigated subjects’ ability to follow navigation instructions in a situation mimicking communication between air traffic controllers and aircrews. The instructions told the subjects to move in grids on a computer screen simulating a 3-D space. They followed the instructions by mouse clicking on the grids. Three modalities were compared: auditory (verbal commands given orally), visual (verbal commands shown on the screen), and spatial (commands shown on the screen as simulated movements). The presentation times in the three modalities were equated. The navigation instructions were always presented twice in either the same or different modalities. Best performance was found either when the spatial modality was repeated or when the visual modality followed the auditory or the spatial modality. The results are explained in terms of the type of encoding used within each modality. These findings are inconsistent with claims that two modalities are always better than one for processing information.

The Development of False Memories Across the Life Span—Grand Ballroom, Saturday Afternoon, 3:50–5:30

Chaired by Mark L. Howe, Lancaster University

The Relative Importance of Categorical and Associative Structure in Children’s False Memory Illusions. Mark L. Howe, Marina C. Wimmer, & Katrina Blease, Lancaster University—The role of associative strength in children’s true and false memories was examined when category and Deece/Roediger–McDermott (DRM) lists were used to cue the same critical lure. Backward associative strength (BAS) was varied such that the category and DRM lists had the same strength. DRM lists had more BAS, or category lists had more BAS. If BAS drove children’s false memories, then BAS, not the type of relation across list items, should determine false memory production. The results confirmed this prediction using both recall and recognition measures. Specifically, (1) both true and false memories increased with age, (2) true memory was better for category than for DRM lists but there were no differences for false memory, and (3) at all ages, false memories varied predictably with changes in BAS but were unaffected by list-type manipulations. These findings are discussed in the context of models of children’s false memory development.

Reducing False Memories in Younger and Older Adults With Autobiographical Elaboration. David A. Gallo & Ian M. McDonough, University of Chicago—Episodic memory accuracy—or the likelihood of making false memories—is influenced by the quality of retrieved information and corresponding decision processes at retrieval. One such decision process is diagnostic monitoring, whereby subjects compare retrieved information with retrieval expectations to help determine the information’s original source. Research indicates that diagnostic monitoring is more accurate for perceptually distinctive sources than for less distinctive sources (e.g., the distinctiveness heuristic) and that healthy aging can spare this process. Here, we extended these ideas to autobiographical elaboration. The retrieval of autobiographical memories in
response to cue words should be a distinctive process, reducing subsequent source misattributions, relative to a semantic control task. Several experiments with younger adults were consistent with this prediction and isolated a recollection-based distinctiveness heuristic. We also tested whether healthy older adults would receive the same benefits of autobiographical elaboration, providing an independent measure of age-related effects on autobiographical memory distinctiveness.

4:30–4:45 (235)
Age Differences in False-Memory Formation: The Contribution of Recollection and Familiarity. SIMONA GHETTI & KRISTEN E. LYONS, University of California, Davis—Some false memories are associated with the recollection of vivid details, whereas others are experienced as familiar. To date, little is known about the relative contribution of recollection and familiarity to false-memory development. Developmental differences were examined (N = 120; ages, 6, 7, 9, 10, and 18 years) in two types of false-memory effects: backward causal-inference errors (i.e., falsely remembering having viewed the nonviewed cause of a previously viewed effect) and gap-filling errors (i.e., falsely remembering having viewed a nonviewed event that belongs to a viewed script sequence). Previous research suggests that backward causal-inference errors depend on recollection, which improves considerably during childhood, and that gap-filling errors depend on familiarity, which shows relative stability during childhood. We tested the hypothesis that age differences in these errors would parallel the developmental trajectory of the processes thought to underlie these errors. As was predicted, backward causal-inference errors increased with age, whereas gap-filling errors were age invariant.

4:50–5:05 (236)
Semantic and Phonological False Memories in Children and Adults: A Comparison of Massed Versus Spaced Lists. STEPHEN A. DEWHURST & ELLER R. SWANNELL, Lancaster University—We investigated the development of semantic and phonological false memories in children (5, 8, and 11 years old) and adults. Participants studied 15-item lists in which a critical sequence of semantically or phonologically related words was embedded, in either a massed or a spaced distribution. Semantic false memories were greater in the massed than in the spaced condition and increased with age only in the massed condition. Phonological false memories were also greater in the massed than in the spaced condition but did not vary significantly as a function of age.

5:10–5:25 (237)
Emotion and False Memory: The Cornell/Cortland Norms. CHARLES J. BRAINERD & YI YANG, Cornell University, MICHAEL P. TOGLIA, University of North Florida, VALERIE F. REYNA, Cornell University, & CHRISTOPH STAHL, University of Freiburg—Is emotion true and false memories influenced by variations in emotion? The recent literature contains inconsistent findings on this question, which is due in significant part to the lack of a standardized methodology for studying it. To make progress on that problem, we developed a pool of 32 DRM-type emotional lists. Arousal and valence vary factorially over the lists: There are equal numbers of high-arousal/positive-valence, high-arousal/negative-valence, low-arousal/positive-valence, and low-arousal/negative-valence lists. The lists have been normed on samples of children (5, 8, and 11 years) in two types of false-memory effects: backward causal-inference and gap-filling errors. We report results from process-level measurements (conjoint recognition) of the effects of variations in arousal and valence.

Visual Working Memory
International Ballroom North, Saturday Afternoon, 3:50–5:30
Chairred by John P. Spencer, University of Iowa

5:50–5:05 (238)
What Does Capacity Measure? Insights from a Dynamic Neural Field Model of Visual Working Memory. JOHN P. SPENCER, University of Iowa and Iowa Center for Developmental and Learning Sciences, VANESSA R. SIMMERING, University of Ottawa, CHRISTOPHER X. ADAMS, & JEFFREY S. JOHNSON, University of Iowa—Change detection tasks typically estimate adults’ visual working memory (VWM) capacity to be three or four simple objects. To explore how capacity limits could arise within a neural system, we used a dynamic neural field model of VWM to capture change detection performance. In this model, objects are represented as “peaks” of activation that are maintained over prolonged intervals. Quantitative simulations show that the model must hold five or six peaks in VWM simultaneously to produce adult-like change detection performance. This suggests that standard methods of calculating capacity underestimate the resolution of the neural system and fail to specify the multiple ways in which errors might arise. We tested our model by generalizing it to a different VWM task—preference learning. The results showed a consistent relationship between adults’ performance and the model’s behavior. This demonstrates that although there are neural constraints on “capacity,” this construct must be grounded in real-time and task-dependent neural dynamics.

4:10–4:25 (239)
Implicit Knowledge of Target Location Biases Encoding Into Visual Working Memory. EDWARD AWH & AKINA UMEMOTO, University of Oregon, MIRANDA SCOLARI, University of California, Irvine, & EDWARD VOGEL, University of Oregon—It is known that the contents of working memory are subject to top-down control. We examined whether implicit knowledge also influences what is encoded into this online workspace. We used a change detection task in which observers were required to remember the colors of simple squares over a brief retention interval. Unbeknownst to the observers, an item in one quadrant of the display (dominant quadrant) was more likely to contain the changed item. The observers were no better than chance at identifying the dominant quadrant, but change detection accuracy was significantly better for items in that quadrant. We further show that this implicit bias influenced only which items were encoded into memory, rather than the clarity or resolution of the items that were stored. We suggest that implicit knowledge of the locations that are likely to contain useful information biases which items are encoded into this highly restricted mental workspace.

4:30–4:45 (240)
Eye Movement Evidence for a Spatial Rehearsal Mechanism Operating on Objects Represented in Visual Working Memory. MELONIE A. WILLIAMS, PIERRE POUGET, LEANNE BOUCHER, & GEOFFREY F. WOODMAN, Vanderbilt University (read by Geoffrey F. Woodman)—Theories of visual working memory propose that object representations are maintained by a spatial mechanism. To test this proposal, we tracked observers’ eye movements during a visual working memory task in which the subjects needed to remember the size and color of one, three, or six objects. We found that during the retention interval, the subjects shifted gaze to the locations at which the objects had appeared in the memory-sample array. In addition, the subjects were more accurate at detecting changes between the sample and test arrays if they had fixated the location of the object during the retention interval. These findings support models of visual working memory in which object representations are maintained by a spatial rehearsal mechanism.

4:50–5:05 (241)
Shifting Focus Between Global, Object-Based, and Part-Based Information in Visual Working Memory. MICHAEL D. PATTERSON & PERPETUA NEO, Nanyang Technological University—We examined visual working memory for global, object-based, and part-based information. Participants viewed novel objects that were divided into colored line segments or filled polygons. After a 3- to 8-sec delay, they judged whether a probe was the whole stimulus, an object, or a part. Previously, we reported that accuracy was highest for global information, followed by object- and then part-based detection (Patterson et al., 2007). Instructions to focus generally on part- or object-based information did not reduce the global-configural memory advantage. The present study demonstrates that instructions to focus on specific parts and objects improve accuracy, even when presented after a 2-sec poststimulus delay. However, there was no effect when a mask was shown immediately before
instructions. Additionally, we demonstrated that the global-configural memory advantage is present only when parts and objects clearly fit together into a whole. Humans have limited flexibility to focus on specific visual information in working memory.

**5:10–5:25** (242)

*Working Memory at Work: How a Focus-Switching Requirement Alters the Nature of Processing.* YANMIN ZHANG, Purdue University, & PAUL VERHAEGHEN, Georgia Institute of Technology (read by Paul Verhaeghen)—In five experiments using an identity-judgment n-back task, we investigated the role of stimulus complexity on focus switching within working memory. We found a qualitative dissociation between the focus of attention and the outer store of working memory: Within the focus of attention, stimulus complexity influenced neither response times nor accuracy; outside the focus, it clearly did. The complexity effect on focus-switching latencies appears to be entirely due to increased retrieval, not encoding, times. Furthermore, the results show that although encoding into working memory is relatively slow and sensitive to complexity when no focus switching is necessary, a focus-switching requirement forces the working memory system into a fast, complexity-insensitive encoding mode. The results thus uncover a fundamental difference in working memory processing when a focus-switching process is engaged.

**Reading**

**Continental Ballroom, Saturday Afternoon, 3:30–5:30**

*Chaired by Sara C. Sereno, University of Glasgow*

**3:30–3:45** (243)

*The Effect of Word-Initial Letter Constraint on Lexical Access During Reading.* CHRISTOPHER J. HAND, PATRICK J. O’DONNELL, & SARA C. SERENO, University of Glasgow (read by Sara C. Sereno)—The present study examined how word-initial letter constraint influences lexical access during reading. Eye movements were monitored as participants read sentences containing target words. Three factors were independently manipulated. First, target words had either high- or low-constraining word-initial letter sequences (e.g., dwarf or clown, respectively). Second, targets were either high or low frequency in occurrence (e.g., crowd or veins, respectively). Third, targets were embedded in either neutral or biasing contexts. This 2 (constraint) × 2 (frequency) × 2 (predictability) design allowed us to examine the conditions under which a word’s initial letter sequence could facilitate processing. Analyses of fixation duration data revealed significant main effects of constraint, frequency, and predictability. Moreover, in measures taken to reflect “early” lexical processing (i.e., first- and single-fixation duration), there was a significant interaction between predictability and constraint. The overall pattern of results suggests that lexical access is facilitated by highly constraining word-initial letters.

**3:50–4:05** (244)

*Computational Modeling of Reading Aloud: New Challenges.* DEREK BENNER, SHANNO, O’MALLEY, & SERJE ROBIDOUX, University of Waterloo—New work undermines the two most successful computational models of reading aloud.

**4:10–4:25** (245)

*Titles Facilitate High-Level Processing But Not Low-Level Word Frequency Effects When Reading Vague Texts.* FRANCES DANIEL, GARY E. RANEY, & JOANNA C. BOVEEL, University of Illinois, Chicago (read by Gary E. Raney)—Providing readers with titles facilitates comprehension of vague texts and decreases reading time (Daniel & Raney, 2006). Daniel and Raney found that removing a title decreased high-level comprehension but not low-level word comprehension. We measured readers’ eye movements as they read vague texts twice, with or without a title, to look for converging evidence that lower level word processing is not influenced by a title. To do this, we compared word frequency effects for texts read with or without titles. If word frequency effects are associated with difficulty of lexical access, and not high-level comprehension, the presence or absence of a title should not affect the size of frequency effects. We found strong frequency effects for first-fixation duration, gaze duration, total time, and number of fixations during first and second readings but no differences as a function of a title. This suggests that titles facilitated high-level, but not low-level, processing.

**4:30–4:45** (246)

*Just One Word at a Time? Word n+2 Preview Effects Revisited.* WAYNE S. MURRAY, LAURA J. WAKEFORD, & MATEI VLADCEA, University of Dundee—Serial attention shift and guidance by attentional gradient models of eye movement control during reading can be distinguished in terms of their predictions related to the seriality of word processing and the presence or not of long-distance “parapveal” effects. Rayner, Brown, and Juhasz (2007) argued in favor of serial models on the basis of finding no preview benefit from a word two words to the right of fixation (word n+2). In a series of three experiments, we replicated their finding in one case but found clear preview effects related to word n+2 in two others, together with evidence for word grouping and delayed effects, all of which appear to be inconsistent with serial models.

**4:50–5:05** (247)

*Foveal Processing and Word Skipping During Reading.* DENIS DRIEGHE, Ghent University—An eyetracking experiment is reported examining the assumption that a word is skipped during reading because parafoveal processing during preceding fixations reached an advanced level in recognizing that word. Word n was presented with reduced contrast, with case alternation, or normally. Reingold and Rayner (2006) reported that, as compared with the normal condition, reduced contrast increased viewing times on word n, but not on word n+1, whereas case alternation increased viewing times on both words. These patterns were reflected in the fixation times in the present experiment, but a dissociation was observed in the skipping of word n+1: Reduced contrast of word n decreased skipping of word n+1, whereas case alternation did not. Besides the amount of parafoveal processing, the decision to skip word n+1 is also influenced by the ease of processing word n: Difficulties in processing word n lead to a more conservative strategy in skipping word n+1.

**5:10–5:25** (248)

*Irrelevant Speech Effects on Sentence Processing During Reading: An Eye Movement Study.* JUKKA HYÖNÄ & MIJA JUNTUNEN, University of Turku—Effects of irrelevant speech on reading were examined by presenting different types of background speech while participants read long, syntactically complex and less complex sentences embedded in long texts. Fixation time measures revealed a reliable syntactic complexity effect across all experiments. In Experiment 1, foreign language background speech did not disrupt sentence processing, whereas meaningful speech produced slight disruption. Experiment 2 demonstrated that disruption in reading as a result of scrambled background speech preserving sentence-like intonation. Semantically unrelated scrambled speech did not disrupt reading more than semantically related scrambled speech. Experiment 3 showed that scrambled speech exacerbated the syntactic complexity effect more than did coherent background speech. Finally, in Experiment 4, effects of syntactically anomalous scrambled background speech were pitted against those of semantically anomalous speech. The pattern of results is accounted for by a sentence-processing module that attempts to parse all available sentence-like input.

**Selective Attention II**

**International Ballroom South, Saturday Afternoon, 3:50–5:30**

*Chaired by David A. Washburn, Georgia State University*

**3:50–4:05** (249)

*Inattention Versus Task-Irrelevant Attention in the Vigilance Decrement: An fTCD Study.* DAVID A. WASHBURN & NATASHA B. SCHULTZ, Georgia State University—The vigilance decrement is a decline in performance as a function of time on task, particularly for long, boring tasks. Undergraduate volunteers completed a 27-min shoot/ don’t shoot task and other cognitive tests designed to reveal individual differences in attention skills across factors of attention. Performance measures (decision accuracy, shot accuracy, shot latency) showed...
vigilance decrements as predicted. We used transcranial Doppler sonography to measure changes in cerebral bloodflow velocity, in an attempt to disambiguate vigilance errors that were due to inattention from those due to shifts of attention to other covert activities (e.g., daydreaming or allocating attention resources and mental effort to a cognitive operation not related to the task). This distinction reflects the operations of the alerting (sustained attention) versus the orienting (attention scanning) networks or factors and may help to elucidate the individual differences that were observed here and are frequently observed in watch-keeping performance.

4:10–4:25 (250)

Avoidable and Unavoidable Forms of Auditory Distraction? Evidence From the Impact of Focal Task Encoding Load. ROBERT W. HUGHES, FRANÇOIS VACHON, JOHN E. MARSH, & DYLAN M. JONES, Cardiff University—The impairment of visual–verbal serial recall by irrelevant auditory sequences (the changing-state irrelevant sound effect) has often been characterized as attentional capture by deviant events (deviation effect). Contrary to this view, the present study showed that increasing the focal task encoding load by perceptually degrading the visual to-be-remembered items abolished the usually disruptive impact of a single deviation in voice within an irrelevant speech sequence (Experiment 1) but had no influence on the changing-state effect (Experiment 2). The results suggest that changing-state and deviant effects are functionally distinct forms of auditory distraction.

The changing-state effect seems to be an unavoidable form of auditory distraction resulting from competition-for-action: Order cues derived from changing sounds compete for sequential action-planning processes involved in serial recall. In contrast, the deviation effect reflects a more general, and resistible, attentional capture process.

4:30–4:45 (251)

Attentional Blinks of Selection, Not Perception. MARY C. POTTER, BRAD WYBLE, & JENNIFER OLEJARCZYK, MIT—Potter, Nieuwenstein, and Strohminger (2008) found that there was an attentional blink for report of two red (or uppercase) words in a sentence, whereas if subjects simply reported the whole sentence, they had no difficulty including the same two words. In a new study, subjects carried out both tasks simultaneously: They reported the RSVP sentence and indicated the two words that were red (Experiment 1) or uppercase (Experiment 2). Report of the sentence was generally accurate, but there was an attentional blink for report of the second target even when it had been included in report of the sentence. In a further study, targets were added to sentences as separate items. The results show that whole and selective report can be carried out in parallel: Attention blinks only for selection.

4:50–5:05 (252)

The Attentional Blink: A New Perspective and Direction. VINCENT DI LOLLO, ALI JANNATI, & THOMAS M. SPALEK, Simon Fraser University—Identification of the second of two targets (T2) is impaired when presented shortly after the first (T1). This attentional blink (AB) has two characteristics: (1) T2 processing is delayed (psychological refractory period, PRP); (2) while delayed, T2 is stored in a maskable buffer. AB theories focus on (1) but don’t explain why no AB occurs unless T2 is masked. I suggest that we have been addressing the wrong issue: Extant AB theories are really theories of PRP. Furthermore, I suggest that the T2 deficit can be used as a tool of convenience to study the characteristics of the labile memory buffer.

5:10–5:25 (253)

Saliency Is Only Briefly Represented: Evidence From Probe Detection Performance. MIEKE DONK & LEROY SOESEMAN, Vrije Universiteit Amsterdam—Salient objects in the visual field tend to capture attention. There is, however, little known about how saliency affects visual selection over time. The aim of the present study was to examine the time course of saliency effects, using a probe detection task. In a series of experiments, it was investigated how the relative saliency of different orientation singletons affected probe reaction time (RT), as a function of stimulus onset asynchrony (SOA) between the presentations of a singleton display and a probe display. The results demonstrate that relative saliency consistently affected probe RT at the shortest SOA. The effect of relative saliency disappeared as SOA increased. These results suggest that saliency is represented in the visual system only briefly after a visual image enters the brain, allowing saliency effects to be only short-lived.

3:30–3:45 (255)

Object Rigidity and Perception in Pigeons. ROBERT G. COOK & YAELE KLEIN, Tufts University—Many objects in the world are rigid, and visual systems can potentially use this information to determine the 3-D shape of objects in motion. Four pigeons were tested with dynamic objects characterized by differences in whether the objects were transformed in a rigid or nonrigid way during their presentation. Using a go/no-go discrimination, the pigeons easily learned to make this categorical discrimination and demonstrated transfer to new exemplars of each type. Subsequent experiments tested various alternative accounts of this discrimination and the factors that influenced it. It is suggested that object rigidity may contribute to how pigeons understand the 3-D structure of their world.

3:50–4:05 (256)

Associative Symmetry, Anti-Symmetry, and a Theory of Pigeons’ Equivalence-Class Formation. PETER J. URCUOLI, Purdue University—Evidence for associative symmetry in nonhuman animals following choice symbolic matching training is scarce at best. Recently, however, symmetry has been reported using successive (go/no-go) matching training. I report a replication of this important result and propose a theory to explain it. The theory assumes that the functional stimuli in successive matching are visual-stimulus–temporal-location compounds and that class formation results from continual exposure to nonreinforced sample–comparison combinations throughout training. The theory makes the counterintuitive prediction that after certain types of training, pigeons will respond more in testing to a reversal of the nonreinforced symbolic baseline relations than to a reversal of the reinforced symbolic baseline relations (i.e., they will exhibit “anti-symmetry”). In fact, they do. The theory also specifies the training conditions that should yield other behavioral manifestations of equivalence (e.g., reflexivity).

4:10–4:25 (257)

Processing of Optical Illusions by a Grey Parrot. IRENE M. PEPPERBERG & PATRICK CAVANAGH, Harvard University—Some birds, such as Grey parrots (Psittacus erithacus), share a number of cognitive concepts with humans—for example, category, relative size, same–difference, absence, number (Pepperberg, 1999, 2006)—but few studies have examined whether they literally see the world as do humans. We tested Alex, a Grey parrot who identified the bigger or smaller of two objects by reporting its color or material, using a vocal English label, and who stated “none” if they did not differ in size, with two-dimensional Müller-Lyer figures (Brentano version) in which the central lines were of contrasting colors. His responses to “What color bigger/smaller?” demonstrated that, in general, he saw the standard illusion as do humans. We then tested him on the vertical–horizontal illusion (differently colored line segments), in T and L forms at various rotations. He saw the
illusion in the T but not the L forms, matching some but not all human responses.

4:30–4:45 (258)
Change Detection by Pigeons and Monkeys. ANTHONY A. WRIGHT, University of Texas Medical School, Houston, JEFFREY S. KATZ, Auburn University, & CAITLIN ELMORE, University of Texas Medical School, Houston—Change detection is a popular task with which to study human visual working memory. Pigeons and monkeys are shown to perform a change detection task with geometric shapes that change in color or shape at a variety of retention interval delays.

4:50–5:05 (259)
Monkeys Plan and Remember Future Responses. MICHAEL J. BERAN, EMILY D. KLEIN, & THEODORE A. EVANS, Georgia State University—Rhesus monkeys and capuchin monkeys were presented with a sample in the middle of a computer screen and four comparisons around the perimeter (one of which matched the sample). The monkeys had to determine the correct comparison before they moved a cursor into contact with the sample, because cursor movement led to opaque screens’ appearing over all match choices. Thus, the task required the monkeys to choose a future response before they were actually allowed to make it. After moving the cursor into contact with the sample, the monkeys performed a psychomotor task in which they pursued moving stimuli around the screen. Only after completing this distractor task were they allowed to complete the matching trial. Both species succeeded in this task, demonstrating that they anticipated future responses before they could be made and may even have prospectively remembered those future responses.

5:10–5:25 (260)
Are Visual or Pattern Cues More Predominant in Foraging by Rats? MARK R. COLE, Huron University College, University of Western Ontario, AMY CLIPPERTON, University of Guelph, & MARGAUX PECK & JULIE QUIRT, Huron University College, University of Western Ontario—Rats searched for food atop 4 of 16 towers arranged in a 4 × 4 matrix. During Phase 1 of Experiment 1, the baited towers were also visually distinctive for some rats, but not for others. In Phase 2, complete removal of the distinctive visual cues did not lead to performance worse than that by the rats that never experienced the distinctive visual cues. In Experiment 2, baited towers were both visually distinctive and in a 2 × 2 pattern, and on occasional probe trials, the rats demonstrated preference for an unbaited visually distinctive tower placed outside the 2 × 2 pattern over an unbaited standard tower that completed the 2 × 2 pattern. During Phase 1 of Experiment 3, baited towers were visually distinctive and in a 2 × 2 pattern. During Phase 2, performance was more depleted when visual cues, as opposed to pattern cues, remained present but were made unreliable.

Motor Control
Waldorf Room, Saturday Afternoon, 4:10–5:30
Chair: Gordon M. Redding, Illinois State University

4:10–4:25 (261)
Visual Prism Adaptation in Left-Handed Subjects. GORDON M. REDDING, Illinois State University, & BENJAMIN WALLACE, Cleveland State University—The left hand of left-handed subjects was exposed to leftward or rightward prismatic displacement under exposure conditions that produced visual realignment. The results are compared with similar data from right-handed subjects. For left-handers, change in visual straight ahead transferred to the exposed left hand, but not to the unexposed right hand. In contrast, for right-handers, change in visual straight ahead transfers to the exposed right hand, but not to the unexposed left hand. These results suggest that limb control is lateralized for right-handers, but not for left-handers.

4:30–4:45 (262)
Planning Complex Limb Trajectories for Everyday Tasks. JONATHAN VAUGHAN, Hamilton College, DAVID A. ROSENBAUM, Pennsylvania State University, RUUD G. MEULENBROEK, Radboud University Nijmegen, & JULIA BRANDT, DREW A. LINSLEY, & ANN DICKSON, Hamilton College—Planning complex limb movement trajectories to avoid obstacles is a ubiquitous and apparently effortless component of everyday life. We will report on recent observations and modeling of complex movements, including tasks based on everyday actions, such as picking up glassware (Rosenbaum et al., 2001), reaching between a computer monitor and a coffee cup to pick up an object (McClelland et al., 1986), gesturing, and pointing with tools. The posture-based model (Rosenbaum et al., 1995) proposes that movement planning exploits the cognitive representation of potential postures, from which both direct and object-avoiding movement trajectories may be derived as needed. Modeling of these tasks supports the general applicability of the model and helps define its limitations. Recent neurological and computational studies support both postural representation and interpolation between postures as planning primitives.

4:50–5:05 (263)
Exploring Sources of Hick’s Law Violations for Aimed Hand Movements. VALERIE F. MARINO & CHARLES E. WRIGHT, University of California, Irvine (read by Charles E. Wright)—In 2004, we reported at these meetings (also in Experimental Brain Research, 2007) research showing that the latency to initiate aimed arm movements to one of several possible targets does not increase as the number of possible targets increases. A similar violation of Hick’s law has been observed for saccades (Kveraga et al., Experimental Brain Research, 2002). Here, in two experiments, we show that this result does not depend on the attention-grabbing characteristics of the stimulus that were used in both these experiments to indicate the actual movement target or the fact that the stimulus was also the movement target. A third experiment demonstrates that there is an effect of the number of possible targets when the mapping of stimuli onto responses is not direct.

5:10–5:25 (264)
Effects of Hand Used and Hand Position in the Discrete Sequence Production Task. WILLEM B. VERWEY & ELIAN DE KLEINE, University of Twente—Various studies have suggested that movement sequences are initially learned predominantly in effector-independent spatial coordinates and only after extended practice in effector-dependent coordinates. The present study examined this notion for the discrete sequence production task by manipulating the hand used and the position of the hand relative to the body. During sequence learning in Experiment 1, in which sequences were executed by reacting to key-specific cues, hand position appeared important for execution with the practiced, but not with the unpracticed, hand. In Experiment 2, entire sequences were executed by reacting to one cue. This produced results similar to those in Experiment 1. These experiments support the notion that robustness of sequencing skill is based on several codes, one being a representation that is both effector and position specific.
Neural Correlates of Narrative Comprehension and Memory.

DAWN WEATHERFORD, Taking an Actor's Perspective: Spatial Relational Mapping or Perceptual Motor Simulation?

YARONKM, 265–271 Sunday Morning, 8:00–9:40

Chaired by Alan W. Kersten, Florida Atlantic University

You're Not There, You're Here. GABRIEL A. RADVANSKY, ANDREA K. TAMPLIN, & SABINE A. KRAWIETZ, University of Notre Dame—An important aspect of event cognition is tracking information about the environment while there is movement through space. In this series of experiments, people memorized a map of a building and then traveled through a virtual version of it. At various points during their navigation, people were probed for information about that environment. Previous experiments, using object–object probes (e.g., microscope–scale), showed similar availability of object information in most rooms, except for a decreased availability for objects in a room that had just been passed through but not interacted with. In the present experiments, people were presented with location–object probes (e.g., laboratory–microscope). With these probe types, people showed profound suppression of information about the room they were currently in. This is interpreted as difficulty in processing the name of the currently occupied location. In short, you're not there, you're here.

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Neural Correlates of Narrative Comprehension and Memory. TAL YARKONI, Washington University, NICOLE K. SPEER, Western Inter-state Commission for Higher Education, & JEFFREY M. ZACKS, Washington University (read by Jeffrey M. Zacks) Readers construct situation models—coherent representations of the characters, locations, and activities described in a narrative. Here, we used fMRI to explore the neural mechanisms supporting situation model processing. Participants read blocks of sentences that either were unrelated to one another or formed coherent narratives. Most brain regions whose activity changed while coherent narratives were read showed similar but smaller changes when unrelated sentences were read. This suggests that comprehension depends on mechanisms similar to those for sentence-level comprehension. However, the dorsomedial prefrontal cortex showed some evidence of narrative-specific activation, supporting a unique role in discourse-level integration. Time course analyses suggested that posterior parietal regions selectively supported situation model construction and frontoventral regions supported situation model maintenance. Sentences in coherent narratives were comprehended and remembered better, and the fMRI correlates of sentence-by-sentence memory suggested that this was due to the use of integrative situation models, rather than to lower level differences in sentence-level or word-level encoding.

Crosstalk Between Action Semantics and Action Simulation. ANNE SPRINGER & WOLFGANG PRINZ, Max Planck Institute for Human Cognitive and Brain Sciences—The internal simulation of perceived action enables one to understand and predict ongoing and forthcoming actions. Our aim is to further explore the mechanisms underlying action simulation. In a series of experiments, our participants watched transiently occluded point-light actions in order to predict the action course after occlusion. Prediction performance was compared after the processing of action-related versus action-unrelated words (i.e., through a priming study using conscious or subliminal semantic priming). Second, task performance was measured when word processing and action prediction ran parallel (i.e., an interference study). To further investigate language specificity, action words were replaced with purely perceptual stimuli (i.e., bowls rotating with different velocities). The results showed that action semantics had an impact on the efficiency of vision-based action simulation. They support our notion that the simulation and prediction of actions extend to language-accessible codes. Specifically, these codes may accelerate or decelerate the time course of internal simulation.

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Models of Recognition Memory: A State–Trace Analysis. JOHN C. DUNN, University of Adelaide, & ANDREW HEATHCOTE, University of Newcastle—The present paper addresses the current debate over univariate versus bivariate models of recognition memory. Univariate models propose that a recognition decision is based on evaluation of a single strength-of-evidence dimension, whereas bivariate models propose that the decision is based on the separate combination of two dimensions, often labeled as recollection and familiarity. Both of these models fit existing experimental data well, and a definitive test has not yet been forthcoming. We apply state-trace analysis to this question and evaluate the critical prediction that if the bivariate model is correct, there should be evidence of bidimensionality in the data. We report the results of four experiments that each varied a pair of factors that have been thought to differentially affect recollection and familiarity. The results yield little or no evidence of bidimensionality. We conclude that the univariate model provides a consistent and parsimonious account of recognition memory.
A Bayesian Account of Reconstructive Memory. MARK STEYVERS & PERNILLE HEMMER, University of California, Irvine—It is well established that prior knowledge influences reconstruction from memory, but the specific interactions of memory and knowledge are unclear. Extending work by Huttenlocher et al. (1991, 2000), we propose a hierarchical Bayesian model of reconstructive memory that specifies how and when prior knowledge should be combined with episodic memory in order to maximize recall accuracy. We present empirical evidence for this model from several experiments on reconstructive memory. In one experiment, participants studied handwritten digits produced by a different group of participants. During a test phase, the reconstructed digits resembled a mixture of the original studied digit and the participant’s individual writing style. In another experiment, participants studied pictures of scenes (e.g., kitchen, office) and later recalled objects from the scene. In accordance with the model, we find that the recalled objects are a mixture of prior knowledge and episodic recollections.

Short-Term Memory Scanning Viewed As Categorization. ROBERT M. NOSOFSKY & MARIO FIFIC, Indiana University, Bloomington—According to the exemplar-based random walk (EBRW) model of perceptual classification, people represent categories by storing individual exemplars in memory, and they classify objects by retrieving these stored exemplars. In this research, we show that the same EBRW model also predicts performance in both standard and extended versions of the classic Sternberg short-term memory-scanning paradigm. In the standard paradigm, the stimuli are discrete alphanumeric characters, whereas in the extended paradigm the stimuli are embedded in a continuous multidimensional similarity space. The model predicts both choice probabilities and mean RTs for individual lists that vary in memory set size, serial position of the target item, and similarity structure of the to-be-remembered items. The upshot is that the seemingly disparate phenomena of categorization abstraction and short-term memory scanning may be mediated by the same underlying cognitive representations and processes.

A Global Memory Model of Remembering and Forgetting From Multiple Lists. KENNETH J. MALMBERG & MELISSA LEHMAN, University of South Florida—Forgetting is a hallmark of memory; because forgetting is often unintended, it is frustrating. However, forgetting also can be the result of attempts to control metacognitively the accessibility of information stored in memory. A global model of recognition and free recall is presented that explains both types of forgetting and remembering from multiple-list experiments. The critical assumption of the model is that both intentional and unintentional forgetting is often due to contextual interference. Unintentional forgetting is the natural result of contextual changes between study and test. Intentional forgetting is accomplished by a rapid, metacognitively instigated change in mental context that renders to-be-forgotten information relatively inaccessible and to-be-remembered information more accessible. This occurs for both recognition and free recall. Implications for item-method directed forgetting, exclusion recognition, and source memory are discussed, as well as the relationship between the present model and other models of free recall (e.g., Howard & Kahana, 2002).

The Co-Evolution of Event Memory and Knowledge. ANGELA B. NELSON & RICHARD M. SHIFFRIN, Indiana University, Bloomington (read by Richard M. Shiffrin)—Novel Chinese characters were trained in a visual search task to have differential experience. The frequency differences produced marked effects on episodic and implicit memory transfer tasks. We present a new variant of the REM model that explains these effects through a co-evolution of event memory and knowledge (Mueller & Shiffrin, 2006; Nelson & Shiffrin, 2006). During learning, event traces are stored, and in addition, event traces accumulate to form knowledge. Both types of traces accumulate features both from the item being learned and from the surrounding context of the item (similar to concepts in the TCM model of Howard & Kahana, 2002).

We discuss the effects of context and recency during learning and EEG changes associated with extended training.

Language Comprehension I
Continental Ballroom, Sunday Morning, 8:00–10:00

Chaired by Ken McRae, University of Western Ontario

Dynamic Combination of Concepts During Online Language Comprehension. KAZUNAGA MATSUKI, University of Western Ontario, TRACY CHOW, Columbia University, MARY HARE, Bowling Green State University, JEFFREY L. ELMAN, University of California, San Diego, & KEN MCRAE, University of Western Ontario (read by Ken McRae)—Knowledge of real-world events influences how people understand language. The present study examined whether conceptually based expectations are generated rapidly from event knowledge. Specifically, instruments combined with specific actions to influence expectations for ensuing patients, in contrast to Rayner, Warren, Juhasz, and Liversedge (2004). Instrument–verb–patient triplets were created from norms designed to directly tap event knowledge (Experiment 1). In self-paced reading (Experiment 2), participants read patient nouns, such as paper, more quickly when they were typical of the instrument–action pair (Susan used the scissors vs. the saw to cut). Experiment 3 showed that these results are not due to direct relations between instruments and patients. This research demonstrates that conceptual event-based expectations are computed rapidly and dynamically during online language comprehension. The results are discussed in terms of event spaces and verb sense, suggesting that instruments can alter the sense of a verb and, thus, expectations for ensuing patients.
The Role of Inhibitory Control in Garden-Path Recovery. LOAN C. VIUONG & RANDI C. MARTIN, Rice University (read by Randi C. Martin)—The role of inhibitory control in garden-path recovery was examined in two experiments. In Experiment 1, participants read direct-object/clausal-subject (DO/S) prime sentences that resolved to subject form; they then produced target sentences from fragments. In Experiment 2, participants read DO/S primes before reading target sentences; the targets resolved to DO form. In both experiments, prime–target pairs shared the same critical verbs, which were either equibiased (e.g., hunt) or transitive biased (e.g., leave). For equibiased verbs, fewer transitive completions (Experiment 1) and slower target reading (Experiment 2) were found after garden-path than after non-garden-path primes. For transitive-biased verbs, more transitive completions (Experiment 1) and faster target reading (Experiment 2) were found. The result for the equibiased verbs argues for a contribution of inhibition in garden-path recovery. The result for the transitive-biased verbs suggests that inhibition fails when the ambiguous verb is strongly biased toward the erroneous analysis.

Dynamics of Activation of Semantically Similar Concepts During Spoken Word Recognition. DANIEL MIRMAN & JAMES S. MAGNUSON, University of Connecticut and Haskins Laboratories—Semantic similarity effects provide critical insight into the organization of semantic knowledge and the nature of semantic processing. The present study examined the dynamics of semantic similarity effects, using the visual world eyetracking paradigm. Four objects were shown on a computer monitor, and participants were instructed to click on a named object while their gaze position was recorded. The likelihood of fixing competitor objects was predicted by degree of semantic similarity to the target concept. The peak in fixations on semantically related distractor images occurred before the peak in fixations on target images, suggesting that activation of semantically related concepts peaks before the peak in target concept activation. Simulations revealed that this relative peak timing does not emerge naturally from linear spreading activation models but is consistent with nonlinear attractor dynamical models of semantic processing.

The Syntax of Idiomatic Expressions: Adjective Insertion. PATRIZIA TABOSSI & ENKA TODORCEVSKA, University of Trieste.—The paper explores the constraints underlying adverb insertion in idioms. Four types of familiar idioms were used: literal and decomposable (Experiment 1), literal and nondecomposable (Experiment 2), nonliteral and decomposable (Experiment 3), and nonliteral and nondecomposable (Experiment 4). Each idiom (e.g., break the ice, overcome an initial embarrassment) was presented in context with one of three adjectives. One produced a meaningful phrase with the noun in the string (e.g., white ice), one produced a meaningful phrase with the interpretation (e.g., a clear initial embarrassment), one was compatible with both (e.g., thin ice and thin initial embarrassment). Only the expressions with the last adjective were rated as acceptable by participants. The evidence suggests that adjective insertion is acceptable as far as an adjective appropriately modifies both the noun in the string and the interpretation. If such an adjective is not available, the idiomatic string cannot accept the operation.

Attention Capture International Ballroom South, Sunday Morning, 8:00—9:40

Chaired by Jan Theeuwes, Vrije Universiteit Amsterdam

8:00—8:15 (282)
A Biased Competition Account of Attentional Capture. JAN THEEUWES & CLAYTON HICKEY, Vrije Universiteit Amsterdam.—According to the biased competition account, multiple objects compete for neural representation. The notion is that two stimuli within a receptive field interact in a mutually suppressive way. We examined the mutual suppression among the two salient singletons (a target and a distractor) in the additional singleton paradigm of Theeuwes (1991). On the basis of a reaction time (RT) analysis, we found that singletons with closer spatial proximity showed greater competition for neural representation than did singletons presented at larger separations. With equal visual spatial separation, a distractor presented within the same hemifield as the target caused an RT interference that was almost 100 msec larger than the interference caused by the same distractor presented at the same distance but in a different hemifield. Consistent with biased competition, this finding demonstrates that when target and distractor are presented in different hemifields there may be less, if any, contralateral hemifield suppression.

8:20—8:35 (283)
Perceptual Load Affects Early Modulation of Reflexive Attention. XUN HE, University of Birmingham, SHIHUI HAN, Peking University, Beijing, & GLYN W. HUMPHREYS, University of Birmingham (sponsored by Glyn W. Humphreys)—Noninformative salient events reflexively capture attention, generating benefits in behavioral and electrophysiological responses to stimuli appearing at that location. Although reflexive attentional orienting does not necessitate that voluntary attentional processes are engaged, voluntary processes may be engaged when the task requires target discrimination. This voluntary processing may affect the reflexive modulation of attention. We used a noninformative peripheral cuing paradigm with a discrimination task, in which the task load was manipulated by adjusting the perceptual difference between targets (stimuli that requested a response) and standards (stimuli that did not request a response). We analyzed the amplitude enhancement in the P1 component of the visual evoked response and found amplitude enhancement in the early phase of P1 in different load conditions. However, this amplitude enhancement diminished in the late phase of P1 when the task load was high. The results suggested an early modulation on reflexive attention from the task load.

8:40—8:55 (284)
Attention Capture and the Ability to Ignore Unique Changes in Visual Search. ADRIAN VON MÜHLENEN, University of Warwick—A sudden change in color is typically less salient in capturing attention than is the onset of a new object. However, a closer look at results reported in the literature and a meta-analysis of existing data suggest that color changes capture attention to a lesser degree. Reanalyzing the data of four experiments (N = 46) revealed a strong capture effect for both color changes and onsets, but only in the first half of the experiment. In the second half, the capture effect for color changes (but not for onsets) disappeared. Further data splitting even suggests that color capture occurred only in the first 90 trials. A new account is proposed, based on a learning-to-ignore process, where the automatic capture of attention is “overridden” when the change is not relevant for the current task. In line with this argumentation, I will also challenge current explanations for the exceptional role of onsets in attention capture.

8:00—9:15 (285)
The Involuntary Capture of Attention by Sound: Are Auditory Oddballs Semantically Analyzed? FABRICE B. PARMENIET, University of the Balearic Islands and University of Plymouth—Studies of involuntary attention capture using the oddball task have repeatedly shown that infrequent auditory changes in a series of otherwise repeating sounds (standards) trigger an automatic response to the novel or deviant stimulus. While most past research has focused on the electrophysiological response to novel sounds, the latter have also been shown to impact on behavioral performance by distracting participants away from a visual task. I summarize the results of recent experiments establishing the cognitive locus of this distraction effect and present new empirical work examining the extent to which auditory novel s undergo semantic analysis. A general framework proposing two distinct sources of distraction (attention capture by novelty and cross talk interference) will be proposed to account for past empirical findings.

9:20—9:35 (286)
What Causes IOR and Contingent Capture? WILLIAM PRINZMETAL & RUBY HA, University of California, Berkeley—The involuntary attention effect is the finding of faster RTs to targets in a cued than in an uncued location with a nonpredictive spatial cue. Two findings
associated with involuntary attention are IOR (a reversal of the cuing effect at long cue–target intervals) and contingent capture (larger cuing effect due to cue–target similarity). We propose two mechanisms of involuntary attention: a serial search mechanism and a decision mechanism. The search mechanism predicts that the cuing effect increases with more display locations. The decision mechanism makes the opposite prediction. We manipulated the number of display locations and the presence of distractors. The search mechanism provided the best account when the target was difficult to locate, but the decision mechanism provided the best account when the target was easy to locate. IOR was consistent with the decision mechanism. Contingent capture was consistent with the serial mechanism. Thus, there are multiple mechanisms of involuntary attention.

Methodology
Willford Room, Sunday Morning, 8:00–10:00

Chairied by Eric-Jan Wagenmakers, University of Amsterdam

8:00–8:15 (287)
Bayesian Hypothesis Testing Made Easy, ERIC-JAN WAGENMAKERS, University of Amsterdam—In the field of experimental psychology, the p-value hypothesis test has established a stranglehold on statistical reporting. This is unfortunate, since the p-value provides at best a rough estimate of the evidence that the data provide for the presence of an experimental effect. A more appropriate measure of evidence is conveyed by the Bayesian hypothesis test, which prefers the model with the highest average likelihood. One of the main problems with the Bayesian hypothesis test, however, is that it often requires relatively sophisticated numerical methods for its computation. Here, I promote the use of what is probably the simplest exact solution to the computation of the Bayesian hypothesis test. The solution, known as the Savage–Dickey density ratio, is valid for nested models and under certain plausible restrictions on the parameter priors. Practical examples are used to demonstrate the method’s validity and flexibility.

8:20–8:35 (288)
Bayes Factor Calculations for One- and Two-Sample Designs, JEFFREY N. ROUDER, PAUL L. SPECKMAN, & DONGCHU SUN, University of Missouri, GEOFFREY IVERSON, University of California, Irvine, & RICHARD D. MOREY, University of Groningen—Progress in science often comes from discovering invariances in the relationship between variables. Invariances often correspond to null hypotheses. As is commonly known, it is not possible to accumulate evidence for the null hypothesis in conventional significance testing. We highlight a Bayes factor alternative to the t test that allows researchers to accept either the null or the alternative hypothesis. The Bayes factor is consistent, is based on reasonable assumptions, has a straightforward interpretation, and has better properties than do other methods advocated in the psychological literature.

8:40–8:55 (289)
Single-Interval and Same/Different Discrimination Tasks Yield Consistent Estimates of Perceptual Learning of Visual Motion, ALEXANDER A. PETROV, Ohio State University—Researchers of perceptual learning use single-interval (yes/no) and two-interval (same/different) tasks more or less interchangeably and attribute training-induced improvements in performance to perceptual factors. We compared the two data collection methods in a within-subjects study of visual motion direction discrimination. Twelve observers practiced interleaved blocks of single- and two-interval discrimination of moving-dot stimuli whose direction differed by 5°. The same/different data were analyzed assuming two alternative decision strategies: differencing versus independent observations. The single-interval data yielded d’ estimates comparable to the d’ estimates from the same/different blocks in the group average, although there were large differences for some individual observers. There was no evidence that practice leads to consistent changes in decision strategy. Both tasks improved with practice: d’ increased approximately twofold after 7 days. The learning effect was partially specific to the practiced motion direction: 50% of the d’ gains were lost when the stimuli rotated 90°.

9:00–9:15 (290)
Accuracy in Parameter Estimation for the RMSEA, KEN KELLEY, University of Notre Dame—The root-mean square error of approximation (RMSEA) is one of the most widely reported measures of fit in confirmatory factor analysis and structural equation modeling. When RMSEA is of interest, so too should be the accompanying confidence interval. A wide confidence interval illustrates the uncertainty with which a parameter has been estimated. The accuracy in parameter estimation (AIPE) approach to sample size planning helps to plan an appropriate sample size so that the confidence interval for the parameter of interest will have an expectation that is sufficiently narrow—optionally, with some probabilistic component. The present work developed AIPE for the RMSEA, adding to the AIPE literature dealing with accurately estimated effect sizes. Analytic developments were made, and a Monte Carlo simulation study was conducted that verified the effectiveness of the procedures in realistic situations. The methods discussed and developed have been implemented in the MBBESS R package.

9:20–9:35 (291)
Measuring Phantom Recollection in the Simplified Conjunct Recognition Paradigm, CHRISTOPH STAHL & CHRISTOPH KLAUER, University of Freiburg—False memories are sometimes strong enough to elicit recollective experiences. This phenomenon has been termed phantom recollection (PR). The conjunct recognition (CR) paradigm has been used to empirically separate PR from other memory processes. Recently, a simplification of the CR procedure has been proposed that is herein extended to the measurement of PR by including an additional parameter. Two experiments in the simplified CR paradigm were conducted in which participants studied lists of items that converged on a single semantic associate. PR was obtained for lists from which eight items were presented, but not for lists from which a single item was presented. In addition, new evidence for the validity of the guessing processes in the simplified CR paradigm is reported. These findings support the validity and usefulness of the simplified CR model as a measurement tool for processes of veridical and false memory.

9:40–9:55 (292)
Individual Differences in Language Organization: A Clustering Solution, CHRISTINE CHIARELLO & SUZANNE E. WELCOME, University of California, Riverside, LAURA K. HALDERMAN, University of Pittsburgh, STEPHEN TOWLER, University of Florida, Gainesville, RONALD OTTO, Computerized Diagnostic Imaging Center, Riverside, & CHRISTIANA M. LEONARD, University of Florida, Gainesville—Although left-hemisphere specialization for language is the norm, there is much individual variation in direction and degree of lateralization. Obvious traits (sex, handedness) account for little variance, and there is no consensus that “weak” lateralization is related to reading impairment. Here, we report a bottom-up approach using cluster analysis in a sample of 200 college students. Asymmetry scores from four lateralized lexical tasks and one reading subtest were used, yielding four clusters; 17 individuals were unclassifiable (outliers). We then examined neuroanatomical measures and scores for additional tasks. One cluster consisted of individuals with low verbal abilities and small-to-average task asymmetries. Another group had average verbal abilities and large task asymmetries. Individuals with high verbal abilities split into two clusters: one with small task asymmetries, the other with inconsistent asymmetries across tasks. There are subtypes of brain–behavior relationships that are independent of traits such as sex and handedness.

Using Memory
Waldorf Room, Sunday Morning, 8:00–10:00

Chairied by Richard A. Block, Montana State University

8:00–8:15 (293)
Intentional Memory: Theories and Evidence, RICHARD A. BLOCK, Montana State University—For almost a century, researchers have investigated whether or not intending to remember information affects memory performance. Empirical contradictions and theoretical controversies remain unresolved. Two influential levels-of-processing studies published in the early 1970s led to a decline in research on the effects
of intentional versus incidental memory. The findings of several recent experiments, using stringent conditions, revealed the effects of intent to remember on recognition memory performance. Pictorial stimuli, such as human faces, were presented at brief stimulus durations, with no inter-stimulus interval, to prevent rehearsal. The findings suggest that allocating attentional resources within 500 msec enhances memory.

8:20–8:35 (294) Memory for Actions: When Is Enactment Not Superior to Observation? MELANIE C. STEFFENS, JANETTE C. SCHULT, & RUL von STÜLPNAGEL, Friedrich Schiller University of Jena (sponsored by Klaus Rothenmund)—Verb–object phrases are remembered better if they have been enacted during study than if one has observed another person enact the phrases. This well-established enactment effect has typically been investigated using lists of unrelated actions, and it has been found that enactment provokes excellent item-specific processing at the expense of processing relations between items. Thus, if recall were to depend on this relational processing that is hindered by enactment, observation could lead to a more effective encoding than does enactment. Indeed, a recent study focusing on the recall of sequences of related actions showed no recall advantage of enactment over observing another person perform (Steffens, 2007, Psychol. Res.). We present a series of experiments that directly compared action sequences and unrelated actions with regard to free recall, recognition, and organization after enactment and observation. Findings confirm that the well-established enactment effect for unrelated actions does not generalize to action sequences.

8:40–8:55 (295) Adaptive Memory: Is Memory “Tuned” for Hunting and Gathering? JAMES S. NAIRNE, Purdue University, JOSEFA N. S. PANDEIRADA, University of Aveiro, & KARIE J. GREGORY & JOSHUA E. VANARDALL, Purdue University—Recent studies suggest that our memory systems are tuned to remember information that is processed in terms of its fitness value. When people are asked to rate the relevance of words to a survival scenario, surprise retention levels exceed those obtained by a veritable “who’s who” of known encoding techniques. The present experiments explored scenarios that mimic the division of labor thought to characterize early hunter–gatherer societies. Researchers have suggested that “foraging-related cognitive specializations” might manifest themselves when males and females perform gender-specific tasks; gathering for females and hunting for males. Males and females were asked to rate the relevance of random words to prototypical hunting and gathering scenarios. Surprise retention tests revealed superior memory for the rated words, as compared with words rated under matched non-fitness-relevant control scenarios (gathering food on a scavenger hunt or as part of a hunting contest), but no sex differences were found in memory performance.

9:00–9:15 (296) Reduced Metaconsciousness of Intrusions As an Explanation for Recovered Memory Reports. ELKE GERAERTS, University of St.Andrews, RICHARD J. McNALLY, Harvard University, HARALD MERCKELBACH, Maastricht University, ANNE-LAURA VAN HARMELLEN, Leiden University, LINSEY RAYMAEKERS, Maastricht University, & JONATHAN J. SCHOOLER, University of California, Santa Barbara—People with spontaneously recovered memories of childhood sexual abuse (CSA) are especially susceptible to underestimating their prior re-memorizing of their abuse. In the present study, we examined whether this may be explained by a reduced “metaconsciousness” of their intrusions related to those events. That is, do these individuals fail to notice that memories of abuse do come to mind, thereby producing the illusion that they have repressed the abuse events for many years? We used an adapted thought-suppression paradigm, probing subjects to evaluate whether they had thought about the unwanted thoughts without having noticed. The results showed that there are important differences in how people with recovered memory experiences notice their negative autobiographical thoughts: People with spontaneously recovered memories seem able to ignore the majority of their negative intrusions, realizing that they have them only when explicitly probed. These data provide an explanation for why individuals with spontaneously recovered memories of CSA report they have not thought about their abuse for years.
influenced by the emotional characteristics of a stimulus. Specifically, will faces and fear (i.e., an emotionally arousing stimulus) capture or limit VSTM capacity, as compared with emotionally neutral faces? Displays of fearful or neutral faces were presented for long (4,000-msec) or short (1,000-msec) durations; participants were asked to remember the identity of five faces while performing an articulatory suppression task. At short encoding durations, VSTM was enhanced for emotional faces. However, at longer encoding durations, VSTM was smaller for emotional than for neutral stimuli. In order to control for basic perceptual differences between stimulus types, the participants also completed blocks of trials with the faces inverted. For these stimuli, the cost to VSTM at long durations disappeared. These results indicate that emotion does influence VSTM and that multiple mechanisms likely underlie these effects.

10:40–10:55 (301)
Color Harmony and Spatial Relations Increase the Capacity of Visual Short Term Memory. THOMAS SANOCKI & NOAH SULMAN, University of South Florida—Are systems for object interrelation more important for visual short-term memory (VSTM) than is the principle of a limited number of object slots? We examined this question by measuring VSTM for layout and color with the change detection paradigm. Experiments on the layout of elements indicated that capacity is increased with displays that are more organized and regular, consistent with the interrelilation hypothesis. The highest capacity (17 elements) was obtained with a single highly interrelatable grid pattern; breaking this down into three objects (for the three slots) reduced capacity. Experiments on VSTM for color indicated that moving color squares to adjoin and interrelate produces high capacities (>10 colors). Furthermore, capacity is higher still when the colors harmonize with each other, as compared with less harmonious palettes.

11:00–11:15 (302)
Perception and Memory of Visual Objects in Clutter. YUHONG V. JIANG & MIYOUNG KWON, University of Minnesota, & WON MOK SHIM, MIT—How are representations of visual objects altered by the presence of other visual objects? For Experiment 1, subjects identified the gender of a probe face preceded by briefly presented and masked prime faces whose gender was either congruent or incongruent with the probe. Priming was strongest when the prime involved four identical faces and weakest when it involved four different faces of a given gender. For Experiments 2 and 3, subjects encoded four different objects that were presented in four sequential frames. Short-term (Experiment 2) and long-term memory (Experiment 3) performance was best when each frame contained four duplicates of a single object (e.g., AAAAA–BBBB–CCCC–DDDD), intermediate when each frame contained a single object (e.g., A–B–C–D), and worst when each frame contained four different objects (e.g., ABCD–BCDA–CDAB–DCBA). These results suggest that an object’s representation is degraded when presented with different objects but is enhanced when presented with identical objects.

11:20–11:35 (303)
Episodes in Visual Perception: The Benefit of Clustered Presentation in RSVP. BRAD WYBLE & MARY C. POTTER, MIT, MARK NIEUWENSTEIN, Vrije Universiteit Amsterdam, & HOWARD BOWMAN, University of Kent—Computational modeling (Wyble, Bowman, & Nieuwenstein, in press) has suggested that the attentional blink is a consequence of the visual system’s attempt to partition targets into episodic representations. This model predicts that, contrary to theories of limited resources, subjects are quite capable of encoding multiple targets within a short period if they are temporally clustered, rather than evenly distributed. Testing this prediction, six letter targets were presented within 9 item/sec streams of digit distractors in either clustered (TTTDDDDDDD) or distributed (TDTDDTDTDD) arrangements over the same total time. As was predicted, clustered presentation produced much better overall report. The model suggests that this report superiority comes at the expense of temporal order information, which experimental data also confirm. Data from faster presentation show that the time between successive targets is critical for defining perceptual episodes. At 19 items/sec, targets and distractors could be intermingled without producing a blink.

11:40–11:55 (304)
Effects of Implied Friction in Spatial Perception Depend on Action Plans. J. SCOTT JORDAN, Illinois State University—When participants indicate the vanishing point of a moving stimulus, the perceived vanishing point is located beyond the actual vanishing point in the direction of stimulus motion. If the stimulus appears to move across a surface or between two surfaces (i.e., implied friction), the magnitude of the forward displacement (FD) decreases as implied friction increases. The present experiments examined what would happen to this implied-friction effect if stimulus movements were controlled by the participant versus the computer. In Experiment 1, participants controlled the stimulus movements or observed them as another participant controlled them. As implied friction increased, FD decreased for observers (i.e., the traditional finding), yet increased for controllers. In Experiment 2, participants switched back and forth from being controllers and observers as they controlled the stimulus with another participant. The interaction of Experiment 1 was replicated, indicating that the implied-friction effect reflects dynamic stimulus properties, as well as participant planning dynamics.

Visual Search
International Ballroom North, Sunday Morning, 10:20–12:00
Chaired by Jeremy M. Wolfe
Brigham & Women’s Hospital and Harvard Medical School

10:20–10:35 (305)
Guided Search for Conjunctions of Many Features. JEREMY M. WOLFE, Brigham & Women’s Hospital and Harvard Medical School—Basic features guide visual search for simple conjunctions. Thus, guidance to “red” and “vertical” enables efficient search for “red vertical” targets among items that are red but not vertical and vertical but not red. However, real objects are likely to be specified by much more complex conjunctions. Does simple feature guidance still apply to high-dimensional conjunctions, or are more complex features required (e.g., “face” or “threat”)? We created six-dimensional stimuli (color, form, and orientation of the whole object and of a part). Observers were asked to look for targets like “yellow vertical rectangle with red, oblique oval part.” Distractor sets could share two, three, or four features with the target. Six-dimensional guided search was possible for two shared features. Search efficiency decreased as shared features increased. Perhaps objects are found efficiently by guiding attention to complex but sparsely coded conjunctions in a very high dimensional space.

10:40–10:55 (306)
Visual Awareness of Unbound Features. MATTHEW S. FINKBEINER, Macquarie Centre for Cognitive Science—It has recently been claimed that the “binding problem” does not arise within the reentrant processing framework (Di Lollo, in press). According to this theory, high-level perceptual hypotheses are correlated with patterns of activity at lower levels, and importantly, visual awareness is said to follow confirmation of the hypothesis that yields the highest correlation. Thus, the binding of features (e.g., color, orientation) is inherent to the system—there is no “problem.” Critically, on this account, feature binding precedes consciousness. To test this aspect of the account, we used object substitution (“four-dot”) masking and asked participants to report the color and orientation of vertical or horizontal rectangles. Although we found masking effects on both color and orientation judgments, the participants were dramatically better at reporting color than orientation. These findings suggest that visual awareness of unbound features is possible and, thus, challenge a key tenet of the reentrant processing account of object recognition.

11:00–11:15 (307)
Effects of Return Probability in Models of Inhibition of Saccadic Return. SIMON FARRELL, CASIMIR J. H. LUDWIG, LUCY A. ELLIS, & IAIN D. GILCHRIST, University of Bristol, & ROGER H. CARPENTER, University of Cambridge—Human observers take longer to redirect gaze to a location that they previously fixated or covertly attended (inhibition of saccadic return: ISR). Arguments have been made for the adaptive value of this phenomenon in the context of search and foraging. However, the mechanisms through which inhibition operates are
not completely understood. In the framework of evidence accumulation
models, in which activity is integrated over time to a response threshold,
ISR could reflect a reduction in the rate of accumulation for saccades to
return to locations, an increase in the threshold for response, or a combi-
nation of the two. Data and modeling are presented showing that slowing
of saccadic latency for return saccades can be accounted for by a reduc-
tion of accumulation rate. Furthermore, the environmental likelihood of
the target’s appearing at a return location predicts saccadic latencies and
differentially affects accumulation rate and response threshold.

11:20–11:35 (308)
Representing Two Targets in Visual Search: An Eye Movement
Analysis. MICHAEL J. STROUD & KYLE R. CAVE, University of
Massachusetts, Amherst, & TAMARYN MENNEER & NICK DON-
NELLY, University of Southampton (read by Kyle R. Cave)—Search
performance is generally lower with two targets rather than one. What if
two targets are represented as a single range of feature values? Subjects
searched for 2 target colors among 16 colors in a ring in color space.
In the similar condition, the 2 target colors were near one another in
color space, whereas in the dissimilar condition, the target colors were
separated by four steps around the ring. Search for dissimilar targets was
more difficult, as revealed by longer RTs, more misses, and more fix-
ated objects. Some subjects made many fixations to colors between the 2
target colors in color space, suggesting that the targets were represented
by a single color range. Others made fewer fixations to the in-between
colors, suggesting that their search was guided by 2 separate target col-
ors. Search may be guided by either a single range of target values or
two separate targets.

11:40–11:55 (309)
Motivational Benefits of Video Game Playing. STEPHEN R.
MITROFF, Duke University—Prior research (e.g., Green & Bavelier,
2003) has shown that, as compared with non–videogame players
(NVGPs), videogame players (VGPs) possess enhanced visual attention
and perceptual abilities. Benefits are found for a variety of individuals
and can result from training: With minimal videogame exposure, NVGPs
can improve on the same tasks, suggesting a causal effect of videogame
play. However, it remains unclear why and how these effects arise. I
present a series of experiments that explore the cognitive mechanisms
that guide VGPs’ benefits and suggest that VGPs gain, in part, from a
heightened level of motivation and arousal. Beyond changes to atten-
tional and perceptual abilities, videogame playing may boost motivation
and arousal, which in turn can guide more optimized strategy choice and
learning. For example, in visual search, I find that VGPs will introduce
their own “speed-accuracy trade-off”; in difficult situations, they will
slow their rate of responding to raise their accuracy.

Language
Continental Ballroom, Sunday Morning, 10:20–12:00
Chaired by Raymond Bertram, University of Turku

10:20–10:35 (310)
The Role of Sleeping in Processing Hyphenated and Concatenated
Compounds. RAYMOND BERTRAM & JUKKA HYÖNÄ, Univer-
sity of Turku, VICTOR KUPERMAN, Radboud University Nijmegen,
& HARALD BAAYEN, University of Edmonton—Triconstituental
Finnish compounds like Jalkapallo-litttö (“football association”) are
concatenated and hierarchically structured with biconstituental internal
compounds (JALKAPALLO) modifying the compound’s head (LITTTO). This
eye movement study investigated how triconstituental compounds would
be processed in concatenated format and with illegally inserted hyphens
at the major constituent boundary (JALKAPALLO-LITTTO) by two different
subject groups: one group performing a first experiment in the morning
and a second in the evening (the no-sleep group), the other group doing
it the other way around (the sleep group). We found that (1) illegally
inserted hyphens enhanced compound processing, probably due to swift
assignment of the correct hierarchical structure, and (2) repeated expo-
sure to hyphenation across experiments was especially beneficial for
those items that were repeated; however, for the no-sleep group it also
carried over to newly presented compounds in Experiment 2. The results
are discussed in the light of morphological processing models and theo-
ries on sleeping and language acquisition.

10:40–10:55 (311)
Simultaneous Production of ASL and English Implies Serial Access in
Production. KAREN EMMOREY & JENNIFER PETRICH, San Diego
University, & TAMAR GOLLAN, University of California, San
Diego—Bilinguals fluent in American Sign Language (ASL) and Eng-
lish rarely switch languages, but they code-blend frequently—producing
ASL signs and English words at the same time. Using a picture-naming
task, we investigated whether cues code blends would pattern like code
switches in 11 early (Codas), and 11 late proficient ASL–English bilin-
guals. Bearing striking resemblance to language switches, code blends
were costly and asymmetrical (affecting dominant English more than
ASL). Interestingly, the code-blending cost to English was modulated
by word frequency such that the size of the frequency effect for English
within a code blend was roughly equal to the sum of frequency effects
in ASL and English. These data imply that although production of the
two languages is simultaneous within a code blend, lexical retrieval itself
is serial. Thus, even when it is physically possible to simultaneously
produce two lexical items, lexical retrieval is a bottleneck process that
cannot be performed in parallel.

11:00–11:15 (312)
The Different Roles of Morphemes in Chinese Word Production
and Recognition. JENN-YEU CHEN & TRAIN-MIN CHEN, National
Cheng Kang University—Previous studies have shown that morphemes
seem to play a role in Chinese word recognition (e.g., Zhou et al., 1999),
but not in Chinese word production (Chen & Chen, 2006, 2007). To
extend our earlier observations of no morpheme effect with the form
preparation task, we employed a picture-naming task with word primes
and contrasted it with a primed lexical decision task, using the same
materials in both tasks. In the picture-naming task, the participants’ re-
sponses were facilitated by a word prime that shared the initial character
with the picture name, but there was no additional facilitation when the
shared characters were also the same morpheme. In the lexical decision
task, the participants’ responses were facilitated by a morphologically
related prime, but not by a character-related prime. We attempt a model
to explain why the morpheme’s role should be different for production
and recognition in Chinese.

11:20–11:35 (313)
Relearning a Forgotten Language. JEFFREY S. BOWERS & SVEN L.
MATTYS, University of Bristol—in this study, English speakers were
trained to distinguish pairs of Zulu phonemes and pairs of Hindi pho-

nemes in an AX task over the course of 30 or more sessions. Some par-
ticipants had no previous exposure to these languages, whereas others
had been exposed to one of them while living in South Africa or India for
a number of years as a child. However, the individuals with early expo-
sure to Zulu or Hindi had not had subsequent exposure to Hindi or Zulu,
and they had no current knowledge of those languages. We found that
some participants with this early exposure showed strong advantages
in relearning the contrasts, as compared with the no-exposure control
group. This result highlights the enduring impact of early exposure to a
language (even if not subsequently practiced) and, hence, the benefits of
such early exposure for learning a second language later in life.

11:40–11:55 (314)
German TV Interviewees’ Usage of Modal and Conversational Ja.
DANIEL C. O’CONNELL, Georgetown University, & SABINE
KOWAL, Technical University of Berlin—Linguistic characteristics of
German ja (N = 676) were investigated in 10 TV interviewees (5 women,
5 men) in Günter Gauss’s Zur Person series. Ja was categorized accord-
ing to grammatical criteria as a modal or conversation particle (Nübling,
2005). Durations (in seconds) of ja and of pauses preceding and follow-
ing ja were measured by means of PRAAT (www.praat.org) software.
A cutoff point of 0.10 sec was used for pauses; none for ja. Speakers
distinguished the two grammatical types of ja according to the follow-
ing prosodic patterns: For every interviewee, mean duration of modal ja
was significantly shorter than that of conversational *ja*; most cases of modal *ja* (~99%) were integrated into the speech stream without any pauses, whereas only a third of conversational *ja* was thus integrated. Hence, the speakers’ usage was in keeping with Nübling’s linguistic model of form and function in German particles.

**Language Comprehension II**
International Ballroom South, Sunday Morning, 10:00–12:00

**10:00–10:15 (315)**

**Electrophysiological Correlates of Syntactic Collocations: The Case of Complex Prepositions.** CRISTINA CACCIARI, University of Modena, NICOLA MOLINARO, University of La Laguna, FRANCESCO VESPIGNANI, University of Trento, Rovereto, & PAOLO CANAL, University of Modena—It is well known that cloze-probability levels are inversely correlated with N400 amplitude, indicating an easier integration for expected words in semantic–pragmatic contexts. In this study, we exploited the presupposed standard order of a type of syntactic multi-word collocation—that is, complex prepositions such as with respect to. We measured the ERPs time-locked to the last preposition in sentences in which the complex prepositions were presented in their standard form or with the last preposition changed (Experiment 1). The expected preposition elicited an N280, followed by an N400–700, two ERP components previously associated with the processing of closed-class words. The unexpected preposition elicited an N280 and an extremely reduced N400–700. Also, the self-paced reading times (Experiment 2) showed a perturbation of the processing system in the critical region. We discuss these results with respect to the specificity of the contextual constraints associated with the collocational nature of complex prepositions.

**10:20–10:35 (316)**

**Incidental Visual Experience Affects Language Processing: An ERP Study.** ROLF A. ZWAAN, LEONORA C. COPEN, & LISELOTTE GOOTJES, Erasmus University Rotterdam—In the first part of the experiment, subjects verified word–picture pairs. For critical pairs, a word was paired with one of two visual shapes (e.g., a picture of an opened book vs. a picture of a closed book), presented for 200 msec. Each subject saw only one word–shape combination. The subjects then participated in an unrelated experiment. Next, they read brief narratives while event-related potentials were recorded. Each of the critical narratives contained a word that had previously been paired with a shape, but one of the shapes always was contextually more appropriate than the other (e.g., a closed book vs. an opened book in a book bag). Although incidental to the reading task, contextual fit of the shape modulated the amplitude of the N400 component approximately 400 msec after onset of the critical word. These results suggest that incidentally acquired visual experiences have an immediate impact on language processing.

**10:40–10:55 (317)**

**Mechanisms of Coreference.** PETE C. GORDON, University of North Carolina, Chapel Hill, & NATALIE KACINIK & TAMARA Y. SWAAB, University of California, Davis—Coreferential processing was studied using event-related potentials (ERPs) to test whether distinct binding principles operate in language comprehension and whether they should be characterized by the types of expressions to which they apply. Sentences were manipulated to contain reflexives or repeated names where reflexives should occur. Significant P600s (without associated N400s) were found for ungrammatical reflexives and for ungrammatical repeated names. A separate manipulation of semantic anomaly comparison produced a strong N400 and no P600. The similar ERP patterns for reflexive violations and repeated-name violations provide no evidence that distinct binding principles apply to distinct types of expressions. The finding here that repeated-name coreference with a prominent antecedent causes a P600 when the two expressions are in the same clause contrasts with previous findings showing that it causes an N400 when the two expressions are in different clauses. It suggests that different principles apply to coreferential processing within clauses and between clauses.

**11:00–11:15 (318)**

**Phonological Cues and Morphosyntactic Processing: ERP Evidence From French.** CHERYL A. FRENCK-MESTRE, & HAYDEE CARRASCO, LPL, CNRS, and Aix-Marseille University—Recent ERP studies in language comprehension have shown that native and nonnative readers alike can benefit from the presence of phonological cues during grammatical processing (Frenck-Mestre et al., 2008; Osterhout et al., 2006). Herein, electrophysiological responses were recorded while French native speakers and adult L2 learners of French read sentences that varied according to the presence versus absence of phonological cues to morphosyntactic agreement. In the first study, subject–verb agreement was manipulated. In the second, gender agreement between the noun and the adjective was manipulated. In both studies, agreement errors elicited a P600 response in all readers. Moreover, the presence of phonological cues to morphosyntactic errors enhanced the P600 effect. These results clearly show that natives and nonnatives alike benefit from the phonological realization of morphemes when processing grammatical agreement and provide further evidence of the role of phonology in processing written language (Gonnerman et al., 2007; Harm & Seidenberg, 2005).

**11:20–11:35 (319)**

**Comprehending Anaphoric and Cataphoric Pronouns in Chinese.** SHELIA M. KENNISON, Oklahoma State University, & BING SUN, South China Normal University—In a series of self-paced reading experiments and offline questionnaire studies, we investigated how native speakers of Chinese resolved pronouns that either followed (anaphoric) or preceded (cataphoric) a proper name or noun description (e.g., the teacher). All sentences contained two clauses. Each clause contained either a pronominal form (i.e., masculine pronoun, feminine pronoun, or a zero pronoun) or a proper name or noun description. For conditions involving overt pronouns, the name or noun description’s gender was either congruent or incongruent with the pronoun’s gender. With the exception of the zero pronoun conditions, the studies tested conditions similar to those in studies of pronoun comprehension in English. The present results indicated that in Chinese, as in English, the processing of cataphoric pronouns differed from the processing of anaphoric pronouns; however, overall, there were multiple differences in the patterns of processing observed for Chinese versus English.

**11:40–11:55 (320)**

**Rasch Models of Aphaolic Syntactic Comprehension.** DAVID CAPLAN, Massachusetts General Hospital, GAYLE DeDE, University of Arizona, GLORIA S. WATERS, Sargent College, Boston University, JENNIFER MICHAUD, Massachusetts General Hospital, & ROEE GUTMAN & JUN LIU, Harvard University—Responses of 42 patients with aphasia secondary to left-hemisphere strokes to 11 sentence types in enactment and sentence–picture matching tasks were modeled using Rasch models that varied in the inclusion of the factors of task, sentence type grouping, and patient clustering. The best-fitting models required the factors of task and patient group but not sentence type grouping. The simulation suggests that aphasic syntactic comprehension is best accounted for by models that include different estimates of resource availability for different tasks and different resource availability in different groups of patients, but not deficits in affecting specific syntactic structures.

**Associative Learning**
Williford Room, Sunday Morning, 10:20–12:00

**10:20–10:35 (321)**

**Sequential Effects in Identification Learning.** MATT JONES & HADDAR HOMAEI, University of Colorado, Boulder—It has long been known that responses in an absolute identification task are biased toward the stimulus on the previous trial. Some theories ascribe this to assimilation in stimulus representation, and others assume that the effect is due to the previous feedback as part of a relative judgment (anchor-and-adjust) strategy. We propose a new model, derived from our previous work in...
categorization, that explains sequential effects in identification in terms of reinforcement learning (RL) and stimulus generalization. Two experiments compared these models by deconfounding the previous stimulus and feedback, using stochastic feedback and irregular stimulus–response mappings. Both showed that the assimilation effect is due to the previous feedback, whereas the previous stimulus actually exerts a contrastive effect. Analyses of stimulus similarity and trial lag reveal much detail about the mechanisms underlying these sequential effects and, in particular, support the RL model.

10:40–10:55 (322)

On the Relative Difficulty of Complex Discriminations. JESSE W. WHITLOW, JR., Rutgers University—Camden—Theories of simple associative learning are either element based or configuration based. A key issue that has emerged in distinguishing between these two approaches is the relative difficulty of patterning discriminations, in which separately presented stimulus elements have a different valence than does a stimulus compound made up of those elements, and biconditional discriminations, in which the valence of a compound stimulus depends on which specific combination of elements it is composed of. This paper reports studies showing that, in contrast to recent reports, positive patterning (A0, B0, AB+) is easier than negative patterning (A+, B+, AB0) and biconditional discriminations are just as easy as positive patterning. These results are more consistent with element-based than with configuration-based approaches.

11:00–11:15 (323)

The Error of Total Error Reduction. RALPH R. MILLER & JAMES E. WITNAUER, Binghamton University—For 35 years, most models of learning have subscribed to the assumption that learning is driven by the magnitude of total error (i.e., the difference between the outcome expected on the basis of all the cues immediately present and the actual outcome). This perspective has been widely embraced by both neuroscientists and connectionist theorists. We will argue that this assumption is not well supported by existing data. An alternative mechanism of learning is local error reduction, which applies independently to each cue present, in conjunction with appropriate rules for retrieval that permit interactions between related associations at the time of testing. Local error reduction models appear to account better for numerous behavioral phenomena. More generally, the case will be made that models of acquired behavior should go beyond acquisition to include retrieval and response generation rules.

11:20–11:35 (324)

Does Guessing With Little Information Interfere With Learning? HAI PASHLER, University of California, San Diego, SHANA K. CARPENTER, Iowa State University, & DOUG ROHRER, University of South Florida—If a person lacking any confidence in his or her ability to produce a particular piece of information is nonetheless required to offer a guess (which almost always turns out to be erroneous), does the guessing impair subsequent learning from feedback that is provided after the guess? The question holds both practical and theoretical interest. In previous studies, we and others were surprised to find no harmful effects of such forced guessing. It seems plausible, however, that the results could be very different with forms of learning that may hinge more critically on the familiarity of possible answers, rather than on the ability to generate candidates. We will present new results on effects of forced guessing from studies involving teaching people to spell spelling-bee-type words, as well as teaching people to pronounce French words.

11:40–11:55 (325)

Sleep Consolidates Generalized But Not Rote Learning of Synthetic Speech. KIMBERLY M. FENN, DANIEL MARGOLISH, & HOWARD C. NUSBAUM, University of Chicago—Although widespread evidence suggests that sleep consolidates memory in nondeclarative learning, consolidation patterns differ dramatically between rote learning (that is restricted to trained stimuli) and generalized learning (that extends to novel stimuli, not presented during training). It remains unresolved whether these disparate findings are due to task differences or basic differences in consolidation. Here, we examined memory consolidation, during sleep, of rote and generalized learning within the same speech-learning task. Sleep consolidated generalized learning but did not reliably affect rote learning. Two groups (rote vs. generalized training) showed immediate performance improvements after training and significant performance degradation after a waking retention interval. After sleep, performance was restored for generalized training only; restoration was not found for rote training. These results support a functional distinction in the consolidation of rote and generalized learning.

10:20–10:35 (326)

Motor Action and Emotional Memory. KATINKA DIJKSTRA, Erasmus University Rotterdam, & DANIEL CASASANTO, Stanford University—Retrieval of autobiographical memories can be facilitated by activation of certain aspects of the original experience—for example, body position or motor movement (Dijkstra, Kaschak, & Zwaan, 2007). The present study examined whether retrieval facilitation occurs when the direction of motor action is congruent with the valence of emotional memories. Consistent with evidence that people mentally represent emotions spatially (Casasanto, in press), participants retrieved memories more quickly and moved marbles between vertically stacked boxes at a higher rate when the direction of movement was congruent with the valence of the memory they retrieved (e.g., upward for positive memories) than when direction and valence were incongruent. Moreover, when valence-neutral prompts were used, participants were more likely to tell positive memories when they moved marbles upward and negative memories when they moved marbles downward during retrieval. The results demonstrate bidirectional influences between the emotional content of autobiographical memories and irrelevant motor actions.

10:40–10:55 (327)

Blind Jealousy: Social Insecurity Increases Emotion-Induced Failures of Visual Perception. STEVEN B. MOST, JEAN-PHILIPPE LAURENCEAU, & ELANA C. GRABER, University of Delaware—Emotional stimuli so capture attention that they can impair visual awareness (an effect known as emotion-induced blindness; Most et al., 2005). In such a task, participants search for a target in a rapid stream of pictures, and performance suffers when an emotional picture precedes the target. Given that neural responses to aversive stimuli can be modulated by perceived social support (Coan et al., 2006), can perceived social support influence susceptibility to emotion-induced blindness? To test this, we recruited male–female romantic couples: the female partner was engaged in an emotion-induced blindness task while the male partner first rated attractiveness of landscapes and then rated attractiveness of single women. In two experiments, strong correlations emerged between the degree to which women reported uneasiness about their partner’s rating other women and their degree of emotion-induced blindness while he did so. Thus, social emotions seem to wield power even at the level of perceptual processing.

11:00–11:15 (328)

Asymmetric Effects of Age on Perception of Neutral and Emotional Stimuli. JULIA SPANIOL & HOLLY J. BOWEN, Ryerson University, SCOTT BLACKWOOD, Rotman Research Institute, HOMAN ALLAMI, Ryerson University, ANDREAS VOSS, Albert-Ludwigs-Universität Freiburg, & CHERYL L. GRADY, Rotman Research Institute—The literature offers some evidence for an age-related positivity effect in memory and attention. Here, we investigated the effects of age and emotional valence in the perceptual domain. Younger (n = 27; mean age, 23 years) and older (n = 26; mean age, 72.5 years) adults performed a perceptual discrimination task (Voss, Rothermund, & Brandstätter, 2008) in which bicolored stimuli had to be classified according to their dominating color. One color was associated with either a positive or a negative emotional outcome (gain or loss of a point), whereas the other was neutral. We used the diffusion model (Ratcliff, 1978) to estimate
the effects of emotional valence on perceptual efficiency and response bias. Perception of neutral stimuli showed age-related decline, whereas perception of emotional stimuli—both positive and negative—was preserved in older adults. Furthermore, both age groups displayed a response bias in favor of the positive color.

11:20–11:35 (329)
Terrorism: Risk, Resource Allocation, Fear, and Social Consequences. Sheldon G. Levy, Wayne State University—The actuarial risk of dying from a terrorist attack is much lower than the risk from other preventable nonmilitary causes. However, resource allocation is inversely related to these risks, although the costs to the U.S. economy alone of preventable nonmilitary death are estimated at over three quarters of a trillion dollars per year. Data of the risk levels in the U.S. and worldwide will be presented. Then the psychological reasons for the high fear of terrorist attack will be examined, and some consequences of high fear levels for the social order will be discussed. Finally, possible experimental tests of hypotheses about the psychological reasons for the disproportionate fear of terrorist attack will be suggested. These will focus on the perceived intent of the attacker and the perceived risk to the social order.

11:40–11:55 (330)
Men’s Memory for Women’s Sexual Interest: Links to Sexual Aggression. Teresa A. Treat, Yale University, & Richard J. Viken, John K. Kruschke, & Richard M. McFall, Indiana University, Bloomington—Numerous theorists posit that heterosexual aggression toward acquaintances results in part from impoverished processing of a woman’s sexual interest or affective cues (e.g., Abbey et al., 1998; McFall, 1990). The present work examines 225 undergraduate men’s attention to and memory for the affect (sexual interest or rejection) displayed by 58 undergraduate women whose normative attractiveness and provocativeness of clothing varied. Participants completed similarity ratings and recognition memory tasks with photo stimuli, a control memory task with line drawings of neutral objects, and numerous questionnaires relevant to the risk of exhibiting sexually aggressive behavior. Multilevel regression techniques revealed that (1) men’s memory for women’s affect improved when the women were sexually interested, attractive, and dressed provocatively at study; (2) men who displayed relatively greater attention to women’s affect than to clothing style showed better memory for women’s affect; and (3) at-risk men showed worse memory for women’s affect, above and beyond worse memory in general.
**POSTER SESSION I**
Northwest Hall, Lower Level, Thursday Evening, 6:00–7:30

- **Eye Movements**

**(1001)**

**Binocular Coordination During Scanning of Simple Dot Stimuli.** JULIE A. KIRBY, HAZEL I. BLYTH, VALERIE BENSON, & SIMON P. LIVERSEDGE, University of Southampton (sponsored by Valerie Benson)—Perhaps the most striking conclusion from recent research into binocular coordination during reading is that points of fixation are quite often disparate. The present experiment was designed to make demands on the oculomotor control system similar to those of reading (sequential saccades and fixations), in the absence of cognitive processes associated with language comprehension. Normal readers' binocular eye movements were recorded as they scanned horizontal arrays of dot targets. The dots were either presented one at a time (target onsets) or all together (permanent target), and further, targets were presented singly or as groups of dots. The results were very similar to those obtained in reading. It was found that the magnitude and frequency of fixation disparity were modulated by the amplitude of the preceding saccade. However, disparity was uninfluenced by target onset and dot group size. We are currently analyzing data to assess the extent to which similar effects occur for dyslexic readers.

**(1002)**

**Reflexive or Not? Examining Attentional Orienting and the Gap Effect.** KAITLIN LAIDLAW & SARA STEVENS, University of Toronto, JIM McAULIFFE, Nipissing University, & JAY PRATT, University of Toronto (sponsored by Jim McAuliffe)—We investigated whether certain nonpredictive cues generate reflexive shifts of attention through superior colliculus (SC) involvement by testing whether cueing effects interact with a known SC-reliant process, the gap effect. By offsetting a fixation point simultaneously with target onset, the SC becomes disinhibited, causing the gap effect: a decrease in saccadic reaction times. This effect is known to interact with inhibition of return to peripherally cued locations; using a short stimulus onset asynchrony, we also found a significant interaction with cue validity. We repeated the study using central gaze and arrow cues, since both are believed to elicit reflexive orienting. Although gaze cues also produced a significant interaction with the gap effect, arrow cues did not. These results suggest that, like classic exogenous cues, the orienting of attention from biologically relevant gaze involves the SC, whereas learned symbolic cues do not rely on subcortical processes.

**(1003)**

**Memory for Objects in Scenes: Acquisition and Recall.** DAVID CORCK-ADELMAN & SHUI-I SHIH, University of Southampton, ALEXANDER POLLATSEK, University of Massachusetts, Amherst, & SIMON P. LIVERSEDGE, University of Southampton (sponsored by Sarah J. White)—We report data from a novel paradigm in which we investigate memory for objects in scenes. Participants’ eye movements were recorded as they inspected for 5- or 10 sec (with instructions to remember) a photograph of a room containing 12 objects. Participants then entered the room in the photograph either immediately or after a 24-hour delay. They were presented with 24 objects (the original 12, then entered the room in the photograph either immediately or after a 24-hour delay). Recall performance showed a relationship between replacement accuracy (object choice and distance from correct location) and order of placement. Additionally, placement accuracy was related to fixation behavior during acquisition. We conclude that scene perception and the nature and quality of the memory representation for objects in scenes are fundamentally related.

**(1004)**

**The Influence of Stimulus Familiarity on Visual Search Efficiency.** ROB E. WALKER & EYAL M. REINGOLD, University of Toronto, Mississauga (sponsored by Eyal M. Reingold)—Visual search efficiency is improved when the search target is embedded among familiar rather than unfamiliar distractors. The distractor-grouping hypothesis suggests that, as compared with unfamiliar-distractor stimulus displays, stimulus displays with familiar distractors permit larger groups or chunks of distractors to be identified and rejected during a single fixation. To test this hypothesis, we recorded participants’ eye movements during a visual search task with familiar and unfamiliar targets and distractors. We reasoned that if several familiar distractors are processed in parallel during a fixation, then fixations might be placed between rather than on individual distractors, resulting in an increase in the average distance of fixations from the nearest distractor. The results of the present study were consistent with this prediction providing strong support for the distractor-grouping hypothesis.

**(1005)**

**Atypical Saccadic Sampling in Autistic Spectrum Disorder.** VALERIE BENSON & JENNA PIPER, University of Southampton, & SUE FLETCHER-WATSON, University of Newcastle—Saccadic orienting was examined for typically developing (TD) and autistic spectrum disorder (ASD) participants during inspection of the “Repin” picture (Yarbus, 1967), under two different viewing instructions. Proportions of fixations and inspection time, on people and on objects in the scene, differed between the two instructions for TD but not ASD participants. Thus, saccadic orienting was influenced by top-down instructions in the TD group exclusively. Underdeveloped fronto-parietal feedback systems in ASD offer one explanation for defective saccadic sampling strategies, since these systems are involved in the distribution of attention and the planning and initiation of eye movements. It is suggested that defective feedback systems in ASD could lead to cognitive impairments.

- **Audition**

**(1006)**

**Tonal Intensity and the Auditory Kappa Effect.** DOUG W. ALARDO-TOMALIN & TODD A. MONDON, University of Manitoba—The kappa effect is a perceptual illusion in which changes in spatial position may influence time perception. In auditory research, the kappa effect has been demonstrated by systematically manipulating the pitch difference between successive tones. Studies have shown that a small difference in pitch leads to the underestimation of the time between tones (Shigeno, 1986). In the present study, the possibility that a version of the kappa effect may arise from intensity changes was investigated. Listeners were presented with three-tone sequences in which the temporal position and intensity of the middle tone was varied relative to the first and third tones. Participants judged whether the middle tone was closer in time to the first or to the third tone. The results showed that perception of temporal intervals was influenced by the relative changes in intensity across the three-tone sequence. This provides strong evidence of an auditory kappa effect based on intensity change.

**(1007)**

**The Auditory Expanding Image Effect: Free Field.** LISA M. PRITCHETT & ALAN D. MUSICANT, Middle Tennessee State University—Previous research has demonstrated that systematic power functions on the head are obtained when participants estimate the size of adjectives when the listeners were observed. We extended these findings to free-field conditions. The general findings for the free-field conditions—that is, that sound images grew through time and lower-frequency tones began larger and expanded more than higher-frequency sounds—were similar to the previous findings using headphones. However, specific patterns for the effect of frequency were noted. Interaction effects, including a statistically significant three-way interaction, location × frequency × duration, indicated that the growth rate of different sounds was affected by location, with sounds presented at +90° (left) and +90° (right) being judged larger than those from 0° (front) or 180° (back). These results parallel sound localization results that show greater accuracy for front–rear-originating sounds versus side-originating sounds.

**(1008)**

**Increased Acuity After Progressive Training: Due to Progression or Variability?** BARBARA A. CHURCH, EDUARDO MERCADO III,
& MATTHEW G. WISNIEWSKI, University at Buffalo—Progressive training, or starting with an easier version of a discrimination task, may help to gradually build up more difficult distinctions, usually produces faster learning and better outcomes than continuous training with a hard discrimination (see, e.g., Liu et al., 2008; Suret & McLaren, 2003). However, research examining this effect has often confounded the progressive nature of training with the variability of training. Variable training can also improve learning outcomes (see, e.g., Barcroft & Sommers, 2005). To better understand the mechanisms underlying improvements in performance, we compared progressive, antiprogressive (but equally variable), and consistently hard training on a birdsong-discrimination task across two training sessions. We also varied the amount of delay (no delay vs. 1 day) between sessions. The best performance was consistently found with longer delays between sessions and progressive training. The anti-progressive (variable) training produced significantly poorer performance. The results are discussed in terms of perceptual learning and the possible role of cortical retuning.

(1009)
The Double-Edged Sword of Repetition: Examining How the Repetition of an Auditory Context Reduces the Impairment Found for Repeated Targets. LORI A. DOAN, TAMARA L. ANSONS, JASON P. LEBOE, & TODD A. MONDOR, University of Manitoba—In vision, implicit memory of spatial context can guide attention and facilitate search for a target, an effect referred to as contextual cuing (Chun & Jiang, 1998). Doan, Leboe, and Mondor (2006) observed superior detection of target sounds embedded within a familiar sequence of distractor sounds. In contrast to this improved performance with a repeated context, the repetition of a target leads to impairments. For visual stimuli, target detection is impaired when the specific identity of a target repeats text, the repetition of a target leads to impairments. For visual stimuli, the repetition of a target leads to impairments. Ansons, Leboe, and Mondor (2006) demonstrated a target detection is impaired when the specific identity of a target repeats text, the repetition of a target leads to impairments. For visual stimuli, the repetition of a target leads to impairments. The results are discussed in terms of perceptual learning and the possible role of cortical retuning.

(1010)
The Time Course of ERP Differences Between Musicians and Non-musicians in Major–Minor Classification of Melodies. ANDREA R. HALPERN, Bucknell University, & MICHAEL J. WENGER & JUSTIN EROH, Pennsylvania State University—Musicians can classify major and minor tunes quite well, but nonmusicians do can so only when applying affective labels. In a previous study, only musicians showed a late positive component (LPC) to the first note that allowed identification of a tune as minor, or sad (but not major). The present study extended this finding by using high-density EEG to examine reactions to a second occurrence of a critical note. We hypothesized that nonmusicians might show an LPC if they had another chance to do so, but we replicated the previous findings: Everyone showed an early-onset response to both the first and second critical notes, but only musicians showed an LPC, and only to minor melodies and not to the first critical note. Musicians apparently make a “minor” decision the first time they can do so; nonmusicians seem to make a global judgment that is not time-locked to the note sequence.

• Time Perception •

(1011)
Visually Evoked Distortion in Time Perception. LEON GMEINDL, MICHAEL ESTERMAN, & SUSAN M. COURTNEY, Johns Hopkins University—Much of the laboratory evidence for distortion in the perception of interval duration comes from task paradigms in which subjects are required either to compare the durations of sequentially presented stimuli or to reproduce demarcated intervals. Some studies using these paradigms have found that increasing the rate of change of various stimulus features (e.g., luminance, motion) leads subjects to overestimate interval durations, suggesting that time is subjectively dilated during the presentation of rapidly changing stimuli. However, an alternative hypothesis is that time is not subjectively distorted during stimulus presentation; instead, replaying stimuli from memory might simply take longer for more rapidly changing stimuli. Counter to this hypothesis, two experiments reported here provide evidence for online, visually evoked distortion in time perception. Furthermore, the results from a third experiment rule out another alternative hypothesis, that an apparent time dilation is due to either earlier stimulus-onset detection or delayed stimulus-offset detection for rapidly changing stimuli.

(1012)
Does Time Fly When You’re Having Fun? JULIE ANNE SEGUIN & GINA M. GRIMSHAW, Victoria University of Wellington—A temporal bisection task was used to examine the independent effects of arousal and valence on time perception. Thirty-two participants were assigned to one of four emotion categories that varied in arousal (high or low) and valence (pleasant or unpleasant). Participants were shown a random mix of emotional and neutral images, displayed for 2,000 to 6,000 msec, and decided whether the duration was closest to the short or long anchor duration. The point of subjective equality (PSE) was influenced by arousal such that highly arousing images were judged to be significantly shorter than neutral images [F(1,28) = 5.883, p = .02]. However, this effect interacted marginally with valence [F(1,28) = 3.335, p = .079]. Follow-up analyses indicated that arousal level influenced time estimation of negative but not of positive images. These findings suggest that emotion arousal does not uniformly influence the speed of the mental clock.

(1013)
Perceptual Learning in Auditory Temporal Discrimination: Cross-Modal Transfer to the Visual Modality? ROLF ULRICH & EINAT LAPID, University of Tübingen, & THOMAS RAMMSSAYER, University of Bern—Perceptual learning was used to study potential transfer effects in a duration discrimination task. Subjects were trained to discriminate between two empty temporal intervals marked with auditory beeps, using a two-alternative forced choice. The major goal was to examine whether perceptual learning would generalize to empty intervals with the same duration but marked by visual flashes. The experiment also included longer intervals marked with auditory beeps and filled auditory intervals of the same duration as the trained interval. In contrast to previous findings, which showed a transfer from the haptic to the auditory modality, the present results do not indicate a transfer from the auditory to the visual modality, although they do show transfers within the auditory modality.

(1014)
Transferring the Learning of Temporal Information From the Auditory to the Visual Sensory Modality. SIMON GRONDIN, Université Laval—It is known that the processing of temporal information is much more efficient in the auditory than in the visual modality. This study analyzes the possibility of improving the discrimination of short temporal intervals marked by two brief visual signals. In the present experiment, an associative learning context was used, involving the simultaneous presentation of both auditory and visual signals. The results show that visual duration discrimination gains a slight but statistically significant benefit from auditory duration discrimination, but that this benefit is not permanent and depends on the initial level of discrimination.

(1015)
Tick. Tock. Describing the Clock: Mechanisms of Temporal Reproduction and Discrimination Across Milliseconds and Seconds. ASHLEY S. BANGERT, PATRICIA A. REUTER-LORENZ, & RACHAEL D. SEIDLER, University of Michigan—Timing figures critically in numerous activities, from hitting a ball to sequencing events. Contention exists, however, about whether a single scalar timer operates across millisecond and suprasecond time scales and across motor and cognitive tasks (Grondin, 2001; Ivory & Hazeltine, 1995; Lewis & Miall, 2003). In the present study, 19 participants performed temporal reproduction and discrimination tasks of eight durations, ranging from 270 msec to just under 2 sec in length. The results challenge the notion that temporal reproduction relies on a single scalar timer for both short and long durations. Although the findings are less clear for the discrimination of short than for long temporal intervals, individuals appear to engage different timing mechanisms across tasks, especially for shorter durations.
Hard As a Rock? Using Progressive Alignment to Facilitate Perceptual Learning in Geoscience. BENJAMIN D. JEE, DAVID H. UTTAL, & DEDRE GENTNER, Northwestern University, CATHY MANDE- UCA, Carleton College, THOMAS F. SHIPLEY, Temple University, & BRADLEY SAGEMANN, Northwestern University (sponsored by Dedre Gentner)—People often learn new concepts through comparison of examples. This learning may be facilitated by progressive alignment—comparing similar pairs before more dissimilar pairs (Gentner, Loewenstein, & Hung, 2007). Highly similar items are easier to align structurally, thus highlighting their common relational structure and any alignable differences (i.e., readily comparable but differing features; Gentner & Markman, 1994). In this study, we applied the principle of progressive alignment to geoscience instruction, which involves teaching students to identify geological structures, such as faults (rock fractures showing evidence of sliding). Participants were presented with pairs of geological photos and had to indicate which photo in each pair displayed a fault. We contrasted a progressive alignment condition, in which perceptually similar pairs preceded dissimilar pairs, and a dissimilar-first condition, which reversed this ordering. The results largely supported the effectiveness of the progressive alignment sequence of instruction. We discuss these results with respect to real-world learning.

Training Mental Rotation: A Comparison of Spatial and Working Memory Training, SHANON L. FITZHUGH, ALEXANDRA B. MORRISON, JASON M. CHEIN, THOMAS F. SHIPLEY, & NORRA S. NEWCOMBE, Temple University—Increases in mental rotation abilities have been found for a variety of types of training, including simple repeated presentation of mental rotation tests. The increase may arise from an improvement in domain-specific skills—that is, in processes for encoding or spatially transforming object representations. Alternatively, training may result in an increase in domain-general skills—that is, in working memory. Here, we report the results of a training study that compared the effects of three types of training: spatial visualization, working memory, and verbal short-term memory. Spatial visualization and working memory training both increased performance on the verbal working memory, and verbal short-term memory. Spatial visualization and working memory training both increased performance on the Mental Rotations Test. The profile of performance changes on other tests (e.g., paper folding, Raven’s Progressive Matrices, Stroop, eye movements) implies that the locus-of-training effect differs for the groups.

Effects of Auditory Feedback on Visual Representational Momentum, SUSAN E. RUPPEL, University of South Carolina Upstate, & TIMOTHY L. HUBBARD, Texas Christian University—Previous studies have claimed that feedback does not influence representational momentum (e.g., Finke & Freyd, 1985; but see Ruppel, Fleming, & Hubbard, in press). However, those studies presented visual targets and visual feedback, so benefits of feedback might have been offset if the appearance of feedback interfered with the target representation or decreased attention to the target (cf. Hayes & Freyd, 2002). Nonvisual feedback should not interfere (as much) with visual target representation, so in the experiments reported here, observers viewed visual targets and probes and received auditory feedback (high tones for correct responses, low tones for incorrect responses). Observers completed two blocks of trials, receiving (1) no feedback on both blocks, (2) feedback on both blocks, or (3) feedback on one block and no feedback on the other. Feedback influenced the amplitude, but not the shape, of the same response distributions. Implications for theories of representational momentum are discussed.

The Influence of Individual Differences in Working Memory Capacity on Spatial Updating Tasks. DANIEL G. SMITH, SARAH H. CREEM-REGEHR, & JASON M. WATSON, University of Utah—In tasks requiring pointing to an object from a novel imagined or physical location, performance differences are typically found, showing that pointing from an imagined location takes longer than pointing from the same physical location (Rieser, 1989). Several accounts of this phenomenon have focused on spatial cognition theory. For example, May (2004) suggested that the increased difficulty observed in the imagined task is due to interference between sensorimotor cues and the intended imagined perspective. We addressed the distinction in spatial updating after real versus imagined rotation in an innovative way by investigating whether participants on the basis of individual differences in working memory capacity (WMC; see Engle, 2002) would influence performance on the two spatial tasks. We suggest that individual differences in WMC tap central aspects of controlled, executive attention and may predict the ability to deal with interfering information in an imagined self-rotation and spatial-updating task.

Tests of Alternative Path Integration Models Using a Triangle Completion Task. ELIZABETH CHRISTAL & WILLIAM H. WARREN, Brown University—In path integration, estimates of the distances traveled and the angles turned must be combined to determine a path back to the home position. The aim of this study is to test competing models of path integration. We independently measured human errors in distance and angle reproduction tasks, and used the results to predict errors in a triangle completion task according to different models, using Monte Carlo simulations. Total error may be due to (1) encoding error in estimating distances and angles traveled, (2) integration error in combining these estimates to determine the homebound path, and (3) execution error in walking the homebound path. We previously found that a model that linearly combined encoding errors (Fujita et al., 1993) could not account for the human data. Here, we incorporate execution error and test alternative models of integration error, including the possible nonlinear combination of errors.

Remaininig Oriented With Abstract or Intermittent Visual Information, ERIC HODGSON, DAVID WALLER, NATHAN GREENAUER, & CATHERINE MELLO, Miami University—In three experiments, we examined what information is necessary for people to remain perceptually engaged with their environment (i.e., not reliant on long-term memory knowledge) while rotating. Participants learned the locations of six objects that surrounded them and then rotated in place for 1 min. During rotation, participants received visual cues whose frequency and content were manipulated. With very abstract visual information, participants remained perceptually engaged only if that information was continually available during rotation. With more detailed visual information, participants were able to remain perceptually engaged with visual cues separated by up to 75° of rotation. Implications for the transition between online and offline spatial processing are discussed.

Rips and Folds in Virtual Space: Reliance on Graph Structure During Navigation. JONATHAN D. ERICSON & WILLIAM H. WARREN, Brown University (sponsored by William H. Warren)—At one extreme, human spatial knowledge might preserve Euclidean properties of metric distance and angle; at the other, it might preserve topological relations such as ordinal, neighborhood, or graph structure. To investigate this question, we introduced two “wormholes” into a virtual hedge maze, which seamlessly transport walking subjects between locations. This creates a non-Euclidean environment that violates ordinal and neighborhood relations but preserves route connectivity. Participants learned the locations of nine objects, then walked from “home” to a reference object (R1 or R2) and took a shortcut to target object A, B, or C. The wormholes altered the ordinal relations among A, B, and C when walking from R1 versus R2, effectively creating rips and folds in space. Despite this, participants walked in the wormhole direction when taking shortcuts, consistent with route connectivity. Human navigation thus appears to be robust to violations of Euclidean, ordinal, and neighborhood relations, relying instead on graph structure.

The Influence of Negative Mood on Memory Performance for Sentences With Affective Content. AUSTIN FITTS, NATALIE STOUPÉ,
that temporary contextual accessibility can bias processing. Moreover, ing led to preferential attention to negative social words. However, in related concepts and found that in socially connected participants, prim-
viduals. If the latter is the case, temporarily increasing the accessibility from chronic accessibility of negative social concepts in lonely indi-
This bias may reflect the fact that such stimuli are judged as more emo-
stimuli. Previously, we found that individual differences in loneliness are associated with preferential attention to negative social information. al so found a positive bias for participants who have never experienced depression. These findings show that some as-
pects of how we process information are mood-state dependent, but that a valence bias exists based on affective experience.

(1024) Emotion Awareness in Bullying, ANDRIA G. SHIMI, University of Oxford, & MARIOS N. AVRAAMIDES, University of Cyprus (spon-
sored by Günther Knoblich)—The present study investigated the extent to which children who engage in bullying behavior in schools are able to reason about their own emotions as well as the emotions of others. More than 350 students between the ages of 8 and 12 were tested using the Olweus bullying questionnaire. Scores from this self-reported question-
naire were used to construct experimental groups that varied on the ex-
tent of bullying behavior. In addition, a variety of measures including the Emotion Awareness Questionnaire, a somatization test, and the strengths and weaknesses test were also administered. Analyses were carried out to assess whether bullies possess skills of understanding emotions inferior or superior to those of normal controls. Correlational analyses based on scores from all measures are also reported.

(1025) Affect–Movement Compatibility Depends on Relative Location, Not Representation of Self in Space. YANMIN ZHANG & ROBERT W. PROCTOR, Purdue University—Markman and Brendl (2005) examined a movement-compatibility effect in which a mapping of positive words to a lever-pull and negative words to a lever-push was faster than the opposite mapping. They obtained this effect for words depicted as farther away in 3-D space than a bar with one’s name on it, but the effect reversed for words depicted as closer. They interpreted this interaction as showing that the compatibility effect depends on a performer’s repre-
sentation of his or her self in space. We replicated Markman and Brendl’s condition and also examined conditions in which no name was on the bar in which a different person’s name was. The interaction obtained by Markman and Brendl was found in all three cases. These results provide evidence that the compatibility effect depends on the stimulus location relative to the location of the bar, and not on people’s representations of their selves in space.

(1026) To Attend or Not to Attend? The Effect of Conceptual Priming and Individual Differences on Attention to Emotional and Social Information. HADAS SHINTEL, Bar Ilan University, & JOHN T. CACIOPPO & HOWARD C. NUSBAUM, University of Chicago—Evidence from the emotional Stroop paradigm suggests that individuals are biased toward negative stimuli, particularly with concern-relevant stimuli. Previously, we found that individual differences in loneliness are associated with preferential attention to negative social information. This bias may reflect the fact that such stimuli are judged as more emo-
tional and threatening by lonely individuals. Alternatively, it may result from chronic accessibility of negative social concepts in lonely indi-
viduals. If the latter is the case, temporarily increasing the accessibility of loneliness-related concepts should result in a similar bias in socially connected individuals. We manipulated the accessibility of loneliness-related concepts and found that in socially connected participants, prim-
ing led to preferential attention to negative social words. However, in lonely participants, priming reversed this pattern. These results suggest that temporary contextual accessibility can bias processing. Moreover, this attentional bias is not entirely stimulus-driven, but may be subject to some degree of cognitive control.

(1027) The Effect of Emotional Context on Facial Perception in Koreans and Americans. SEONGYU KO & MARA MATHIER, University of Southern California, & TAEHO LEE, HYEAYOUNGYOON, & JUNG-
HYE KWON, Korea University—This study tested the hypothesis that the way people perceive emotional facial expressions is influenced by the context, and that the degree to which people are influenced by the context differs depending on culture. Previous research has indicated that people from collectivist Asian cultures are more influenced by the context in their visual processing than are people from individualistic Western cultures. However, most studies examining the ability to de-
tect different types of facial emotion have shown participants emotional faces without any context. Younger and older Korean and American par-
ticipated were shown faces that displayed different levels of intensity of fear and happiness superimposed on neutral, neutral, positive, and no contexts. They were asked to rate the intensity of the facial emotion on a 7-point scale. As predicted, Koreans were more influenced by the emo-
tional contexts than Americans when judging emotional faces, although this effect was stronger for negative than for positive faces.

Selective Attention

(1028) The Relation Between Reading Ability and the Attentional Blink in University Students. GUY L. LACROIX, JESSICA GUNNELL, TARRA ANDERSON, & JO-ANNE LEFREVRE, Carleton University—Previous experiments have produced conflicting results concerning the relation between reading ability and the attentional blink (AB). Lacroix et al. (2005) found that adolescent participants with reading difficul-
ties displayed shallower ABs than normal readers, but Lum et al. (2007) obtained the opposite result. The goal of this study was to reexamine the relation between reading and the AB in an adult population. A group of 95 undergraduate students took part in the study. In addition to a rapid serial visual presentation task, participants completed measures of IQ, working memory, reading ability, phonological processing, rapid naming, and spelling. The preliminary results show that weaker readers produced deeper ABs than stronger readers, even after controlling for working memory. Hence, the results are in line with those of Lum et al. and suggest that weaker readers may require more working memory re-

(1029) Studying a Preconscious Memory Buffer Using the Attentional Blink. ALI JANNATI, THOMAS M. SPALEK, DON READ, & VINCENT DI LOLLO, Simon Fraser University—The attentional blink (AB) is the finding that perception of the second of two sequential targets (T2) is impaired if presented within 500 msec of the first (T1), when T2 must be stored in a preconscious buffer (PCB) while T1 is processed. We studied the characteristics of PCB by asking what form of masking interferes with the stored representation. Three experiments investigated the effects of masking on the basis of contour superimposition, contour proximity, and onset transients. The results pointed to onset transients as the main masking factor. This outcome favors an attentional interruption account, in line with the concepts of phenomenal versus access consciousness.

(1030) Target Uncertainty and Attentional Capture: Singleton Detection Mode or Multiple Top-Down Control Settings? CHARLES L. FOLK & BRIAN A. ANDERSON, Villanova University—During a search for a target of a known color, uninformative color precues will capture at-
tention (i.e., produce cue validity effects) only if they share the target color. However, recent evidence has shown that when the target color varies unpredictably across trials, color precues will capture attention, regardless of whether they match the target color (Folk & Remington, 2008). The latter result has been interpreted as reflecting the adoption of singleton detection mode (SDM), in which participants set themselves
testing the role of perception in the attentional blink. buck & david e. huber, independent stages of visual processing. suggest that the mechanisms underlying spatial cuing and the ab are during the period of the ab but also beyond it. these results strongly free paradigm, and found that effective spatial cuing occurs not only during, but not beyond, the time-span of the ab. we tested whether this by james t. enns)—identification of the second of two targets is im-

was only found in experiment 1. these results demonstrate that an object moved clockwise or counterclockwise about fixation, completing 1 revolution per second. on some trials, the distractor's direction of motion was abruptly reversed, unpredictably, prior to the target frame. we hypothesized that if observers track and suppress distractors to overcome capture, their performance should only be impaired when distractors move on an unpredictable trajectory (i.e., on reversal trials). the results showed reliable decrements in performance on reversal trials but not on the no-reversal trials. these data help clarify the mechanism by which recovery from capture is achieved.

effects of foveal and parafoveal distractors on object naming. debra malpass & antje s. meyer, university of birmingham (sponsored by antje s. meyer)—we compared the effects of fixated versus nonfixated distractors on object naming. on each trial, participants were presented with a green target and a red distractor object with a phonologically related or unrelated name. in experiment 1, target and distractor were presented as overlapping images in the same location. in the remaining experiments, the objects were shown in different loca-
tions. the participants fixated and named the target (experiment 2), or they fixated the distractor (experiment 3) or a central point (experiment 4) while naming the target. participants were faster to name fixated targets (experiments 1, 2) relative to nonfixated targets (experiments 3, 4). an effect of phonological relatedness between target and distractor was only found in experiment 1. these results demonstrate that an object must be the focus of visual attention in order to activate its name. fixation of an object is not sufficient for name activation.

spatial orienting is not impaired during the attentional blink. shahab ghorashi & james t. enns, university of british colombia, & vincent di lollo, simon fraser university (sponsored by james t. enns)—identification of the second of two targets is impaired when it is presented within about 500 msec of the first (the attentional blink, or ab). surprisingly, a spatial cue can effectively guide attention to the location of the second target during the ab and increase identification accuracy (ghorashi et al., 2007). this finding conflicts with a report by nieuwenstein et al. (2005) that spatial cues are effective during, but not beyond, the time-span of the ab. we tested whether this absence of effective cuing beyond the ab was caused by an experimentally imposed ceiling that arose from stimulus impoverishment due to integration masking. we removed this ceiling by using an integration-free paradigm, and found that effective spatial cuing occurs not only during the period of the ab but also beyond it. these results strongly suggest that the mechanisms underlying spatial cuing and the ab are independent stages of visual processing.

testing the role of perception in the attentional blink. cara l. buck & david e. huber, university of california, san diego (sponsored by david e. huber)—in the attentional blink (ab), accuracy for a second target is reduced when it falls within 200–500 msec after the first target (t1) in an rsvp sequence. a series of experiments examined the role of perception in producing this performance deficit by including trials that interrupted ab sequences at various lags after t1 presenta-
tion with testing of a final masked item. all experiments additionally included standard end-of-sequence report on a random subset of trials to confirm the ab as traditionally measured. for all types of sequence-interrupted tests, which do not rely on short-term memory, ab effects were observed. these tests included target identification (which letter was the last item?), target detection (was the last item a letter or a digit?), and distractor identification (which digit was the last item?). the univer-
sality of these ab effects with immediate interrupted testing suggests that presentation of t1 produces a transient perceptual deficit.

task demands determine whether the focus of attention is unitary or divided. lisa n. jefferies, university of british columbia, & daniel j. weeks & vincent di lollo, simon fraser university (sponsored by daniel j. weeks)—mutually exclusive theories posit that spatial attention is either allocated as a single, unitary focus or divided into multiple, independent foci. we show instead that the mode of at-
tentional deployment depends on task demands. we used two rsvp streams and two target pairs (t1-pair, t2-pair) to probe whether a single focus or dual foci were employed. in experiment 1, the t1-pair appeared predictably within the streams (encouraging a separate-foci strategy); in experiment 2, it appeared unpredictably in stream or between the streams (encouraging single-focus strategy). when the t2-pair appeared between the streams, performance was poor in experiment 1 (consistent with dual foci that left the central region unattended) and accurate in experiment 2 (consistent with a single focus that included the central region). we conclude that whether focal attention is unitary or divided depends on the specific demands of the task at hand, the objective being to optimize task performance.

temporal preparation decreases metacontrast masking. bettina rolke, kerstin kleinmann, & karin m. bausenhart, university of tübingen (sponsored by allen m. osman)—when participants can anticipate the temporal occurrence of a stimulus, reaction time (rt) to this stimulus is especially short. in order to investigate whether temporal preparation facilitates perceptual processing, we employed a metacontrast masking paradigm. temporal preparation was manipulated in a blocked foreperiod paradigm, in which a warning signal announces the temporal occurrence of a forthcoming imperative stimulus. partic-

participants had to discriminate whether a spatial gap within a landolt square was on either the right or the left side. to obtain a masking function, the leftmost onset asynchrony (soa) between the landolt square and the following mask was varied. the results replicated the rt benefit of temporal preparation. in addition, the common u-shaped metacontrast function of discrimination performance depending on soa was attenuated by temporal preparation. thus, the results demonstrate that tempo-
ral preparation improves perceptual processing.

test a target-relevant distractor in a feature singleton search task. takatsune kumada, national institute of advanced indus-
trial science and technology, japan—it has been known that task-

irrelevant singleton distractors disrupt visual search for a feature single-
ton targets (e.g., theeuwes, 1991). the present study examined whether a task-relevant singleton distractor has consequences for a singleton search similar to those of a task-irrelevant singleton distractor. partic-

pants searched for an orientation singleton target among nontargets with a color singleton distractor. in the task-irrelevant distractor condition, the color singleton distractor had the same orientation as nontargets. in the task-relevant condition, the color singleton had the same orientation as the target. when target–nontarget similarity was low, both task-relevant and task-irrelevant distractors delayed search times, but search was ef-
cient. however, when the target–nontarget similarity was high, target search was inefficient in the presence of the task-relevant distractor, but target search was still efficient with the task-irrelevant distractor. these
• Cognitive Control •

Attentional Mechanisms Underlying Skill Failure and Success Under Pressure, MARCI S. ديCARO, KRISTA D. CARLSON, & ROBIN D. THOMAS, Miami University, & SIAN L. BEILOCK, University of Chicago (sponsored by Robin D. Thomas)—In three experiments, we showed that both attention-demanding skills (e.g., rule-based categories) and procedural skills that run largely outside of explicit attentional control (e.g., information-integration categories) falter under stress, but for different reasons. Experiment 1 showed that rule-based category learning is hurt when attention is distracted away from learning, whereas information-integration category learning falters when too much attention is devoted to performance. Experiment 2 demonstrated that pressure situations shown to elicit poor learning of these two category structures do so because different components of the pressure situation cause distraction (a performance-contingent outcome) and performance monitoring (video surveillance). The former hurts rule-based learning, and the latter, information-integration learning. Experiment 3 demonstrated that pressure-induced failure can be eliminated with a secondary task that prevents distraction (for rule-based categories) or explicit attentional control (for information-integration categories). Failure under pressure depends on (1) environment-induced shifts of attention and (2) the attentional control structures governing performance.

Sustained-Attention Failures in the Lab Predict Daily-Life Mind-Wandering Rates, JENNIFER C. McVAY, MICHAEL J. KANE, & THOMAS R. KWAPIL, University of North Carolina, Greensboro—We measured mind-wandering in a laboratory go/no-go task (the sustained attention to response task [SART]) and during the daily-life activities of 72 subjects. Subjects first completed the SART, with experimenterscheduled thought probes inserted after some no-go trials, and then carried Palm Pilot PDAs for 7 days of experience sampling. Subjects’ mind-wandering rates were stable across contexts: Proportions of task-unrelated thoughts (TUTs) during the SART significantly predicted rates of mind-wandering during daily activities. Our data also demonstrated the impact of TUTs on task performance in both the laboratory and life. Subjects committed more SART errors on trials when they also reported a TUT (vs. on-task thoughts), and they reported performing their daily-life activities more poorly when they also reported mind-wandering (vs. on-task thoughts). Individual differences in cognitive control, as measured by subjective mind-wandering reports, subjective assessments of task performance, and objective measures of task performance, are thus reliable across laboratory and daily-life contexts.

Motivationally Based Modulation of Cognitive Control During Task-Switching, ADAM C. SAVINE & TODD S. BRAVER, Washington University (sponsored by Todd S. Braver)—It is increasingly appreciated that executive control processes need to be understood in terms of motivational as well as cognitive mechanisms (Locke & Braver, 2008). The present study used cued task-switching paradigms to determine whether increasing motivational priority facilitated the deployment of task control, via preparatory enhancement. In four experiments, participants first performed baseline, nonincenitive blocks, which provided individually titrated performance thresholds for subsequent incentive blocks (single- and mixed-task conditions). In these blocks, monetary bonuses were provided as incentives on a random, precued subset of trials for above-threshold performance. Performance was globally improved in the incentive block, even on nonincenitive trials. Furthermore, classic switching and mixing costs were attenuated or even abolished on incentive trials, but these effects were moderated by CTI duration, indicating that the effect was preparatory in nature. Incentive-related sequential effects were also observed. These results suggest that motivational priority information enhances recruitment of cognitive control processes.
effect was larger after compatible trials than after incompatible trials—the hallmark behavioral finding of adaptive control processes. The sequential effect was observed when repetitions of stimulus features were eliminated from the analyses. However, the sequential effect was not observed when the consecutive trials used different stimulus modalities. This result was obtained even when the two stimulus modalities used highly related stimulus–response mappings. Thus, the data suggest that sequential effects are restricted to the relevant input modality. An fMRI study identified the neural regions activated by conflict between auditory and visual stimuli.

**Task Switching**

(1045) **Examining Age-Related Inhibitory Deficits in Task Switching.** IRING KOCH & INA WEGENER, RWTH Aachen—Using a cued task-switching paradigm, old and young adults switched unpredictably among three tasks. Task inhibition was measured by assessing $n = 2$ task repetition costs (i.e., the performance difference between ABA vs. CBA sequences). These costs are assumed to be due to the persisting aftereffect of inhibiting the previous, and thus most competing, task. Since older adults are often assumed to have a deficit in inhibition processes, one should expect them to show smaller $n = 2$ task repetition costs. However, conflicting with an inhibitory-deficit account, we observed larger $n = 2$ repetition costs in old than in young adults, supporting a preliminary finding by Mayr (2001). Additionally, we found larger practice benefits in old adults, but practice did not affect task inhibition. Together, the data suggest that age-related task-switching deficits may be due to increased difficulties in activating new tasks when there are competing tasks, leading to more inhibition of competing tasks.

(1046) **The Temporal Dynamics of a Voluntary Task Switch.** JASON IVANOFF & MELISSA GENDRON, St. Mary’s University, & CATHERINE M. ARBINGTON, Lehigh University—Even when tasks are selected voluntarily, a performance cost emerges when there is a task switch. Here, we explore the effect of target judgment speed on the voluntary selection of task sequences and the information-processing dynamics of voluntary task-switching. Using the response-signal technique to collect speed–accuracy trade-off functions, participants judged the parity or magnitude of single digits. As the speed of task judgments was stressed, the frequency of repeating tasks increased, and longer runs of the same task became increasingly common. In addition, speed–accuracy trade-off functions for the task-switch trials demonstrated a relative decrease in the rate of gain of information accrual. These results demonstrate a relative failure of cognitive control in the voluntary task-switching paradigm when the speed of target judgments is stressed.

(1047) **Adaptive Control of Response Preparedness in Task Switching.** MARCO STEINHAUSER, RONALD HÜBNER, & MICHEL DRUEY, University of Konstanz—When participants switch rapidly between two tasks, bivalent stimuli can accidentally trigger the previously executed, and therefore still activated, response. Recently, it has been suggested that response-repetition effects in task-switching experiments reflect response inhibition that reduces the risk of such erroneous response repetitions. The present study investigated neural correlates of this inhibition process using lateralized readiness potentials. In three experiments, we demonstrated a response-switch bias emerging during the preparatory interval that was independent of task sequence (Experiment 1), linked to task preparation (Experiment 2), and present only under task-switching conditions (Experiment 3). These results suggest that the response-switch bias reflects a control process that adaptively regulates response preparedness under task-switching conditions.

(1048) **Independence Between Timing and Task Switching With Univalent and Bivalent Stimuli.** CHARLES VIAU-QUESNEL & CLAUDETTE FORTIN, Université Laval, & RICHARD SCHWEICKERT, Purdue University—Our recent data have indicated that task switching and timing can be performed concurrently without any interference. We used univalent stimuli. The results obtained under different conditions and with bivalent stimuli, found interference, leading to the claim that time estimation and executive control processes require common attentional resources. In the present study, the concurrence of timing and task switching was tested using bivalent and univalent stimuli in two experiments. In each trial, two tasks were executed successively. The two tasks could be either memory search (two, four, or six memorized items) or digit classification (odd/even), in switch (search–search, digit–digit) and no-switch (search–digit, digit–search) conditions. Bivalent (digits in both tasks) and univalent (digits and letters in classification and memory tasks, respectively) stimuli were used in Experiments 1 and 2. Dissociations were found in both experiments: The produced intervals lengthened with increasing load in memory search but were unaffected by task switching.

**Speech Perception**

(1051) **Similarity and Frequency in Phonological Variant Recognition: An Artificial Lexicon Study.** ELENI PINNOW & CYNTHIA M. CONNINE, Binghamton University—The role of similarity and frequency in learning schwa-deleted phonological variants was investigated using an artificial lexicon. Learning conditions included 15 repetitions of three-syllable pseudowords with medial schwa (high-frequency variant) and one repetition of a schwa-deleted counterpart (low-frequency variant) (Experiment 1) or only the high-frequency variant (Experiment 2). A subsequent lexical decision task included both schwa-present and schwa-deleted variants (not learned in Experiment 2) in both experiments. A variant frequency effect was found in Experiment 1 (less accurate recognition of low-frequency, schwa-deleted form). Not-learned schwa-deleted forms (similar to learned schwa-present forms) elicited higher false alarm rates than novel schwa-deleted fillers in Experiment 2.
False alarm rates for not-learned variant forms in Experiment 2 were lower than those for the same (low-frequency) learned forms in Experiment 1. The results support both a hybrid representational (multiple, frequency-graded representations) and processing (similarity-based) account of variant processing.

(1052) Age-Related Changes in Lexical Competition. KATHLEEN PIROG REVILL & DANIEL H. SPIELER, Georgia Institute of Technology—Although hearing loss accounts for much of the difficulty older adults have comprehending spoken language, cognitive factors also play a role. Age differences in the resolution of competition may be responsible for the finding that older adults have more difficulty recognizing a word when it has many lexical competitors, but little is known about the time course of lexical competition in older adults. We monitored the eye movements of 16 young adults (18–30 years old) and 16 older adults (60–80 years old) with good hearing as they followed spoken instructions to click on objects displayed on a computer screen. The lexical frequencies and neighborhood densities of the target items were manipulated, as well as whether a lexical competitor was present in the display. Relative to young adults, older adults experienced delayed target fixations and prolonged competition when the target word had high-frequency competitors.

(1053) Speaking Rate Normalization: Precursor Window. CHUNG-I SU & JAMES R. SAWUSCH, University at Buffalo—Speech segment durations vary with both speaking rate and phonetic identity, yet listeners adjust to changes of speaking rate to ensure phonetic constancy. Two experiments investigated the influence of nontarget segment duration on target phonetic perception. The first experiment used a two-word phrase (fruit goat or fruit coat) and varied the phoneme durations in the first word. Listeners identified the initial consonant of the second word. The second experiment used a nonce syllable series (/skr̩sh/–/skr̩sh/) to examine whether duration variation of the preceding consonants would influence listeners’ responses to the target vowel. The results showed that duration variations of preceding phonemes altered listener responses to the target segment in both experiments. This effect decreased as the temporal distance between the duration variation and the target increased and largely dissipated by about 450 msec, providing an estimate of the temporal window in which preceding segment durations influence target phonetic identity.

(1054) How Do Prereader and Reader Children Process Schwa Deletion? ELSA SPINELLI, University of Grenoble, & ISABELLE RACINE, University of Geneva—We compared the performance of prereader children with that of older reader children in order to test an orthographic account of the processing cost due to schwa deletion. In three experiments (lexical decision, picture-word checking, and word-monitoring tasks), target words were presented either in their reduced (le ch'val “the horse”) or in their nonreduced (le cheval) form. The results showed that for both prereader and reader children, nonreduced versions of target words were recognized faster than their reduced versions, despite the fact that prereaders do not know how to write these words. Although a conflict between the underlying orthographic form and the surface phonetic form of words could account for the effect obtained for readers, it could not explain the processing cost found for prereader children. We hypothesized that the effect found for prereaders is due to the prevalence of the nonreduced version of words in the spoken input of children.

(1055) Clustering and Bracketing Approaches to Speech Segmentation. IBRAHIMA GIROUX, LEAD-CNRS, Bourgogne University, & ARNAUD REY, LPC-CNRS, Provence University (sponsored by Arnaud Rey)—In two experiments, the predictions of clustering and bracketing approaches to speech segmentation were tested on the status of lexical units and embedded sublexical units (Swingley, 2005). Whereas the bracketing approach, instantiated by a serial recurrent network (e.g., Elman, 1990), predicts that the two kinds of items will not be distinguishable when exposure to language increases, the clustering approach, instantiated by Warmer (Perruchet & Vinter, 1998), predicts a progressive word superiority effect. In Experiment 1, participants had similar performance on disyllabic words and disyllabic sublexical units after 2 min of exposure to an artificial language, but after 10 min, performance was significantly better on words. Experiment 2 extended this finding by showing better performance on trisyllabic words than on disyllabic sublexical units after 10 min but not after 2 min. These results suggest that words reach a special status in the speech processing system across time, as predicted by the clustering approach.

* Discourse Processing *

(1056) The Formation of Elaborative and Bridging Inferences. JOHN GOULD, Boston University, DAVID CAPLAN, Massachusetts General Hospital, & GLORIA S. WATERS, Boston University (sponsored by David Caplan)—Three experiments were conducted that examined the formation of elaborative and bridging inferences. The first replicated Klin et al.’s finding of slower reading times for sentences that contradicted an elaborative inference when they occurred within two sentences downstream of the possible formation of the inference. The second experiment found that naming words semantically but not associatively related to the content of the elaborative inference showed inhibition at this early presentation point. The third experiment showed that naming words semantically but not associatively related to a bridging inference showed neither priming nor inhibition at that point. The results suggest that the elaborative inferences were not formed in advance of encountering a contradictory sentence, but were generated to make the discourse coherent or in response to an association from a presented word.

(1057) The Time Course of Situation Model Updating. W. MATTHEW COLINS & KEITH RAYNER, University of Massachusetts, Amherst.—It is well accepted that when reading and comprehending a passage, readers construct and update a situation model organized across a number of different dimensions. However, the time course along which dimensions of a situation model are updated has never been investigated. In this experiment, we compared the time course of situation model updating along the spatial dimension and the protagonist dimension. Readers were presented with passages that either described a main character’s location within the story environment (spatial dimension) or described some relevant characteristic of the main character (protagonist dimension). Later in the text, information was presented that was either consistent or inconsistent with these descriptions. Readers’ eye movements were measured to examine how comprehension was affected by inconsistent information and whether there were differences between the spatial and protagonist dimensions of the situation model.

(1058) Nonsuppression of Negated Entities: An Eye-Movement Study. WILIAM H. LEVINE, WILLIAM R. BATTINICH, JOEL A. HAGAMAN, & HEATHER LAMONS, University of Arkansas.—We investigated whether the mental representations of negated concepts are suppressed. In two reading-time experiments, we measured readers’ eye movements while they read anaphors that referred to an entity in the prior sentence. The prior sentence also contained a potential distractor in the form of a negated noun phrase (NP). We manipulated the NP so that it was either from a category different from that of the referent or from the same category; in the latter case, its typicality within the category was manipulated (e.g., Justin bought a mango but not any water/an apple/a kiwi. He ate the fruit.). We found evidence that same-category distractors interfere with anaphor comprehension. These results are inconsistent with a theoretical perspective that posits that negation obligatorily leads to suppression of a concept. Instead, we argue that the representation of a negated concept will be dictated by its pragmatic role.

(1059) Why Cell Phones Are Irritating: Different Types of Speech Yield Different Attentional Demands. LAUREN L. EMBERSON, GARY
(1060) The Difference a Day Makes: Time Shifts and Memory-Based Text Processing. BROOKE LEA & MATTHEW OLSON, Macalester College, DEBRA LONG, University of California, Davis, & DAVID N. RAPP, Northwestern University—Research investigating the event indexing model, a model of situation-model development during reading comprehension, has found that narrative time shifts (e.g., “A day later?”) prompt readers to update their situation model with new information about the passage of time (Zwaan, Langston, & Graesser, 1995). Narrative time shifts, therefore, can be used to test an important prediction about the activation of text information made by memory-based text processing (MBTP) theories. According to MBTP, reactivation of backgrounded text occurs via a resonance process that is unaffected by high-level comprehension processes such as those involved in situation model updating (Myers & O’Brien, 1998). We tested this hypothesis by manipulating time shifts and memory cues while controlling for factors that affect resonance (e.g., overlap, elaboration, and distance between target episodes). We replicated the time-shift effect and found that time shifts affect the time course of reactivation during reading.

(1061) High-Skilled Readers Resonate: Low-Skilled Readers Minimalize. KARLA A. LASSONDE, Minnesota State University, EDWARD J. O’BRIEN, University of New Hampshire, & DANIELLE S. McNAMARA, University of Memphis—Peracchi and O’Brien (2004) found that predictive inferences were activated only when the immediately preceding text and information in the situation model were both consistent with that inference. The inference was not generated when information in the situation model did not support the predictive inference. Peracchi and O’Brien argued that information in the situation model can override activation from the immediate context. McNamara and McDaniel (2004) showed that low-skilled readers tend to have less well-developed situation models; therefore, inference activation should be primarily influenced by information in the immediate context. In the present experiment, high-skilled readers showed the same pattern found by Peracchi and O’Brien. In contrast, low-skilled readers showed inference activation—both when an earlier described characteristic of the protagonist was consistent and inconsistent with the inference. The results are discussed in terms of differing development and use of situation models by high- and low-skilled readers.

- LANGUAGE COMPREHENSION -

(1062) Use of Sarcasm: Effects of Group Presence and Gender. ALBERT N. KATZ & ANDREA E. BOWES, University of Western Ontario—This study investigated social factors (gender, group presence) in the perception of the use of sarcastic and literal insults. Eighty participants read vignettes describing friends in conflict. The contexts varied in whether the insult was uttered to the victim in a group setting or not and whether it was sarcastic or not. Across conditions, female participants rated insults as significantly less polte than did male participants, regardless of literalness. When uttered in a group and made literally, the insults were perceived as more relationally aggressive. Moreover, participants perceived the aggressor’s sarcasm as being more humorous than a literal insult, whereas the humor was less apparent to the victim. The results are discussed in terms of the effects of group presence, interlocutor perspective, and relational aggression on the differences in comprehending sarcastic language by men and women.

(1063) Who Is More Liberal, Clinton or Obama? The Principle of Congruity in Asking Questions. I-CHANT A. CHIANG, Abertywyth University (sponsored by Herbert H. Clark)—How does congruity facilitate question asking and answering? Question askers manipulate the concepts being activated by the words they choose in the question. This study examined congruity effects for abstract, subjective concepts, specifically the political concepts of “liberal” and “conservative.” Even though these concepts are multidimensional in nature, political questionnaires often use the terms “liberal” and “conservative” in probing the public about opinions on political figures. How do congruity effects play a role in these political surveys? Two types of congruities were investigated: semantic congruity and spatial metaphoric congruity. Congruity is found to facilitate response time and decrease errors when making liberal and conservative judgments of politicians.

(1064) The Dynamics of Sense-Making: ERP Evidence of Words Within Words. PETRA M. VAN ALPHEN & JOS J. A. VAN BERKUM, Max Planck Institute for Psycholinguistics and University of Amsterdam—In two ERP experiments, we examined whether listeners, when making sense of spoken language, take into account the meaning of spurious words that are embedded in longer words, either at their onsets (e.g., pie in pirate) or at their offsets (e.g., pain in champagne). In the experiments, listeners heard sentences in which the critical words were multisyllabic words with either an initial or a final embedding. The semantic fit of the carrier words and embedded words in the context was manipulated in such a way that semantic involvement of embedded words should result in a modulation of the N400 component. The outcomes show that listeners briefly take into account the meaning of both initial and final embeddings, but only under specific conditions. These results give us new insights into the dynamics of the sense-making process and its link to lexical activation.

(1065) Is It Either Memory Effect or Lexical Quality, or Both? QUN GUAN & CHARLES A. PERFETTI, University of Pittsburgh (sponsored by Charles A. Perfetti)—Two experiments sought to identify event-related-potential (ERP) correlates of paraphrases of words in text and in a word list to explore how information is comprehended. In Experiment 1, two sentence-passage contained the target word, as the first content word of the second sentence, and its paraphrase referent, which varied in distance from the target word by 4-to-8-word intervening clause, in the first sentence. The targets that were delayed by the intervening clause, relative to the immediate targets, resulted in stronger attenuation of the N400 among the skilled readers, in contrast to the less-skilled counterparts. Experiment 2 used similar paraphrase-referent and target-word pairs and compared them with semantic-associated word pairs and control word pairs. We expected to observe no difference in ERP indicators between skilled and less-skilled comprehenders, because comprehensible skill is contributed by the context-sensitive use of words.

(1066) Effects of Prosodic Stress on Memory in Language Comprehension. SCOTT H. FRAUNDORF, DUANE G. WATSON, & AARON S. BENJAMIN, University of Illinois, Urbana-Champaign—Two experiments investigated whether prosodic stress affects memory in language comprehension. Prosodic stress frequently indicates linguistic focus (see Ladd, 1996) and may lead to increased semantic specificity in semantic encoding and representation. We manipulated the presence of constrastive stress in recorded stories containing contrasts between two items in a discourse. In Experiment 1, discourse referents receiving contrastive
stress were recognized better on a later two-alternative forced choice recognition test than were referents not receiving contrastive stress. Experiment 2 tested whether contrastive stress on one referent had any effect on memory for another referent within the same story. Contrastive stress improved memory for the focused referent, but did not impair or facilitate memory for the other referent in the story. These findings suggest that stress and linguistic focus facilitate memory in language comprehension and that these effects may be localized to the specific referents that receive stress.

(1067)
Effects of Age, Working Memory, and Speed of Processing on Syntactic Processing. GLORIA S. WATERS, Boston University, DAVID CAPLAN, Massachusetts General Hospital, & GAYLE DeDe, University of Arizona—Two hundred participants, ages 19–90, were tested for working memory (WM), speed of processing, and syntactic processing ability, measured as the difference in self-paced reading times for (1) the embedded verb versus the embedded verb and noun phrase in sentences with object- and subject-extracted relative clauses; (2) the embedded subject noun in sentences with subject-attached object-extracted relative clauses versus sentences with sentential complements; and (3) the embedded verb in sentences with subject-attached object-extracted relative clauses versus the main verb in sentences with sentential complements. Regression analyses showed that only age predicted the first two measures of syntactic processing, and only WM predicted the third. The results suggest that aging affects the ability to structure and interpret sentences that can be readily understood, and that general WM is needed to assign structure and meaning in sentences that cannot be ordinarily parsed without review and conscious effort.

* Reading *

(1068)
Reading and Resource Allocation With Visual Noise. XUEFEI GAO & SOO RIM NOH, University of Illinois, Urbana-Champaign, RHEA T. ESKEW, Northeastern University, & ELIZABETH A. L. STINE-MORROW, University of Illinois, Urbana-Champaign (sponsored by Elizabeth A. L. Stine-Morrow)—The effortfulness hypothesis suggests that simulated or age-related sensory declines may decrease capacity for semantic integration in language comprehension. We tested this hypothesis by measuring resource allocation during reading. College students (n = 36) read three sets of passages word by word, one at each of three levels of dynamic visual noise, created by assigning a randomly selected proportion of pixels to a new randomly selected grayscale value after each refresh (0 = none, 5 = low, 7 = high). There was a reliable interaction between processing level (word- vs. mouse-level processing) and noise [F(2,70) = 5.210, p = .008]. The visual noise increased resources allocated to word-level processing [F(2,70) = 2.963, p = .058], at the cost of attention paid to meaning-making (textbox-level) processing [F(2,70) = 3.950, p = .024]. Supporting the effortfulness hypothesis, this study is novel in showing that simulated sensory declines can affect online resource allocation during reading and sheds light on how sensory challenges may interact with higher-level cognitive functions.

(1069)
Academic Skill and Prosodic Inner Voice. JENNIFER GROSS, KYLE HAMPTON BREDELL, AMANDA L. MILLETT, & BRIAN BARTEK, Grand Valley State University—Silent readers have a prosodic “inner voice,” according to the implicit prosody hypothesis (Fodor, 2002). For example, an e-mail message with capital letters (CAPs) may be perceived as “shouting” (prosodic stress). In two previous experiments, participants judged the helpfulness of capped words, under the guise of helping an editor distinguish intentional from nonintentional CAPs (caused by a computer virus). When CAP-elicited stress matched the prosodic meter of the writer’s inner voice, perceived helpfulness was judged higher than when the CAP-elicited stress and prosodic meter of the sentence were incongruent. The purpose of the present analysis was to determine whether prosodic sensitivity, which distinguishes good from poor readers in children learning to read, also differs among college students. We conjectured that better college students (self-reported GPA in Experiment 1; self-reported ACT in Experiment 2) would perform better on the prosodic-judgment task. Our results suggest that our CAP-elicited stress measure has construct validity.

(1070)
Lexical Stress Effects in Silent Reading. MARA E. BREEN & CHARLES E. CLIFTON, University of Massachusetts, Amherst (sponsored by Keith Rayner)—The present study evaluated the implicit-prosody hypothesis, which maintains that prosodic contours are constructed during silent reading. Eye movements were recorded while subjects read five-line limericks silently. The target—the last word of the second line—had an alternating stress pattern (e.g., strong–weak, IMPORTS; weak–strong, imPORTS). The target’s stress was either consistent with the last word of the first line (i.e., rhymed), as in (1a, 2b), or inconsistent, as in (1b, 2a). (1) The city must safeguard the seaports, (a) to save us from dangerous imports. (b) because of how much it now imports. (2) The panel is set to report how much we pay for imports. (b) on how much the city imports. We observed an interaction between stress pattern and consistency: Reading times for “imports” were highest when a weak–strong target followed a strong–weak prime [i.e., in (1b)]. These results suggest that lexical stress information is activated during silent reading, lending support to the implicit-prosody hypothesis.

(1071)
Reading and the Right Fusiform: Examining the Effects of a Novel Face-Based Orthography. MICHELLE W. MOORE, SIFONG E. HUI, RUPA H. RAMASWAMY, CORRINE DURISKO, CHARLES A. PERFETTI, & JULIE A. FIEZ, University of Pittsburgh—A left-lateralized fusiform area, the visual word form area (VWFA), is active when English readers view words (Cohen & Dehaene, 2004). Chinese–English bilinguals have bilateral fusiform activation when they view English words (Perfetti et al., 2005), suggesting that the right hemisphere homologue of the VWFA (r-VWFA) can support orthographic processing. To study the role of the r-VWFA in reading, we created a FaceFont orthography using faces as graphemes. We hypothesized that the FaceFont would elicit activation predominantly in the r-VWFA. Participants completed extensive FaceFont training, first learning face/phoneme associations, and then progressing to reading words and sentences. The results indicate that FaceFont is learnable, though participants learn FaceFont more slowly than a comparison orthography involving line segments. Preliminary imaging results suggest that FaceFont is associated with activation of the r-VWFA. Thus, lateralized fusiform activation during reading may reflect perceptual characteristics of text, rather than constraints imposed by the language system.

(1072)
How Is Stress Assigned in Italian? Evidence From Adult, Typically Developing, and Developmentally Dyslexic Readers. DESPINA PAIZI & CRISTINA BURANI, Institute for Cognitive Sciences and Technologies (ISTC-CNRI, Rome (sponsored by Patrizia Tabossi)—Stress assignment in Italian could be a function of stress regularity or number of words that share the same stress pattern and final orthography phonological sequence (stress neighborhood). We examined the interaction between stress regularity and word frequency, as well as stress neighborhood effects, in reading aloud with adults, typically developing readers (4th and 6th graders), and 6th-grade developmental dyslexics. Children, especially dyslexics, were expected to show stress regularity effects, due to heavier reliance on sublexical processing and limited lexical knowledge with respect to adults. Frequency affected all groups of readers. Adults and typically developing readers did not show stress regularity effects, but dyslexics made more errors on irregular low-frequency words. Stress neighborhood affected all readers, indicating sensitivity to the distributional properties of the language. Stress assignment to Italian low-frequency words is mainly a function of stress neighborhood, which similarly affects performance of readers of different ages and reading skills.

(1073)
Effects of Disambiguating Context on Resolution of Biased Ambiguous Word in Chinese Sentence Reading: Evidence From Eye
Fixations. Dingguo Gao & Ju Chen, Sun Yat-Sen University (sponsored by Charles E. Clifton)—Two experiments were conducted to investigate how context influences resolution of lexically ambiguous words in Chinese sentence reading. In Experiment 1, we recorded eye movements when participants were reading sentences containing either biased ambiguous words or control words. A subordinate-bias effect (SBE) did exist in Chinese sentence reading, in which fixation times on ambiguous words were longer than those on controls when disambiguating context instantiated the subordinate meaning of an ambiguous word. In Experiment 2, we examined the factors that cause SBE through adding a set of nonambiguous words. In the target region, fixation times on ambiguous words were longer than those on high-frequency nonambiguous words. The most interesting result was that fixation times on ambiguous words were shorter than those on low-frequency nonambiguous words. In spill-over region, fixation times were not significantly different between any two conditions, which implied that participants did not feel any additional processing difficulty among the three conditions.

Recognition Memory

Age Differences in Implicit and Explicit Memory for Physical Features of Words. Karen M. Evans & Kara D. Federmeier, University of Illinois, Urbana-Champaign—in recognition experiments, manipulations of physical form have been used both to examine the impact of form overlap on (usually implicit aspects of) recognition judgments and to test episodic memory for source details. These aspects of form memory are strikingly dissociated in older adults, who seem to use form overlap at least as much as younger adults during item recognition but are impaired in accessing this information explicitly during source judgments. Previous work from our lab has suggested that separate neuropsychological mechanisms may be responsible for form-based and form-independent recognition, raising the possibility that these mechanisms may be differentially sensitive to age-related decline. Here, we recorded event-related potentials as younger and older adults identified words repeated in the same or in the opposite letter case as the corresponding study word and then performed a source judgment. Both behavioral and electrophysiological evidence pointed toward differences between recognition supported by form overlap and recognition without such overlap.

Test Type and the Testing Effect in Recollection. Dale L. Smith & Lewis M. Barker, Auburn University—The testing effect has been shown to be a robust phenomenon in recall. However, there have been inconsistencies demonstrating the testing effect using final recognition tests. This has led some to suggest that recollection, but not familiarity, benefits from intervening tests. The present studies attempted to determine whether differences in type of intervening test affect recognition performance at final test using the remember–know and source memory procedures. Comparison of the final-test recollection probabilities in the different intervening-test conditions did not suggest an advantage for testing over additional study trials. However, additional analyses suggested that a testing advantage may exist in recollection, but only for correctly recalled items. Items that were correctly identified at the intervening test were also more likely to be recollected than items that were not identified at the intervening test, regardless of test type. The results emphasize the importance of intervening test performance in the testing effect.

Evidence in Favor of the Early-Phase Elevated-Attention Hypothesis. Amy H. Criss, Syracuse University, & Kenneth J. Malmborg, University of South Florida—Low-frequency (LF) words are better recognized than high-frequency (HF) words, with a higher hit rate (HR) and a lower false alarm rate (FAR). One explanation for the HR difference is the early-phase elevated-attention hypothesis, which proposes two stages of encoding. In the early phase, words are identified on the basis of orthographic characteristics. LF words are composed of atypical features, making their identification more difficult and resulting in the LF HR advantage. Two experiments tested the proposal that LF words are better recognized because of their distinct lexical features. The late phase of encoding consists of controlled processing, in which the semantic features are paramount. According to the early-phase elevated-attention hypothesis, semantic features of HF and LF words do not differ in diagnosticity and do not contribute to the word frequency effect. We found evidence for this in a third experiment comparing memory for words and objects.

Measuring the Duration of the Reinstatement Effect. Lauren M. Knott & Stephen A. Dewhurst, Lancaster University (sponsored by Peter E. Morris)—Previous research has shown that reinstating an effortful encoding task at retrieval enhances remember responses. Demonstrations of the reinstatement effect typically use a short retention interval. The present study investigated the duration of the reinstatement effect by testing retention 10 min, 24 h, and 1 week after study. The results showed that reinstating an effortful encoding task (generating items from anagrams) increased remember responses at test, but reinstating an automatic task (reading intact words) had no effect. The advantage for words generated at both study and test persisted across the 1-week retention interval. In contrast, the advantage for words generated at study and read at test disappeared after 1 week. These results demonstrate the persistence of the reinstatement effect and the benefits of an effortful generation task over longer retention intervals.

Functional Specificity of the Parahippocampus. Lillian Park, Gordon Winocur, & Morris Moscovitch, Rotman Research Institute (sponsored by Fergus I. M. Craik)—Patient studies have suggested that the parahippocampus plays an important role in spatial and visual/perceptual memory, which are both important for recollection. This suggests that recollection would be impaired in patients with parahippocampal lesions. In a patient with a focal left parahippocampal lesion, there was a reduced rate of “remember” responses for older memories in a variety of recognition tasks, whereas the rate of “remember” responses for younger memories matched controls. A reverse temporally graded pattern for recollection was observed. Although the patient has reduced recollection, his overall performance on these recognition tests nonetheless matched that of controls, suggesting that he compensates with familiarity processes. His ability to recollect appeared to be more impaired in instances when information is poorly encoded, as with faces or shallowly encoded words. The left parahippocampus may have a role in the maintenance or retrieval of recollection over time.

Retrieval-Induced Forgetting in Recognition Memory. Gina A. Glanc, Norwich University—It has been demonstrated that retrieval practice on a subset of studied items can cause forgetting of different but related studied items. This retrieval-induced forgetting has been demonstrated in a variety of recall studies and has been attributed to an inhibitory mechanism activated during retrieval practice by competition for a shared retrieval cue. The present study generalizes the retrieval-induced forgetting effect to recognition memory and investigates this competition assumption. Experiment 1 demonstrated a typical retrieval-
induced forgetting effect in item recognition. Using an independent cue for retrieval practice should alleviate response competition and therefore eliminate the retrieval-induced forgetting effect. Experiment 2, however, demonstrated evidence of retrieval-induced forgetting, even with use of an independent retrieval cue during retrieval practice. Therefore, results from this study may illustrate that the retrieval-induced forgetting mechanism in recognition memory is elicited during the final recognition test.

The List Length Effect in Recognition Memory. ANGELA KINNELL, University of Adelaide, & SIMON J. DENNIS, Ohio State University—The list length effect in recognition memory refers to the finding that recognition performance for a short list is superior to that for a long list. This finding has been widely replicated in the literature and is central to current debate between item-noise and context-noise models of memory. Although the effect arises naturally in item-noise models, context-noise models predict no list effect. Recently, it has been argued that if potential confounds are controlled, the list length effect is eliminated. We report the results of several new experiments designed to explore the roles of attention, contextual reinstatement, the remember–know task, and the use of different types of stimuli. We concluded that there is no list length effect for words when potential confounds are controlled, but that it does occur for more confusable stimuli, such as faces. This lends support to context-noise models of recognition memory.

**Prospective Memory**

Control of Monitoring in Prospective Memory: Evidence for a Multi-process Model. MICHAEL K. SCULLIN & MARK A. MCDANIEL, Washington University, & GILLES O. EINSTEIN, Furman University (sponsored by Mark A. McDaniel)—To explore the relation between monitoring and prospective memory (PM) retrieval, most previous research has examined whether the presence of a PM task slows responding on an ongoing task. Although slowed task performance suggests that monitoring is present, this method does not clearly establish whether monitoring is functionally related to PM performance. According to the multiprocess model (McDaniel & Einstein, 2000), monitoring is essential for PM retrieval with nonfocal but not with focal cues. To test this hypothesis, we introduce a new methodology to gain some control over monitoring. We stimulated monitoring by presenting items that were related (or unrelated) to the PM task proximal to target events. Importantly, whereas monitoring proximal to target events led to a large increase in nonfocal PM performance, no such benefit was observed for focal PM performance. These results suggest that retrieval processes other than monitoring, such as spontaneous retrieval, may support prospective remembering.

Providing Prospective Memories Facilitates Human Language Acquisition. KELLY A. SCHMIDTKE & JEFFREY S. KATZ, Auburn University—Uniquely rewarding each correct choice in a conditional discrimination provides subjects with prospective memory cues that facilitate acquisition. This effect has been replicated with different animals, typical young humans, and cognitively disabled adult humans, but has proved difficult to obtain with typical adult humans. In the present computer experiment, college students were presented with 1 of 15 Japanese characters and asked to choose its associated English word. Each correct choice was followed by either a consistent or inconsistent picture and then either a consistent or inconsistent prize lottery entry. Consistent pictures and prizes may serve as unique cues that facilitate acquisition. Although acquisition was not affected by the prizes’ consistency, it was affected by the pictures’ consistency. Participants who received consistent pictures learned the meaning of the Japanese characters faster than those who received inconsistent pictures. These results suggest that prospective memories can facilitate typical adult human learning.

Describing Prospective Memory for Focal and Nonfocal Tasks: Multi-process or Transfer-Appropriate Processing Theory? KATHRYN A. HUDSON & DAWN M. McBRIDE, Illinois State University—Prospective memory (PM) performance has been described by both multiprocess theory (Einstein & McDaniel, 2005) and transfer-appropriate processing theory (Meier & Graf, 2000). However, few studies have compared these two theories to determine whether one can better predict data in a PM task. The present study was designed to compare conditions for which these two theories make different predictions. The reaction time (RT) difference between a PM task block and a baseline block without the PM task was calculated in ongoing task trials. RT differences were similar for focal and nonfocal conditions when the type of processing (conceptual) overlapped in the ongoing and PM tasks. However, the RT difference was larger for the condition with different types of processing across tasks (perceptual ongoing task and conceptual PM task) than for the other conditions. These data support a transfer-appropriate processing description of PM task performance.

Prospective Memory Costs: General or Specific? ANNA-LISA COHEN, Yeshiva University, ALEXANDER JAUDAS, University of Konstanz, & PETER M. GOLLWITZER, New York University and University of Konstanz—A current focus in the prospective memory (PM) literature is the extent to which a PM task (remembering to perform a future action) interferes with ongoing activities (defined in this study as lexical decision latencies). In a previous study (Cohen et al., 2008), participants had to detect six PM cues that were word targets (e.g., gbrl). The results revealed ongoing-task costs on lexical decision word trials but no significant costs for nonword trials. In the present study, participants had to detect six PM cues that were either word targets (e.g., gbrl) or nonword targets (e.g., rlig). We investigated whether costs would only be found for nonword trials when the associated PM cue was a nonword. The results from this study will help us determine whether ongoing-task costs are general or specific (depending on the degree of overlap between ongoing-task stimuli and PM stimuli).

The Cost of Prospective Memory: Resolving an Apparent Inconsistency. REBEKAH E. SMITH, University of Texas, San Antonio—Prospective memory tasks are often embedded in an ongoing activity. For instance, Smith et al. (2007, Experiment 2) asked participants to remember to press the F1 key if they saw their name during an ongoing lexical decision task. The Smith et al. experiment involved a single prospective memory target and an ongoing activity that focused processing on the defining characteristics of the target event. Smith et al. found evidence for a cost to the ongoing activity. However, Cohen et al. (2008) presented results that were interpreted as showing no evidence for a cost to an ongoing lexical decision task when participants were asked to remember to press the F1 key when a single target word appeared. Two experiments were conducted to investigate this apparent inconsistency.

Time-Based Prospective Memory Is Influenced by Demands Placed on the Attentional Gate. GABRIEL I. COOK, ALLYSA RUESCHENBERG, & MANUEL WUDKA-ROBLES, Claremont McKenna College—Manipulations reducing the availability of attentional resources (e.g., task difficulty, task complexity, divided attention, etc.) decrease prospective-duration judgments of time estimation. According to the attentional-gate model (Block & Zakay, 1992, 2006), allocating attention toward a complex cognitive task or distracting environment usurps cognitive resources away from attending to time. Unfortunately, reduced attention to time decreases the number of temporal cues used to track the passage of time. Because time-based prospective memory involves similar time-estimation processes, we tested the predictions of the attentional-gate model in this memory paradigm. Participants fulfilled either a time-based pulse or step intention while they performed a lexical-decision task with full or compromised attentional resources, as manipulated by task switching. As predicted, task switching reduced response latencies as well as prospective memory. We believe that time-estimation ability plays an important role in the accuracy of fulfilling time-based intentions. Differences between pulse and step intentions are discussed.
• **False Memory** •

(1088) **Modeling Part-Set Cuing of False Memories.** TROY A. SMITH & DANIEL R. KIMBALL, University of Oklahoma (sponsored by Daniel R. Kimball)—The part-set cued effect is the highly robust finding that providing a subset of studied items as retrieval cues impairs recall of the remaining items relative to an uncued condition. Recent empirical investigations of this effect have consistently observed an association. We now show that fSAM simulates part-set cuing effects on veridical recall, unlike fSAM, which does not explicitly represent semantic associations. We now show that fSAM simulates part-set cuing effects on both veridical recall and semantically induced false recall.

(1089) **Distinguishing True From False Memories: Gist-Based Processing Predicts Ability to Use Phenomenology to Discriminate Memory.** TAMMY A. MARCHE, University of Saskatchewan, CHARLES J. BRAINERD & VALERIE F. REYNA, Cornell University, DAVID G. LANE, University of Saskatchewan, & JANEEN D. LOEHR, McGill University—Given that there appear to be subtle, but reliable, differences in memory phenomenology between true and false memories, do some individuals possess better ability than others to discriminate what's real from what's not? The present study examined whether individual differences in gist-based processing (as assessed by susceptibility to DRM false memory) predict an individual's ability to discriminate those memories on the basis of subjective ratings of memory phenomenology. Participants were presented with DRM word lists and asked to rate the items they recognized as studied using a version of the Memory Characteristics Questionnaire. The results indicated subtle differences in phenomenology between true and false memory, replicating prior work, and that individual differences in false recall predicted memory discrimination ability. These findings support such accounts of false memory as fuzzy-trace theory and suggest that individual differences in gist-based memory may be used to determine who can and cannot discriminate the real from the not-so-real.

(1090) **Dynamics of Semantic Priming in Recognition Testing.** DANIEL R. KIMBALL, WILLIAM J. MUNTEAN, TROY A. SMITH, University of Oklahoma, & MARTHA MANN, University of Texas, Arlington—Two experiments investigated semantic priming during recognition testing, using the Deese/Roediger–McDermott (DRM) paradigm. In Experiment 1, we observed a linear increase in critical-lure false alarms (FAs) as the number of a lure's previously tested semantic associates increased; this pattern held for DRM lists that either (1) had been studied, regardless of whether other, unstudied DRM lists were also tested, or (2) had not been studied, regardless of whether any DRM lists had been studied. In Experiment 2, we held the number of previously tested associates constant, but manipulated their cumulative backward associative strength to the lure. We observed an increase in critical-lure FAs with an increase in the cumulative strength of previously tested items, but only for unstudied, not for studied, lists. Critical-lure FAs appear to be driven by the number of previously tested associates for studied DRM lists, but by such associative activation mechanisms in false recognition and suggest that these results are evidence in support of the important role played by associative activation mechanisms in false recognition and suggest that the thematic consistency of the list is likely to have limited impact when associative strength is kept constant.

• **Metamemory/Metacognition** •

(1091) **Memory Illusions and Amnesia: Korsakoff Patients’ Performance in the DRM Paradigm.** ILSE VAN DAMME & GÉRY d’YDEWALLE, University of Leuven (sponsored by Géry d’Ydevelle)—Recent studies with the Deese/Roediger–McDermott (DRM) paradigm have revealed that not only impaired veridical memory, but also diminished false memory, is characteristic of Korsakoff patients’ amnesia. Because of the typically used explicit retrieval instructions, however, this finding may reflect problems at encoding, at recollection, or both. Therefore, three experiments examined implicit as well as explicit memory for nonstudied words (associatively related to studied words), in Korsakoff patients and in memory-intact controls. Implicit stem completion was tested either at the end of the experiment or immediately after study. In addition, three types of explicit memory tests were used (i.e., cued recall, free recall, and recognition). Both encoding instructions and encoding duration were manipulated. The results revealed that Korsakoff patients' veridical and false memory scores were only diminished when explicit recollection was required, not when memory was tested implicitly. Intentional learning instructions and increased study duration enhanced explicit memory performance for both groups.

(1092) **Context Changes Affect Correct but Not False Recall.** JOSHUA A. WOODS, HELEN L. WILSON, & STEPHEN A. DEWHURST, Lancaster University (sponsored by John Tows)—Two experiments investigated the effects of context changes on correct and false recall using the Deese/Roediger–McDermott procedure. In Experiment 1, a manipulation of odor context (rosemary vs. cinnamon) showed that correct recall was greater when the same odor was present at study and test, with no effect of odor context on false recall. In Experiment 2, a manipulation of environmental context (indoors vs. outdoors) produced a reverse context-dependent effect, whereby correct recall was higher in the changed context conditions. Again, no effects of context were observed in false recall. Theoretical implications of these findings are discussed.

(1093) **Differential Effects of the Number of Associates on False Recognition and Thematic Identification.** ANGEL FERNANDEZ, University of Salamanca, MARIA A. ALONSO, University of La Laguna, & EMILIANO DIEZ, University of Salamanca—Our previous research with the Deese/Roediger–McDermott (DRM) paradigm has shown that when the associative relationship between studied items and the critical word remains constant, variations in the number of studied associates do not significantly affect the level of false recognition. In a new experiment, with the same type of materials, we have found that the number of associates included in a list is critical for the task of identifying the theme or gist of the list, with theme identification reliably increasing as the number of associates increases from two to six. Taken together, these results are evidence in support of the important role played by associative activation mechanisms in false recognition and suggest that the thematic consistency of the list is likely to have limited impact when associative strength is kept constant.

(1094) **Agenda-Based Regulation of Study Decisions.** ROBERT ARIEL & JOHN DUNLOSKY, Kent State University (sponsored by John Dunlosky)—Theories of self-regulated study have indicated that learners monitor item difficulty to decide which items to select for restudy. We propose that item selection is also driven by learners’ agendas, which may override any influence of item difficulty. According to this agenda-based-regulation (ABR) model, learners develop a agenda to guide decisions about how to allocate their study time when faced with various task constraints, such as reward structure or time available for study. In three experiments, learners studied items, had an initial recall trial, and selected half of the items for restudy according to the number of previously tested associates for studied DRM lists, by which associates’ cumulative backward associative strength for nonstudied lists.

(1095) **Are Hole-in-Memory States Different From Tip-of-the-Tongue States?** BENNETT L. SCHWARTZ, Florida International University—French speakers use two terms to refer to the feeling of temporary inaccessibility. One expression, which translates as “on the tip of the tongue”
the validity of misinformation. Performance is high. These results concur with other eyewitness memory studies—recently collecting data from French-speaking participants.

Multiple Sources of Evidence in Confidence Processing. JORDAN R. SCHOENHERR, CRAIG LETH-STEENSEN, & WILLIAM M. PETRUSIC, Carleton University (sponsored by William M. Petrusic)—Three experiments examined the effect of flanking stimuli on a line bisection task. A flanking “X” stimulus was used in Experiment 1, resulting in significant changes in subjective confidence levels without influencing the primary decision in the same manner. In Experiment 2, flanking numerals from the confidence scale (60 and 90) had a greater impact on the confidence level than did those outside the scale (20 and 40). In Experiment 3, sets of flanking words that were related to the primary decision (“longer” or “shorter” and “right” or “left”) influenced both bisection judgments and confidence levels. In both Experiments 2 and 3, the order of the confidence report relative to the primary decision response selection also proved to influence confidence level. We conclude that the confidence process uses sources of information over and above those of the primary decision. In this way, confidence processing exhibits properties similar to other metacognitive judgments.

Aging and Monitoring Associative and Item-Specific Encoding. MEREDITH M. PATTERSON & CHRISTOPHER HERTZOG, Georgia Institute of Technology (sponsored by Leah Light)—Young and older adults were taught interactive imagery as a strategy for learning word pairs. In the control condition, participants viewed word pairs, formed an interactive image for each, and made a judgment of learning (JOL) on the pair. In the experimental condition, participants formed mental images and made JOLs for both members of each pair, then formed an interactive image and made a JOL for the partner. Participants in both conditions then completed four-alternative forced choice item and associative recognition tasks. No evidence of an associative deficit for older adults was found in either condition. Focusing on the individual members of word pairs boosted item recognition for both age groups but had no effect on associative recognition. There was a main effect of test, with more accurate JOLs for associative than for item recognition.

Categories and Concepts

The Neuronal Basis of Category Learning by Comparison. RUBI HAMMER, Hebrew University, ANDRÉ BRECHMANN & FRANK OHL, Leibniz Institute for Neurobiology, & DAPHNA WEINSHALL & SHAUL HOCHSTEIN, Hebrew University (sponsored by Shlomo Benit)—Accumulated evidence from cognitive and neurological studies has suggested that category learning involves more than one process. Recently, we distinguished between two types of category learning processes: learning by comparison of exemplars from the same category versus learning by comparison of exemplars from different categories. Here, we present an fMRI study demonstrating that these two processes differ also in their underlying neuronal mechanisms. We show that when participants learn a new rule-based categorization principle by comparing different-class exemplars, the learning process is associated with significantly higher BOLD signal in the dorsal striatum than when participants are trained by comparing same-class exemplars. This effect does not seem to be associated with the complexity of the categorization rule or with participants’ success in the task. Our findings are compatible with the possibility that the dorsal striatum is more involved in processing between-category informative variation than in processing within-category variation.

Effects of Feedback on Maintaining Categorization Strategy in Humans and Rhesus Macaques (Macaca mulatta). JOSEPH BOOMER, MARIANA V. COUTINHO, JUSTIN J. COUCHMAN, & J. DAVID SMITH, University at Buffalo (sponsored by J. David Smith)—We investigated whether categorization by humans and rhesus monkeys depends on feedback signals. Members of both species learned to classify multicolored disks into one of two categories through trial-by-trial feedback. After category learning to criterion, the subjects were tested further, either without feedback (humans) or with feedback deferred until
after each block of trials (humans and monkeys). Humans’ performance continued at high levels, demonstrating a capacity to hold in mind their categorization strategy and continue to apply it. Performance of the monkeys quickly fell to chance after immediate feedback was withdrawn. Monkeys showed a deficit in their ability to bridge from trial to trial using only their own, internal task construal. Humans demonstrated a more robust capacity to sustain a cognitive set without feedback, perhaps indicating their use of a verbalizable response-mapping system.

**Empirical Evidence for Role-Governed Categories.** MICAH B. GOLDWATER, C. HUNT STILWELL, & ARTHUR B. MARKMAN, University of Texas, Austin—Role-governed categories (Markman & Stilwell, 2001) are defined by the roles their members play in events. For example, guests and hosts play different roles in visiting events. These natural categories are ubiquitous, but they are rarely studied. We demonstrate, first, that role-governed categories have prominent ide-

These natural categories are ubiquitous, but they are rarely studied. We demonstrate, first, that role-governed categories have prominent ideals (based on ideal role-fillers), whereas feature-based categories have demonstrated, first, that role-governed categories have prominent ide-

**Rule-Defined and Non-Rule-Defined Category Learning in Children.** SARAH J. MILES & JOHN PAUL MINDA, University of Western Ontario—Although category learning is well studied in adults, little research has been done on children’s category learning. Although the prefrontal cortex is involved in learning categories that are rule-defined (i.e., “If black, then Category A,” it seems to be less involved in learn-

Since the prefrontal cortex is not fully developed in children, it was expected that children would have trouble learning rule-defined categories but would be unimpaired in learning non-rule-defined categories. In a series of studies, 5-year-old children and adults learned to categorize items using either a rule-defined or a non-rule-defined strategy. It was found that adults used a rule-defined strategy more frequently than did children, suggesting that children do not have a fully developed rule-based category learning system. When a concurrent task taxed verbal working memory, adults performed similarly to children, suggesting that verbal working memory is a necessary component of rule-based category learning.

**Neurophysiological Dissociation of Rule-Based and Information Integration Category-Learning Mechanisms.** ROBERT G. MORRISON, PAUL J. REBER, & KEN A. PALLER, Northwestern University—Behavioral, neuropsychological, and neuroimaging evidence has suggested that categories can often be learned via either explicit or implicit mechanisms. In this study, Gabor patches that varied on two dimensions were viewed by participants who learned categories via feedback. Different stimulus distributions can encourage participants to favor explicit rule-based or implicit information integration mecha-

Neyophysiological Dissociation of Rule-Based and Information Integration Category-Learning Mechanisms. ROBERT G. MORRISON, PAUL J. REBER, & KEN A. PALLER, Northwestern University—Behavioral, neuropsychological, and neuroimaging evidence has suggested that categories can often be learned via either explicit or implicit mechanisms. In this study, Gabor patches that varied on two dimensions were viewed by participants who learned categories via feedback. Different stimulus distributions can encourage participants to favor explicit rule-based or implicit information integration mechanisms (Maddox, Ashby, & Bohil, 2003). We monitored brain activity with scalp encephalography while participants (1) passively observed Gabor patches, (2) categorized patches from one distribution, and, (1 week later, (3) categorized patches from another distribution. Be-

havioral performance was matched across the two learning conditions, which nevertheless elicited several distinct event-related potentials. These results demonstrate the efficacy of real-time neural monitoring during category learning and provide additional evidence implicating different neurocognitive mechanisms in explicit rule-based versus implicit information integration category learning.

**Beyond the Solution: Problem Solving As Category Learning.** JESSIE BIRDWHISTELL, University of Kentucky, & SETH CHIN-
many methods suppress rule violations, but few produce lasting cautious- 
ess. Furthermore, transfer may occur even in the control condition.

(1110) Features Associated With Thematic Roles of Claim Predicates Deter-
mine Reason Acceptability. AARON A. LARSON & M. ANNE BRITT,
Northern Illinois University, CHRISTOPHER R. WOLFE, Miami Uni-
versity; JOSEPH JORDAN & KEITH M. MILLER, Northwestern Illinois
University (sponsored by Christopher R. Wolfe)—A model of argument
processing must explain how one determines whether a reason supports a
claim. For example, why does the reason “many sentenced to death were
found innocent using DNA” support a claim about the immorality of the
death penalty but not a claim about its ineffectiveness? One candidate
for guiding this claim–reason connection is the possible set of features
associated with thematic roles of claim predicates. Study 1 had partici-
pants list features for the agent and patient of argument predicates (e.g.,
“should ban”). Study 2 found that this set of features accurately captured
the set of reasons supporting claims in arguments from a corpus analysis.
Study 3 demonstrated that arguments with reasons that match with the
predicate features were rated stronger than those that did not match.
These results can form the basis for a model of argument processing and
can guide interventions aimed at improving argumentation skills.

(1111) Updating Causes Along a Typicality Dimension. ANNIE PESHKAM,
Northwestern University, PANAYIOTA KENDEOU, McGill University,
& DAVID N. RAPP, Northwestern University (sponsored by David N.
Rapp)—Readers often learn about causes of events and later find these
causes refuted or corrected with more accurate or detailed explanations.
Nevertheless, readers appear to, problematically, rely on earlier, inaccu-
rate causes (Seifert, 2002). The present study investigated whether such
reliance is a general effect or is potentially influenced by the typicality
of causes. We had participants read a story about a warehouse fire that
provided either a typical (i.e., Experiment 1) or an atypical (i.e., Experi-
ment 2) cause. In both experiments, this cause was potentially refuted
with either a typical or an atypical alternative. We measured participants’
mentions of possible causes, as well as endorsements for the likely cause,
with recall and questionnaire protocols. Participants were equally likely
to mention the original cause, regardless of the typicality of the alterna-
tive, but their endorsements were a function of typicality. These findings
detail the ways in which alternatives can impact beliefs about causality,
as well as how measures differentially reflect causal processing.

(1112) Inductive Reasoning in Parkinson’s Disease: Declines in Abstract
Thinking. AMANDA L. PRICE, Elizabethtown College—Parkinson’s
disease (PD) is associated with concept formation impairment, which
may reflect ineffective responses to feedback. To assess this possibility,
18 PD patients and 19 age-matched controls completed the twenty
questions task, which requires participants to ask a series of questions
to identify a target item from a set of 30 images. The images can be
organized along a series of hierarchical categories. PD patients were
less likely to make use of this organization, tending instead to rely on
simple, concrete questions that ruled out only one item. Patients’ ques-
tions did not suggest an increased tendency to perseverate or inappro-
priately change mental set, suggesting a normal response to feedback.
Reasoning performance was associated with working memory capacity,
suggesting that concept formation requires rapid, online comparison of
the available stimuli. Together, these data indicate that concept forma-
tion deficits in PD reflect difficulty generating abstract rules rather than
ineffective use of feedback.

• JUDGMENT/DECISION MAKING •

(1113) Comparison-Induced Evaluations Around a Reference Point.
AMBER N. BLOOMFIELD & JESSICA M. CHOPLIN, DePaul Uni-
versity—We investigated the extent to which biases created by verbal
comparisons between values (comparison-induced distortion theory;
Choplin & Hummel, 2002), rather than the psychophysical phenomenon
described by Stevens’s (1961) power law (e.g., Kalhonen & Tversky,
1997), create evaluation biases around reference points (RPs). In par-
cular, comparison-induced distortion theory suggests that people
use language to describe values relative to RPs (e.g., the probability of
describing values as “approximately the same,” or differences implied
by verbal comparisons) might create key characteristics of the evaluation
function surrounding RPs. In the present studies, participants compared
values with an RP and then evaluated options relative to an RP
using a magnitude estimation paradigm (Stevens, 1975). We manipu-
lated comparison phrases to suggest either large (e.g., “same/different
ballpark”) or small (e.g., “same/different”) differences. Magnitude esti-
mations were consistent with the predictions of comparison-induced
distortion theory.

(1114) Risk-Taking Behavior Is Mediated by Slow-Wave Frequencies: An
EEG Study. GABRIELLA PRAVETTONI & CLAUDIO LUCCHIARI,
University of Milan (sponsored by Remo Job)—The pattern of neural
 correlates of risk-taking behavior has been the object of several studies. In
particular, the dynamics of neural activity may be proficiently cap-
tured by methodologies with a high temporal resolution, such as EEG
analysis. We used a gambling paradigm that provides a measure of deci-
sion making under risk. Fifteen healthy volunteers took part in the study
(7 women and 8 men, ages 18–29, M = 24.12, SD = 3.18). The EEG was
recorded with a 32-channel DC amplifier, before (5-min baseline) and
during the task. Slow-wave frequency (4–8 Hz) oscillations appeared
to vary with risk-taking behavior, showing a greater increment after a
 risky choice. Furthermore, the analysis of the basal EEG revealed the
theta/beta ratio could discriminate between gambling and conservative
subjects. Slow-wave frequencies seem to be a physiological correlate of a
cortico-subcortical circuit that modulates decisional behavior (Shutter
et al., 2006).

(1115) There Is No Heuristic System: Evidence of Reflective Heuristic
Processing. EDWARD T. COKELY & PAULA PARPART, Max Planck
Institute for Human Development—Some researchers have suggested
that reasoning and judgment may involve two separate systems—an au-
tomatic, intuitive System 1 (also called “the heuristic system”) and
a controlled and rule-based System 2 (Stanovich & West, 2000). Although
these constructs are increasingly relied upon to explain and interpret
data, there is controversy about their nature (Gigerenzer, 1996; Mosh-
man, 2000). The present research challenges the interpretation that there
is only one heuristic system (i.e., “System 1”). We demonstrate that the
use of fluency in judgment, which is commonly associated with auto-
matic processing, can also rely on controlled, reflective (“System 2”) pro-
cessing. Specifically, in an estimation task, more controlled processing
paradoxically leads to an increased reliance on fluency as a cue for
judgment. The results converge to suggest that there is no heuristic sys-
tem, because some heuristic processes require reflective and controlled
processing (Cokely, 2007). Implications for dual-process theories are
discussed.

(1116) Tracking Memory Search for Cue Information. GEOGHEN JUHN,
University of Greifswald, FRANK RENKEWITZ, University of Erfurt,
& JOSEF F. KREMS, Chemnitz University of Technology—In studying
memory-based multivariate decision making, information search can-
not be directly observed. We report an experiment employing a process-
 tracing method that may be applicable for investigating memory-based
decisions. Participants learned about the attributes of decision alterna-
tives from pictures with verbal labels. Later, they were told about the
validities of attribute classes and performed pairwise memory-based
decisions following instructed decision strategies. During decision mak-
ing, they saw only the pictures, without the verbal labels. We recorded
participants’ eye movements to see whether the instructed decision
strategies would be discriminable in gaze patterns on the now-empty
pictures. This exploration was based on earlier findings showing that,
while remembering information no longer visible, individuals tend to

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look where the information was before. Gaze patterns could be related to the patterns of information search associated with the instructed decision strategies.

(117) Framing Effects of Emotion Words and Desire. JOANNE INGRAM, LINDA M. MOXEY, & RUTH FILIK, University of Glasgow (sponsored by Ruth Filik)—Prior research has suggested that logically equivalent volume statements are interpreted using reference points. The present eye-tracking experiment investigated whether manipulating reference points using emotion words and desirable situations could affect the interpretation of the volume statements, “half full” and “half empty.” Intuitively, in sentences in which “full” is the desirable volume, such as “The actor was excited/annoyed because the theatre was half full/half empty,” “half full” appears consistent with the positive emotion (excited) and “half empty” with the negative emotion (annoyed). Regression path reading times, total reading times, and regressions into the emotion region (excited/annoyed) indicated that negative emotions were consistent with “half empty” statements but, conversely, that positive emotions were not consistent with “half full” statements. When desire is for “full,” “half full” may have been interpreted as the pragmatic “not full.” These results have implications for discussions of attribute framing and for theoretical debates on the “not all” inference.

- BILINGUALISM -

(118) Lexical Properties Influence Cross-Language Phonetic Interactions. MATTHEW BERENDS, Northwestern University, RIEUS VERDON-SCHOT, Leiden University, & MATTHEW GOLDRICK, Northwestern University (sponsored by Matthew Goldrick)—A large body of work has shown that properties of a speaker’s native language (L1) influence their pronunciation of sounds in a second language (L2). For example, Japanese words do not end in stop consonants, leading to difficulties in producing English words with this phonological structure (as shown in borrowings such as fight → faiit). We examined the extent to which this L1 interference can be influenced by L2 lexical properties. Native speakers of Japanese and English produced monosyllabic English words and nonwords matched in phonological complexity. The articulatory properties of the groups’ final-stop production were then compared. Japanese speakers’ productions were more English-like in words than in matched nonwords (e.g., Japanese speakers produced a more English-like final /p/ in map than in bap). This suggests that lexical properties influence phonetic processing. Lexical representations of L2 words facilitate their phonetic processing, suppressing intrusions from the L1 sound system.

(119) The Processing of Derivational Morphology in Korean–English Bilingual Readers. SAY YOUNG KIM, MIN WANG, & IN YEONG KO, University of Maryland, College Park (sponsored by Rochelle Neuhman)—Two experiments using a lexical-decision priming paradigm were conducted to examine whether cross-language activation during the processing of derived words in Korean–English bilingual readers occurs via decomposition. In Experiment 1, when participants were given a real-derived word and an interpretable pseudo-derived word (i.e., an illegal combination of a stem and a suffix) in Korean as a prime, response times for the corresponding English translated stems were significantly faster than in the control condition, with an unrelated word prime. In Experiment 2, nonmorphological ending words (i.e., illegal combinations of a stem and an orthographic ending) elicited no priming effect on latencies for targets relative to the controls. From these findings, we suggest that cross-language activation of morphologically complex words occurs in bilingual reading, and furthermore that bilingual readers decompose complex words and are sensitive to morphological structure, not lexicality, in agreement with similar findings in monolingual studies.

(120) Interlingual Homograph Recognition by English–French and French–English Bilinguals. LYNNE N. KENNETTE, Wayne State University, LORI BUCHANAN & TANIA COLLET-NAJEM, University of Windsor, & LISA R. VAN HAVERMAET, Wayne State University (sponsored by Patricia Sipe)—Bilinguals were presented with lists of English words, French words, and interlingual homographs (IHs), which are words that exist in both lexicons but differ in meaning (e.g., lit means “bed” in French). Participants were shown pictorial representations of these stimuli (and both referents for the IHs) and asked to decide whether each had appeared on the prior list. It was expected that IH words would result in more interference (slower RTs). It was also predicted that French-dominant individuals would be faster at retrieving information from their French lexicons than from their English lexicons (and vice versa for the English-dominant). The results showed main effects of word category for both accuracy and RTs: Performance on both types of IH words was similar and significantly slower than on non-IH words. The second prediction was partially supported: The interaction term was marginally significant ($p < .06$), but only the French-dominant performance on French IH referents was as predicted.

(1121) The Role of Cross Language Activation on the Resolution of Syntactic Ambiguity. LI-HAO YEH & ANA I. SCHWARTZ, University of Texas, El Paso—Syntactic ambiguity refers to when a sentence can be interpreted differently. For example, in the sentence “She left the piano in the barn which was once owned by her neighbor ten years ago,” “which” can either refer to the piano or the barn. Previous studies have shown that Spanish speakers prefer to attach the high noun phrase (NP) (“piano”) and English speakers prefer to attach the low NP (“barn”). The goal of the current study was to investigate whether bilinguals’ syntactic resolution preferences would be further influenced by cross-language lexical activation of the nontarget language. We predicted that cross-language activation of the cognate would influence attachment preferences. More specifically, the lexical transparency of cognates might facilitate the more cognitively taxing high-attachment tendency, leading to faster processing of sentences, forcing high attachment. The results are discussed in terms of existing bilingual lexical models and models of sentence processing.

(1122) Bilingual Lexical Activation Within Sentence Contexts: Evidence From Eye Movements. CAROLINE ENGSTLER, MATTHEW GOLD-RICK, & VIORICA MARIAN, Northwestern University (sponsored by Viorica Marian)—Research has shown that, in auditory processing of single words, bilinguals co-activate both languages in parallel. We examined whether this phenomenon generalizes to auditory sentence comprehension. Using the visual-world paradigm, eye movements were recorded while German–English bilinguals listened to high- and low-constraint sentences. The results revealed activation of the nontarget language. When processing target words (e.g., “pills”) in English sentences, bilinguals looked more often at competitor pictures whose German name overlapped phonologically with the target (e.g., “mushroom”; German form, Pilz) than at phonologically and semantically unrelated pictures. The degree of nontarget language activation was modulated by whether the target occurred within a predictable or an unpredictable sentence context and by the lexical status of the target (cognate vs. noncognate). Findings suggest that bilinguals show bottom-up co-activation of both languages through phonological overlap of target and competitor, whereas sentence context constrains co-activation in a top-down manner through the level of predictability of the target.

(1123) Effects of Bilingualism on Flexibility and Abstract Reasoning. DENISE PANEDURO, York University, MARIA KHARITONOVA, University of Colorado, Boulder, & NICHOLAS J. CEPEDA, York University—Previous research has demonstrated that bilingual children are more likely than their monolingual peers to flexibly switch from sorting cards by one rule (e.g., by color) to sorting by another rule (e.g., by shape). Additionally, flexible switchers are more successful than perseverators at applying their behavior to novel instances, showing an early-developing synergy between flexibility and generalization. The present study sought to replicate the bilingual advantage on flexibility and to assess whether
the advantage extends to generalization. Bilingual and monolingual pre-
schoolers first sorted cards according to one rule (e.g., shape), then had
to switch to a second rule (e.g., color), and then were asked to continue
their behavior with novel cards. We predicted that bilinguals would out-
perform monolinguals not only on the flexibility task (consistent with
previous research on the bilingual advantage), but also on the generaliza-
tion task (consistent with research showing a flexibility–generalization
link). The results and implications are discussed.

Performance on Complex Second Language Tasks Under Back-
ground Speech Noise.ERICA B. MICHAEL, PETRA BRADLEY,
CARRIE CLARADY, MICHELLE FALK, & JENNIFER JANESH, Uni-
versity of Maryland, College Park, & JUNE J. PILCHER, Clemson Uni-
versity—Professional language work (e.g., translation or interpretation)
often occurs under noisy and distracting conditions. Research has indi-
cated that speech perception, memory, and other tasks suffer in noise,
with larger consequences in a second language (L2). Studies have rarely
examined individuals with extremely high L2 proficiency, however, and
tasks have typically been limited to word or sentence comprehension.
In the present study, 29 language professionals completed language and
cognitive tasks in English (their L2) under conditions of background
speech/office noise versus relative quiet. Language tasks (transcription,
auditory scanning, GRE Verbal test) were designed to simulate job tasks
performed by language professionals. Cognitive tasks included working
memory and psychomotor vigilance tasks and represented some of the
cognitive components involved in language work. The primary result
was that transcription speed, but not accuracy, suffered under noise. In
addition, performance on cognitive tasks indicated some declines in lan-
guage performance under noise.
Perceptual Interaction Between Component and Configural Properties in Face Perception. RAMA AMISHAV & RUTH KIMCHI, University of Haifa (sponsored by Ruth Kimchi)—We examined the relative dominance of configural (spatial–relational) and component properties in face perception, using Garner’s selective attention paradigm. Observers were able to selectively attend to one component (e.g., nose) while ignoring irrelevant variations in another component (e.g., mouth), or to selectively attend to one configural property (e.g., intereye distance) while ignoring variations in another configural property (e.g., nose–mouth distance). When both types of properties varied in upright faces, symmetric interference from irrelevant variation was obtained: Observers were unable to selectively attend to components while ignoring irrelevant variations in configural properties, and vice versa. Performance with inverted faces showed asymmetric interference from component to configural properties, indicating relative dominance of components. These results indicate that component and configural properties interact in the perception of upright faces. This mutual interaction between component and configural properties, rather than the relative dominance of the latter, may be the hallmark of face perception.

Dissociating Response Interference From Holistic Processing in the Composite Task. JENNIFER J. RICHLER & OLIVIA S. CHEUNG, Vanderbilt University, ALAN C.-N. WONG, Chinese University of Hong Kong, & ISABEL GAUTHIER, Vanderbilt University (sponsored by Isabel Gauthier)—Holistic processing of faces can be measured as failures of selective attention to one face half under instructions to ignore the other face half during naming or same/different matching tasks. But is interference from the irrelevant half due to response interference, rather than to true holistic processing? Participants learned to name two faces “Fred” and two “Bob.” At test, composites were created from the top and bottom halves of different learned faces or a novel face. Naming one face half was less accurate only when the irrelevant half was associated with a different name, indicative of response interference. However, naming was slower when the irrelevant half was from a different face versus the same face, regardless of whether it was associated with the same name, a different name, or no name, suggesting holistic processing. These results suggest that holistic processing can be measured separately from response interference in the composite task.

Active Exploration and 3-D Face Recognition: Electrophysiological Evidence. JIE SUI & CHANG HONG LIU, University of Hall, & JOHN M. KENNEDY, University of Toronto, Scarborough—Neural mechanisms offering an advantage to active manual control of visual stimuli in face recognition were investigated using event-related potentials. Observers judged whether two sequentially presented faces were the same person. The observers in the active condition explored 3-D views of the first face, using a mouse. The observers in the passive condition simply viewed a replay of the sequence generated by the active observers. The second face was a single static image presented in a different view. Matched faces produced a greater P1 in the active than in the passive condition. This may be an early global processing advantage for faces learned through active exploration. Also, the active condition produced a greater N250r, which may show that active exploration at encoding affects the retrieval of visual memories.

Relation Between Load Independence and Configural Processing for Face Recognition. CATHERINE L. REED, Claremont McKenna College, & PAULA M. BEALL & DANIEL N. McINTOSH, University of Denver—Relations among expertise, automaticity, and configural processing have been assumed for face recognition but have not been directly tested. This study investigated what aspects of configural processing are necessary for the automatic recognition of faces, using a load independence paradigm (Lavie, Ro, & Russell, 2003). Five experiments manipulated congruency between a task-irrelevant face and a task-relevant name and the search-set size for names. They replicated the upright face congruency effect (faster RTs when faces matched the name) and demonstrated load-independent processing (congruency effects regardless of set size). Subsequent experiments manipulated face orientation, spatial distances among features, and salient hair features. Only inversion disrupted load independence. The automatic processing of faces may rely on information that best distinguishes faces, including first-order configurual relations and salient features.

Investigating the Motion Parameters Important in Famous Face Recognition. NATALIE L. BUTCHER & KAREN LANDER, University of Manchester (sponsored by Andrew Stewart)—In a series of experiments, we investigated the effect of motion on familiar face recognition and tried to identify the parameters important to the moving face recognition advantage. Participants were asked to recognize famous faces and rate moving clips on various factors, including familiarity, how much motion was perceived, and distinctiveness of the facial motion displayed. The results demonstrated that both the recognition of moving faces (Experiment 1) and the recognition advantage for moving faces (as compared with static ones; Experiment 2) is mediated by the type of motion shown. Further work (Experiment 3) explored whether the amount and distinctiveness of facial motion were linked to the clip shown or were related to the famous face identity (consistent across clips). Work is discussed with regard to characteristic motion patterns and the nature of the stored face representations.

Individual Differences in the Development of Face Recognition. PATRICIA A. MCMULLEN, AMY C. McPHERSON, & PHILIP J. DUNHAM, Dalhousie University—Individual differences in the development of configural face processing ability were assessed in 7- and 11-year-old children and in adults. A recognition memory task using upright and inverted faces and a modified Mooney face detection task were administered. Recognition time was greater for inverted than for upright faces for 11-year-olds and adults, but not for 7-year-olds, supporting a maturational gradient of configural processing. However, 24% of the adults failed to show this pattern, indicating that a large percentage of adults do not achieve configural face processing as tested in this manner. This percentage was even larger for children. Correlations between upright and inverted face recognition and Mooney face detection were consistent with increasing separation of the processes underlying these tasks with age. For children, all the tasks were correlated. For adults, Mooney face detection was correlated only with upright face detection. The results support a maturation of configural face processing to varying degrees within individuals.

Affective Priming With Schematic and Grayscale Faces. DEAN G. PURCELL, Oakland University, & ALAN L. STEWART, Stevens Institute of Technology—Sequences of prime and target faces with angry, happy, or neutral expressions were separated by 305 msec. In conventional affective-priming tasks, observers report only the affect of the prime. Our observers determined whether the two faces displayed the same or a different affect. Experiment 1 used schematic faces as primes and targets. We found that affective priming with congruent stimuli produced faster reaction times than did affectively incongruent stimuli. Experiment 2 also used schematic target faces, but primes were grayscale pictures, rather than schematic drawings. Grayscale primes evoked slower reaction times than did our schematic primes. Unlike in Experiment 1, a congruency effect was not found for the angry primes. For the happy and angry faces of Experiment 2, happy primes produced shorter reaction times regardless of the affect of the target, and reaction times were longer for angry targets regardless of the prime’s affect.

Interactions Between Identity-Specific and Visually Derived Semantic Codes in Face Processing. RACHEL ROGERS & ROBERT A. JOHNSTON, University of Kent—Contemporary models of face recognition
distinguish two sorts of semantic information available from a face: identity-specific semantic codes and visually derived semantic codes (Bruce & Young, 1986). Access to the former (e.g., biographical information) has been extensively investigated, but the latter have mainly been used as marker variables for examining other aspects of face recognition (e.g., attractiveness, distinctiveness. masculinity/femininity). It is usually assumed that these attributes are invariant. This may be true for unfamiliar faces, but in experiments employing familiar faces, perception of these characteristics may vary with participants' knowledge of the stimuli. In a series of experiments, participants were familiarized with attributes of previously unfamiliar people and then required to make ratings of various physical characteristics. The findings reveal a complex interrelationship between facts known about a person and the derivation of visually derived codes from his or her face. The implications for employing these variables in face-processing experiments are discussed.

(2009)
Race and the Structural Encoding of Faces. HEATH E. MATHESON & AARON J. NEWMAN, Dalhousie University (sponsored by Raymond Klein)—Using event-related potentials, researchers have revealed an early negative component—the N170—that is larger in response to faces than to other classes of objects. It is thought that this component reflects processes that encode the structure of the face. Importantly, it has been shown that the N170 is not sensitive to the age or gender of the face, suggesting that this type of information is extracted at a different stage. However, it is unclear whether this stage is sensitive to the race of the face. In the present experiment, event-related potentials were recorded while participants viewed faces of three different races. It was shown that race had no effect on the N170, a finding consistent with the notion that race is extracted from a face image either before or after the basic structure has been encoded.

(2010)
Dissociating Between the Role of Exposure and Individuation in Perceptual Expertise. YONATAN GOSHEN-GOTTSTEIN, KEREN HALSBAND, & GALIT YOVEL, Tel-Aviv University (sponsored by Yonatan Goshen-Gottstein)—Perceptual experience plays a major role in our ability to recognize objects. Two factors usually operate in concert to achieve perceptual expertise: massive exposure to the stimuli of expertise, together with an attempt to individuate them. Here, we attempted to dissociate between these factors. Adult participants discriminated faces of adults and newborn faces in a delayed matching-to-sample task. Performance was better for adult than for newborn faces. To assess the unique roles of exposure and individuation, we tested neonatology nurses who had been highly exposed to newborn faces but did not attempt to individuate them on the basis of facial features. Interestingly, recognition of newborn faces was not better in these nurses than in age-matched controls. In a second study, a short individuation training with newborn faces improved recognition of novel newborn faces in participants who had minimal exposure to newborn faces. Thus, the quality, rather than the quantity, of experience determines recognition abilities.

• 3-D/MOVEMENT PERCEPTION •

(2011)
Fast Extraction of Absolute Distance Information Facilitated by Previous Views of Real-World Environment. DANIEL A. GAJEWSKI & JOHN W. PHILBECK, George Washington University—Previous research has established that humans can walk without vision to previewed targets without large systematic error and that they can do so with equal accuracy under brief and extended viewing conditions. The present study compared the accuracy and precision of blindwalking performance with brief (113-msec) and extended (5-sec) viewing durations, with the aim of determining the role for learning in equivalent performance. Participants briefly viewed targets placed at floor level 3–5 m distant through a liquid crystal shutter that provided precisely controlled glimpses of a real, naturally lit indoor room, followed by a visual mask. Accuracy and precision were equivalent at both viewing durations, but errors were greater in the brief viewing condition when the block of brief viewing trials was administered first. The results suggest that information acquired from long-duration viewing facilitates the later extraction of distance information during brief glimpses.

(2012)
The Influence of Social Cognition on Perception of Human Movement. AYA J. SENKFOR, Wayne State University (sponsored by Cynthia May)—Real-world perceptions of people in motion contain numerous social and nonsocial contexts. These contexts play a significant, but unclear, role in our perceptions. Although investigations have evaluated perceptual biases associated with human movement, it is unclear how social and nonsocial contexts alter these perceptual biases. Three experiments investigated the modulation of perceptual biases during observation of movement containing social and nonsocial contexts. In Experiment 1, images of a hand moving toward or away from the body (nonsocial body context) were shown. Participants evaluated the distance the hand moved. Accuracy levels varied across different movement patterns and body contexts. In Experiments 2 and 3, the same images of human movement toward/away from the body were presented but also different social contexts were included (age, emotion). Both types of social contexts facilitated accuracy. However, the two contexts differentially influenced accuracy across movement patterns and body context. Changes in perception across contexts are discussed.

(2013)
The Memory of the Ground Surface Representation for Space Perception. LEI ZHU, East China Normal University, ZHIJANG J. HE, University of Louisville, & TENGEN OOI, Salus University—How long is the ground surface representation, which serves as a reference frame for space perception, retained after the visual image of the ground disappears? To answer this, we measured in the dark the judged location of a dimly lit target 1 sec before and 1 sec, 2 sec, 2.5 sec, and 5 sec after (ISI) a 2 × 4 parallel array of LED-texture elements that delineated the level ground was extinguished. For all six target locations tested (3.25–7.00 m on/above the ground), judged locations were most accurate when the targets were seen with the textured ground and became progressively inaccurate when seen later in time without the textured ground. The pattern of judged locations (5 sec > 1 sec) tends toward that measured in total darkness without prior exposure to the textured ground, where targets are judged as located on an implicit slant surface (intrinsic bias). Thus, our findings suggest that the memory of the ground representation decays over several seconds toward the intrinsic bias.

(2014)
Reward-Maximizing Performance in Two-Alternative Decision Making. PATRICK A. SIMEN, Princeton University, DAVID CONTRERAS, University of Granada, CARA L. BUCK, University of California, San Diego, PETER HU, University of Chicago, & PHILIP HOLMES & JONATHAN D. COHEN, Princeton University—Bogacz et al. (2006) analyzed a simple drift-diffusion model (DDM) of performance in a two-alternative decision-making task in order to identify parameters (starting point and decision threshold) that maximize reward rate. These were used to make predictions about performance (choice of speed–accuracy trade-off) in response to manipulations of the response–stimulus interval (RSI) and asymmetries in stimulus frequency and the reward associated with each stimulus. We tested two sets of these predictions: (1) for shorter RSIs, participants should lower thresholds and reduce RT; (2) for certain combinations of stimulus frequency and reward asymmetries (when the starting point exceeds threshold), participants should treat the task as a signal detection task by making exclusively the response associated with the more frequent and/or rewarded stimulus as soon as any stimulus appears. We conducted a motion discrimination experiment, the results of which supported these predictions: Speed–accuracy trade-off adjustments and fast, exclusive responding occurred under predicted conditions.

• SPATIAL COGNITION •

(2015)
The Effect of Sense of Direction on Direction-Giving Processes. ALYCIJA M. HUND, Illinois State University—The goal of this project
was to understand how sense of direction (i.e., the ability to maintain one’s orientation relative to the environment) impacts the cues people use when providing wayfinding directions. In particular, do people with a keen sense of direction provide more cardinal descriptors and exact distances and more correct details overall than do people with a less keen sense of direction? Seventy-five participants provided directions to get from starting locations to destinations in a complex university building. They also completed two measures of sense of direction: a self-report form and a verbal measure that involved indicating the regular locations of landmarks. As was expected, the participants with a keen sense of direction were significantly more likely to provide distances and correct directions than were the participants with a low sense of direction, indicating that sense of direction impacts direction-giving processes.

(2016) Egocentric and Intrinsic Frames of Reference in Haptic Spatial Learning, NAOHIDE YAMAMOTO & JOHN W. PHILBECK, George Washington University—This study investigated how a tabletop-sized spatial layout is represented in memory when it is learned through touch. The layout had an intrinsic axis about which object locations were bilaterally symmetrical. When participants were misaligned with the intrinsic axis during learning but were informed of its presence by instructions, spatial relations among objects were retrieved more quickly at an imagined orientation parallel to the intrinsic axis. Without those instructions, an egocentric orientation experienced during learning enabled faster retrieval. In addition, when both intrinsic and nonintrinsic orientations were learned, the intrinsic orientation elicited faster performance. These results indicate that both intrinsic and egocentric reference frames are used when haptically encoding a small spatial layout, extending previous findings from visual learning of a room-sized environment. Together, these findings suggest some functional similarities, among spatial memories of small-scale and large-scale environments, as well as those acquired through different modalities.

(2017) Alignment Effects in Linguistically Encoded Environments, MARIOS N. AVRAAMIDES, University of Cyprus, JONATHAN W. KELLY, Vanderbilt University, & ANDRIA G. SHIMI, University of Oxford—Three experiments examined whether a sensorimotor alignment effect (i.e., an advantage for spatial judgments carried out from imagined perspectives aligned with the body) and a memory-encoding alignment effect (i.e., an advantage for spatial judgments performed from imagined perspectives aligned with the learning perspective) would be present with environments encoded through linguistic statements. The results revealed that a sensorimotor alignment effect was present when participants were tested in the same room as that in which they had encoded the environment, but not when they were tested in an adjacent room. However, a sensorimotor alignment effect did occur when the participants in the adjacent room were asked to visualize the described objects around them. A memory-encoding alignment effect was present in all the testing conditions. These results extend previous findings with visually encoded environments (Kelly, Avraamides, & Loomis, 2007), indirectly supporting the idea that spatial representations derived from different sources are functionally equivalent.

(2018) Mental Rotation Ability Depends on Both Sex and Gender Identity, COLE EISDON & KEITH B. LYLE, University of Louisville—Males outperform females on spatial cognition tasks such as mental rotation (e.g., Collins & Kimura, 1997). Here, we sought to determine whether spatial cognition depends on dimensions of gender identity (masculinity and femininity), as well as on sex (male vs. female). Gender identity has previously been shown to affect performance on tests of nonspatial cognition (e.g., Berg, Ingersoll, & Terry, 1985). To examine whether gender identity would affect spatial cognition in the present study, male and female undergraduate subjects were given a redrawn Vandenberg Mental Rotation Test (Peters, 1995) and the Bem Sex Role Inventory (Bem, 1974), which assesses masculinity and femininity on separate scales. Replicating past research, males outperformed females on the mental rotation test. The key novel finding was that, among females, mental rotation performance depended on degree of femininity: Low-femininity females significantly outperformed high-femininity females.

(2019) Egocentrically Defined Bias in Spatial Memory, JESSE Q. SARGENT, STEPHEN C. DOPKINS, & JOHN W. PHILBECK, George Washington University—Research suggests that memory for object locations may acquire systematic patterns of constant error, or bias. The present study explored the frame of reference within which such bias may be defined. Participants learned the location of six objects around them in a room, were blindfolded, and underwent a 70º passive whole-body rotation around a fixed vertical axis, then several back-and-forth turns meant to cause disorientation, and then four more 70º turns. After each turn or series of turns, the participants used a pointer to indicate the locations of the objects. Analyses showed evidence of egocentrically defined bias and no clear pattern of allocentrically defined bias. The results are interpreted as providing support for the influence of egocentric encoding of object locations in these circumstances.

(2020) Using Stroop Interference to Discern the Nature of Spatial Categories, DALE S. KLOPFER & BRANDI A. KLEIN, Bowling Green State University—Apprehending spatial terms (e.g., above) requires determining the direction from a reference object to a target. What about distance? Some researchers (e.g., Logan & Sadler, 1996) have found that the distance from the reference to the target object does not affect the apprehension of spatial relations; others (e.g., Carlson & Van Den, 2004) have found that it does. Our study capitalizes on the finding that the amount of Stroop interference varies with the similarity between the color of the word and the color denoted by the word: interference is greater with ORANGE in yellow than in blue ink. Spatial terms above and below were shown at three different distances above and below a fixation point, and participants named the location of the word. Interference was greater at the middle distance, consistent with the idea that spatial categories have prototypes within the vertical axes and that distance is relevant for apprehending spatial relations.

(2021) Differentiating Body Orientation and the Knowledge of Body Orientation in Spatial Updating, CHRISTOPHER J. TEETER, ANDREA M. SERGI, & HONG-JIN SUN, McMaster University (sponsored by Sue Becker)—In this study, we examined observers’ ability to continuously monitor relations between themselves and their environment. Participants learned the features of a room-sized spatial layout, were blindfolded, and were relocated to the room’s center. Once relocated, the participants assumed a body orientation (facing direction) that was either aligned or misaligned with learning orientation (E1). After being disoriented but informed of their body orientation (E2). The participants then made directional judgments to the spatial features of the room while adopting an imagined (mental) orientation that was either congruent or incongruent with the orientation of their body. Performance was significantly impaired when the participants adopted an imagined orientation that was incongruent with their body orientation. The extent of this impairment was greater in E1, demonstrating the difficulty in mentally overriding input from body-based sensory systems; however, the impairment observed in E2 extended such findings to reveal the residual effect of knowledge of body orientation.

• COGNITION AND EMOTION •

(2022) What is Pressure? Relating Social Pressure to Regulatory Focus, DARRELL A. WORTHY, W. TODD MADDOX, & ARTHUR B. MARKMAN, University of Texas, Austin (sponsored by W. Todd Maddox)—Previous research has suggested that pressure leads to choking when one learns to classify items on the basis of an explicit rule but leads to excelling when one learns to classify on the basis of an implicit strategy. In this work, we relate social pressure to regulatory focus theory. We propose that the effects of pressure on performance arise because pressure induces a prevention focus that interacts with the more local reward.
structure of the task. To test this hypothesis, we repeated the previous research with a losses reward structure, so that participants under pressure were not left in a regulatory fit. In contrast to previous results, participants attempting to minimize losses showed a delayed implicit-learning task but excelled on the explicit-learning tasks. The results suggest a three-way interaction between pressure level, task type, and reward structure.

(2023) The Automatic Processing of Threat: Preferential Attention Without Implicit Negative Valence. HELENA M. PURKIS & OTTMAR V. LIPP, University of Queensland—Theories of nonassociative fear acquisition propose that humans have an innate fear response to certain stimuli, such as snakes and spiders. This response may be mediated by an evolved fear module (Öhman & Mineka, 2001) that processes the perceptual features of threat stimuli and generates an automatic fear response. Visual search and affective priming tasks were used to examine attentional processing and implicit evaluation of snake and spider pictures in participants with different explicit attitudes: controls (n = 25) and snake and spider experts (n = 23). Attentional processing and implicit evaluation were found to diverge: Snakes and spiders were preferentially attended to by all the participants; however, they were negative only for the controls. This research suggests that although snakes and spiders are preferentially attended to, negative evaluations are not automatically elicited during this processing.

(2024) Effect of Partial Information on Novel Figures on the Mere Exposure Effect. HISAYO IMAI & YUKIKO ISHII, Tokyo Women’s Christian University (sponsored by Makiko Naka)—We examined the effect of partial information for novel figures on the mere exposure effect (MEE). Stimulus figures were 4 × 4 dot matrices with eight lines and 3 × 3 dot matrices with five lines. The 3 × 3 figures were embedded as parts of the 4 × 4 figures. Two hundred thirty-four undergraduates studied both 3 × 3 and 4 × 4 figures. Then they were presented with a studied and a non-studied pair of either 3 × 3 or 4 × 4 figures. Half of the participants chose more preferable figures, and the other half chose less preferable ones. The participants chose studied figures significantly more often than chance in 3 × 3 study conditions, regardless of test conditions for the more preferable choice, and significantly less often than chance in 3 × 3 test conditions, regardless of study conditions for the less preferable choice. These results indicate that partial information may induce MEE only for the more preferable choice. It is suggested that there may be an interactive effect between partial information and choice type on the MEE.

(2025) Triggers for and Functions of Nostalgia in Consumers’ Ad Processing. TAKASHI KUSUMI, Kyoto University, KEN MATSUDA, Yamaguchi University, & ERIKO SUGIMORI, University of Tokyo—In two questionnaire surveys, we investigated the triggers for and functions of nostalgia in relation to memory, emotion, and aging. Study 1 explored the contents of and triggers for nostalgic experiences by requesting 451 undergraduates to do four different descriptions (of scenes, songs, events, and commercials). An analysis of the descriptions, using text mining, revealed that nostalgia occurred in response to events that had had frequent repetition in the past and a long time lag. Study 2 explored the functions of nostalgia among 737 consumers (15-65 years of age) by using a survey method. Structural equation modeling revealed five steps in nostalgic ad processing: (1) nostalgic predisposition, (2) perception of nostalgic triggers, (3) retrieval of past events and ad memory, (4) familiarity and positive mood incited by the ad, and (5) intention of purchase. Nostalgic predisposition and sensitivity to nostalgic triggers increased with age. This tendency was higher among men than among women.

(2026) Nostalgia Influences the Evaluation of Advertisements. KEN MATSUDA, Yamaguchi University, ERIKO SUGIMORI, University of Tokyo, & 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 advertisements with pictures that varied in nostalgic valence (high or low). Five minutes or 1 week later, the participants rated old and new products on preference, purchase intention, and recognition. In a food category that had a high nostalgia connection, generalizations evoked by the nostalgic pictures in the advertisements raised the evaluation of the products immediately after presentation. Overall, product evaluations increased after a delay. On the other hand, in a commodity category with a low nostalgia connection, nostalgic pictures lowered the evaluation of the products. This result suggests that pairing exposure with nostalgic pictures operated as a negative reinforcement for purchase intention, because consumers want a modern designation, rather than nostalgia, in relation to these products.

(2027) An Integrative Model of the Centrality of Trauma Memory and PTSD Symptoms. JOSEPH M. FITZGERALD, Wayne State University, DORTHIE BERNTSEN, University of Aarhus, & CARRISA L. BROAD-BRIDGE, Wayne State University—A measure of the incorporation of memory for trauma into identity, the centrality of events scale (CES), possesses excellent concurrent validity in terms of correlations with indicators of both predictors and symptoms of PTSD. However, a significant number of individuals who score high on the CES have few symptoms of PTSD (hi–lo), and others score low on the CES but score high on measures of PTSD symptoms (lo–hi). A large sample of college students (N = 418) recalled their most traumatic memory, rated it on multiple scales, and completed the CES and multiple measures of personality, PTSD and depressive symptoms, dissociative thinking, and characteristics of their childhood. Ratings of event categorization were also obtained. Analyses identified a number of individual variables that predict hi–lo and lo–hi status. Discriminant function analyses integrated the variables into a model of the relationship of the CES and PTSD symptoms.

• SELECTIVE ATTENTION •

(2028) Individual Differences in Selective Attention: Effects of Working Memory Span and Distractibility. DARLENE R. ARCHER, DALE DAGENBACH, & JANINE M. JENNINGS, Wake Forest University—Previous research has demonstrated that attentional processes can be controlled by active and passive mechanisms of selection. The relationship between (1) individual differences in daily life distractibility and (2) individual differences in working memory span and the operation of passive and active attentional selection mechanisms were assessed using the flanker paradigm developed by Lavie (1995). Participants reporting high and low levels of daily life distractibility, as measured by the Cognitive Failures Questionnaire, showed similar patterns of active attentional control at low set size, but different patterns of attentional control were found at high set size. High working memory span individuals demonstrated greater active attentional control at low set size than did low-span individuals, but high- and low-span individuals showed similar patterns of passive attentional control at high set size.

(2029) Dispelling the Myth That Attentional Momentum Underlies Inhibition of Return. JANICE J. SNYDER, University of British Columbia, Okanagan, WILLIAM C. SCHMIDT, University at Buffalo, & ALAN KINGSTONE, University of British Columbia (sponsored by Alan Kingstone)—For over 2 decades some form of inhibitory process has been thought to underlie inhibition of return (IOR). An alternative hypothesis, originally considered and rejected by Posner and Cohen (1984), was recently revived as a noninhibitory explanation of IOR. The attentional momentum hypothesis proposes that cuing a peripheral location generates a subsequent analogue attentional movement away from the cue, so that responses are fastest to targets on the purported path of attention (opposite the cue) and slowest to targets off the purported path (at the cued location). Such a claim is falsified by the original and subsequent data showing conclusively that momentum does not underlie IOR. So-called momentum effects are confined to specific and idiosyncratic cue–target trajectories, are uncorrelated with IOR, are present for only a small minority of participants, and result from collapsing across cue–target trajectories. IOR effects, in contrast, occur independently of spatial position and are robust and general.
Enhanced Perceptual and Conceptual Selection Difficulty Makes Inhibition Measurable. CHRISTIAN FRINGS, Saarland University (sponsored by Hubert D. Zimmmer)—“Where is all the inhibition gone?” asked Moore (1994) in a paper on negative priming without probe distractors. She thereby referred to the puzzling finding that negative priming—that is, worse performance to probe targets previously presented as prime distractors—is usually dependent on the presence of probe distractors. In four experiments, I manipulated perceptual and conceptual selection difficulty and observed reliable negative priming with constantly absent probe distractors. In particular, in two experiments, perceptual selection difficulty was increased by using tactile patterns as stimuli (Experiment 1) or by varying the luminance of visual stimuli (Experiment 2). In two further experiments, the conceptual selection difficulty was increased by varying the S–R mapping from trial to trial (Experiment 3) or by instructing participants to rehearse a letter string in the working memory while responding to the probe (Experiment 4). The results are discussed with respect to different theories of negative priming.

Does Involuntary Attention Capture Require Central Resources? ERIC RUTHRUFF, University of New Mexico, MEI-CHING LIEN, Oregon State University, JAMES C. JOHNSTON, NASA Ames Research Center, & ERIC ADAMIC, Oregon State University—Previous studies have reached the surprising conclusion that stimuli capture spatial attention only if they can access central resources. We reexamined this conclusion, using a modified psychological refractory period paradigm. Task 1 required a speeded classification of either an auditory tone or a visual digit, in separate experiments. Task 2 required identification of a letter (brief and pattern masked) in a specific target color. The key question was whether irrelevant stimuli (“cues”) colored the same as the Task 2 target would capture spatial attention. From single-task studies, it was clear that such cues would capture attention involuntarily if Task 2 were performed alone. But would capture also occur under dual-task conditions? In fact, it did. Task 2 accuracy was elevated when the target appeared in the same location as the cue. We conclude that spatial attention can be captured involuntarily even when central resources are occupied by another task.

An Exploration of Gaze Bias in Visual Decision Tasks. MACKENZIE G. GLAHOLT & EYAL M. REINGOLD, University of Toronto, Mississauga—Eye movement measures were employed to investigate the time course of biases in looking behavior during visual decision-making tasks. Our study replicated and extended prior research by Shimjo, Simion, Shimjo, and Scheier (2003) and Simion and Shimjo (2006). Three groups of participants performed forced choice decisions in a two-alternative free-viewing condition, a two-alternative gaze-contingent window condition, and an eight-alternative free-viewing condition. Participants viewed photographic art images and were instructed to select the one that they preferred (preference task), or the one that they judged to be photographed most recently (recency task). Across experiments and tasks, we demonstrated robust bias toward the chosen item in gaze duration, gaze frequency, or both. The present gaze bias effect was less task specific than those reported previously. Importantly, in the eight-alternative condition we demonstrated a very early gaze bias effect, which rules out a postdecision response-related explanation.

Context-Sensitive Adjustments of Cognitive Control. RICO FISCHER, GESINE DREISBACH, & THOMAS GOSCHKE, Technische Universität Dresden—Dynamic adjustments of cognitive control in response to interference from irrelevant stimulus attributes have repeatedly been shown. The purpose of the present research was to investigate how these control adjustments are modulated by the processing demands of a primary task. To this end, we combined a primary task (number comparison task: classifying digits as smaller or larger than 5) with a Simon task. Control adjustments were observed in the form of typical sequential modulations of the Simon effect. In addition, we found sequential modulations of the numerical distance effect and an interaction of both effects. The results suggest that not only response conflict due to interference from task-irrelevant features, but also processing demands of task-relevant features determine the level of control adjustment in the subsequent trial.

Auditory Spatial Attention in Depth: Behavioral and ERP Evidence. ALISON F. EARDLEY, University of Westminster, LUKE MASON, Goldsmiths, University of London, MASA AL-KURDI, University of Westminster, & JOSE van VELZEN, Goldsmiths, University of London (sponsored by John M. Kennedy)—The majority of research on shifts of spatial attention has focused on lateralized shifts within near space. In three experiments, the impact of depth on shifts of spatial attention was examined. First, examining attentional shifts within near and far space, standard attentional-cuing effects were found irrespective of depth, although accuracy was reduced in far space (Experiment 1). When attention was shifted between near and far space, poorer accuracy in far space was also identified (Experiment 2). Furthermore, standard attention effects were found in near space. However, when participants attended to far space, response times were the same whether or not the target was then heard in near (cued) or near (uncued) space. ERP evidence based on lateral shifts within near and far space was collected (Experiment 3). Early effects indicate that initially, attention spreads from near to far space only; however, later effects show attention spreading in both directions.

Expectancy Modulates Behavioral and ERP Indices of Inhibition of Return. JESSICA J. GREEN, THOMAS M. SPALEK, & JOHN J. MCDONALD, Simon Fraser University—Using our new rapid search paradigm, we showed that the N2pc component of the event-related potential mirrors the inhibition of return (IOR) observed in response times, with a smaller N2pc and slower responses for targets appearing at the previously attended location (repeat), as compared with targets appearing at the previously unattended location (change). Here, we examined performance and brain activity as a function of the number of successive repeat- or change-location trials in order to determine how expectancy modulates both response times and the N2pc. When participants expected the target to appear at a new location, responses were slower and the N2pc was reduced for repeat-location trials. When participants expected the target to appear at a repeat location, the responses were faster and the N2pc was larger for repeat-location trials. These findings show that the retardation underlying IOR is dependent on expectations that vary from trial to trial.

Stereotype Threat Effects on Voluntary Task Switching. CHRISTINA R. WEYWAEDT & KARIN M. BUTLER, University of New Mexico—Priming negative stereotypes can impair task performance in stigmatized groups. Stereotype threat (ST) effects extend beyond tasks related to the stereotype domain, suggesting that ST interferes with active control more generally (Beilock, Rydell, & McConnell, 2007; Schmader, Johns, & Forbes, 2008). The purpose of this experiment was to measure ST effects on the ability to choose which tasks to perform in a voluntary task-switching paradigm. ST did not affect task choice for high working memory individuals but reduced the probability of switching for low working memory individuals. These results support the view that ST influences performance generally by affecting mechanisms of active control. The discussion will explore specific elements of control that can account for changes in task choice following ST.

Behavioral Adaptation Following Errors: Are We Blind to Errors? WIM NOTEBAERT, FEMKE HOUTMAN, & TOM VERGUTS, Ghent University—Cognitive control theories predict two behavioral effects following errors. First, it is predicted that trials following errors are slower than trials following correct trials, and second, it can be predicted that interference effects in congruency tasks are smaller after errors than after correct trials (Ridderinkhof, 2002). In a previous study, we demonstrated that posterior slowing is not a cognitive control effect and is caused by the infrequent occurrence of errors. We replicated this effect
and, furthermore, demonstrated that posterior reduction of interference was not caused by the error as such but by the conflict that occurred on most of the error trials (the Gratton effect). After controlling for the congruency of the previous trial, we observed increased interference after errors. These findings indicate that conflict, and not accuracy, predicts consequent behavioral adaptation. In general terms, this is in line with conflict-monitoring theory (Botvinick et al., 2001).

(2038) Effects of Memory Load in Attentional Processes: Visual Search in Space and Time. BEATRIZ GIL-GÓMEZ de LIANO & JUAN BOTELLA, Autonomous University of Madrid—Many studies have shown a relationship between working memory and attention; as memory load increases, attentional performance is impaired (e.g., Lavie, Hirst, de Fockert, & Viding, 2004). However, a few experiments have failed to find clear effects of memory load on visual search performance in space (Logan, 1978; Woodman et al., 2001) and time (e.g., Akyürek, Hommel, & Jolicœur, 2007). In the present study, we have explored the effects of memory load in attentional processes in the space and time domains. In four different experiments, the participants had to perform the same task, although the stimuli were to be located in space or time. The results show similarities between attentional processes in space and time, as has already been highlighted in other studies (e.g., Correa, Lupiáñez, Milliken, & Tudela, 2004). Theoretical implications for attentional processes models in space and time are discussed.

(2039) Many Types of Cognitive Load Increase the Flanker Effect. KIMBERLY M. HALVORSON & ELOI HAZELTINE, University of Iowa, & RICHARD B. IVRY, University of California, Berkeley (sponsored by Richard B. Ivry)—In a flanker task, the target stimulus must compete with task-irrelevant distractor stimuli for perceptual and cognitive resources. Lavie et al. (2004) demonstrated that manipulating the concurrent perceptual and cognitive load during the flanker task had different effects on the magnitude of the flanker effect. Increasing the perceptual load produced smaller flanker effects, but increasing the cognitive load (by adding a working memory component to the task) produced larger flanker effects. In a series of experiments examining the effects of different types of secondary tasks on the flanker effect, we tested both tasks that required participants to keep information active in working memory and tasks that simply required participants to switch from one task to the other. Both types of tasks produced similar increases in the magnitude of the flanker effect. Moreover, despite the imposition of a secondary task, persistent sequential effects were observed.

(2040) The Shielding Function of Task Sets. GESINE DREISBACH, Technische Universität Dresden, & HILDE HAIDER, Universität zu Köln (sponsored by Michael R. Waldmann)—In order to pursue goal-directed behavior, the cognitive system must be shielded against interference from irrelevant information. Aside from the online adjustment of cognitive control widely discussed in the literature, an additional mechanism of preventive goal shielding is suggested that prevents irrelevant information from being processed in the first place. Participants had to react to eight different words depicting clothes items presented in front of line drawings that could be either semantically related (clothes) or unrelated (animals with spatial orientation) to the target words. One group learned the stimulus–response (S–R) mappings by heart, while another group used a task set (TS). In the S–R group, semantically related and unrelated distractors interfered with performance, whereas in the TS group, only semantically related distractors interfered; unrelated distractors had no effect. Task sets thus support the priming of related information and help to shield against the processing of irrelevant information.

(2041) Spatial Interference Depends on Processing Resources: Combining the PRP Paradigm With Event-Related Brain Potentials. CAROLA LEHLE, JÖRG SANGALS, & BIRGIT STÜRMER, Humboldt-Universität zu Berlin, ASHER COHEN, Hebrew University, & WERNER SOMMER, Humboldt-Universität zu Berlin—In the Simon paradigm, task-irrelevant stimulus features prime responses that elicit interference in case stimulus and response features do not match (incompatible assignment). In the present study, a spatial and a color version of the Simon task functioned as second tasks in a PRP paradigm. In replicating Magen and Cohen (2005), an underadditive interaction with stimulus onset asynchrony (SOA) was observed for the spatial Simon effect, whereas the color Simon effect was additive to the effect of SOA. In line with previous accounts, spatial interference in the Simon task seems to be resolved at stages of decision selection and event-related brain potentials, however, indicated that early activation due to spatial interference in incompatible assignments was absent at short and increased at longer SOAs. This finding, hence, suggests that spatial priming depends on the availability of resources.

(2042) The Impact of Stressful Life Events on Cognitive Control Abilities. RANJANI PRABHAKARAN, DAVID D. NGUYEN, & SHARON L. THOMPSON-SCHILL, University of Pennsylvania (sponsored by Sharon L. Thompson-Schill)—Exposure to stressors, such as loud noises, is thought to impair prefrontal cortex (PFC)-mediated cognitive behaviors via an increase in catecholamine release (Arrast, 1998). Recent advances in genomics have highlighted the role of genes influencing dopamine levels in PFC and cognitive control abilities. The psychiatry literature has also emphasized the importance of gene–environment interactions in influencing behavior (Caspi & Moffitt, 2006). The present study focuses on the impact of environmental factors in the form of life stressors on cognitive control abilities. Subjects performed a battery of cognitive control tasks, including the Stroop task and a two-back working memory task. The subjects also completed a variant of the Undergraduate Stress Questionnaire (USQ; Crandall et al., 1992), which assesses exposure to stressful life events. The subjects with higher USQ stress scores demonstrated greater interference on cognitive control tasks. These results suggest that exposure to stressful life events impacts cognitive control abilities.

(2043) The Item-Specific Proportion Congruence Effect: More Than Contingency Learning? JULIE M. BUGG, LARRY L. JACOBY, & SWATI CHANANI, Washington University (sponsored by Larry L. Jacoby)—The item-specific proportion congruence effect refers to the finding that Stroop interference is greater for mostly congruent items (e.g., blue and yellow), relative to mostly incongruent items (e.g., green and white). At least two mechanisms underlie this effect. One, a cognitive control mechanism, is believed to modulate the influence of word reading such that word reading is more strongly dampened for mostly incongruent items. The second, a contingency learning mechanism, involves production of the color response most frequently associated with a particular word. First, we demonstrate an item-specific proportion congruence effect, using a novel picture/word Stroop paradigm in which participants name the picture and ignore an embedded word (Experiment 1). Then, we provide a direct test of the cognitive control account by evaluating the influence of word reading on novel pictures, not seen during an item-specific proportion congruence training phase (Experiment 2). The theoretical implications of our findings will be discussed.

• Motor Control •

(2044) Performing a Concurrent Visual Search Task Enhances (Does Not Impede) Standing Stability. RONG-JU CHERNG, WAN-JIU CHAO, & JENN-YEU CHEN, National Cheng Kung University (sponsored by Jenn-Yeu Chen)—The effect of a concurrent task on standing stability was examined in 14 adults who performed a visual search task while standing barefooted with feet together on a fixed or compliant support surface. The search task involved eight different set sizes. The results showed that performing the search task improved standing stability. The improvement did not vary with the set size of the search or with the type of foot support. The results suggest that standing as a postural task does not compete with a cognitive task. Rather, it is maintained at a level needed for performing the cognitive task.
Posters 2045–2052

Friday Noon

Role of Tactile Feedback in Synchronization Tapping. PETER Q. PFORDRESHER, University at Buffalo, & CAROLINE PALMER, McGill University—Most synchronization tasks require participants to respond on a hard surface or to move limbs freely in the air. Synchronization in music performance typically involves contact with a flexible surface, such as keys or strings, which differ in the timing and extent of tactile feedback. We report an experiment in which trained pianists synchronized to a regular auditory pulse by tapping either on a table or on a sponge. The pianists synchronized using right-hand fingers, either alone or in sequences, to address the role of finger independence. Motion analyses suggested that the performers adapted to the flexible surface by increasing finger amplitude, probably to enhance tactile feedback. Sequential tapping trials revealed that finger independence modulated the degree to which the performers differentiated tapping on a sponge or a table. Overall, the findings converged with theoretical perspectives that link synchronization accuracy to the coordination of sensory information, including feedback sources, across different channels.

Cross Talk of Instructed and Applied Arbitrary Visuomotor Mappings: Behavioral and fMRI Studies. FLORIAN WASZAK, CNRS and Université Paris Descartes, DORIT WENKE, Max Planck Institute for Human Cognitive and Brain Sciences, & MARCEL BRASS, Ghent University—Humans are able to perform any motor response to any stimulus. This cornerstone for the flexibility of human behavior has been investigated under the label of arbitrary visuomotor mapping. The focus of research has been on the question of how these mappings are executed once the subjects have been instructed appropriately. However, one question has been rather neglected thus far: What, in the first place, enables humans to instantaneously implement any arbitrary stimulus–response (S–R) mapping by mere instruction? We report two experiments assessing the cross talk of arbitrary S–R mappings as a part of the instructed task representation, on the one hand, and the cross talk of repetitively applied mappings, on the other hand. The results show a neurofunctional dissociation of the cross talk elicited by instructed and applied mappings, suggesting that the first occurs on the level of task set, whereas the latter occurs on the level of S–R associations.

Intermittent Feedback Model of Goal-Directed Forearm Movement. OH-SANG KWON, JEFFREY N. SHELTON, & ZYGUMNIT PIZLO, Purdue University (sponsored by Zygumnit Pizlo)—Two prominent models frequently used to explain goal-directed human movement are the stochastic optimized-submovement model and the minimum variance model. Both successfully explain the speed–accuracy trade-off known as Fitts’s law, but neither is complete. The former cannot predict the movement trajectory between the endpoints, and the latter is not consistent with the multiple movement segments (submovements) often observed in human motion. In this study, a new model is proposed in which an aimed movement consists of two submovements and a single feedback instant, with the trajectory of each submovement being individually optimized. Simulations using the proposed model show that (1) the optimal transition between the two submovements occurs at an early stage of the movement and produces a sharp peak in the acceleration profile, and (2) the positional variance curve is bell-shaped. Both results are consistent with psychophysical data.

Dissociation of Perceptual and Response-Related Grouping Effects in a Precue Task by Means of Event-Related Brain Potentials. JÖRG SANGALS & WERNER SOMMER, Humboldt-Universität zu Berlin (sponsored by Werner Sommer)—Recently, the fast availability of spatially compatible response cues has been shown to depend on grouping phenomena among representational entities at perceptual and response-related levels (Adam, Hommel, & Umiltà, 2003). The present study aimed at inspecting the time course of response activation with respect to the grouping of perceptual and response-related codes. A precued four-choice reaction task was carried out in which participants responded with fingers in an adjacent or an overlapped position. The results replicated previous findings showing RT benefits if precise stimuli and precued responses were spatially grouped, even if the precues preceded the target by only 50 msec. The time course of the lateralized readiness potential indicated that S–R mapping increased the duration of premotoric processing stages. Surprisingly, perceptual grouping shortened the duration only of processing stages following response selection. Implications of the results for computational accounts of the grouping assumption will be discussed.

Changing Dynamics in the Mental Lexicon: New Lexical Representations Strengthen Over Time. JANNE TAMMINEN & GARETH GASKELL, University of York—In a 2-day study, participants learned written novel words and their meanings (e.g., “Feckton is a type of cat”). Different words were learned on each day, and semantic access was investigated at the end of Day 2. An explicit meaning recall task showed more accurate responses to Day 2 words. However, two semantic decision tasks showed faster response times to trials involving Day 1 words. A shadowing task, in which the participants for the first time heard spoken forms of the words and had to repeat them aloud, also showed faster response times for Day 1 words, whereas Day 2 words were shadowed as slowly as nonwords. We conclude that even in the absence of further exposure the lexical–semantic links in novel words strengthen over time when speed (but not accuracy) of semantic access is considered. Furthermore, novel phonological representations generated from orthographic exposure change over time toward a more word-like state.

Testing Computational Models of Letter Perception With Item-Level ERPs. ARNAUD REY, STEPHANE DUFUAU, STEPHANIE MASSOL, & JONATHAN GRAINGER, LPC, CNRS, and Aix-Marseille University.—In the present study, online measures of letter identification were used to test computational models of letter perception. Event-related potentials (ERPs) were recorded to letters and pseudoleters, revealing a transition from feature analysis to letter identification in the 100–200-msec time window. Measures indexing this transition were then computed at the level of individual letters. Simulations with several versions of an interactive-activation model of letter perception were fitted with these item-level ERP measures. The results are in favor of a model of letter perception with feedforward excitatory connections from the feature to the letter levels, lateral inhibition at the letter level, and excitatory feedback from the letter to the feature levels.

Inside the Regularity Effect for Naming Chinese Characters. SAU-KIN CHIN (sponsored by Ping Li)—For Chinese readers, the regularity effect refers to the difficulty associated with naming characters with invalid phonetics. There are two types of invalid phonetics: nonhomophonous and heterophonous. It is difficult to isolate the impact of phonetic validity on the regularity effect for the nonhomophonous characters, because these characters share the phonetic with the homophonous characters. On the other side, the neighborhood characteristics should have little influence on the consistent heterophonous characters that never share the phonetic with the homophonous characters. A naming experiment with a strict manipulation of neighborhood characteristics showed that the consistent heterophonous produced the smallest regularity effect on latency and error data, as compared with the nonhomophonous and the inconsistent heterophonous. This result demonstrates the contribution of phonetic validity to the regularity effect for the consistent heterophonous and implies specific learning traces for phonetic validity and neighborhood characteristics.

Investigating Phonological Neighborhood As a Function of Adult Reading Ability. LAWRENCE LOCKER, AUDREY HAZAMY, & JOHN D. MURRAY, Georgia Southern University—Prior research has shown that phonological neighborhood can influence visual word recognition (e.g., Yates, 2005; Yates, Locker, & Simpson, 2004). The present study investigated the extent to which the influence of phonological neighborhood might differ relative to adult reading ability. Participants...
performed a lexical decision task composed of words varying in phonological neighborhood density (high vs. low) and were then administered a standard test of reading ability. Replicating prior findings, a processing advantage was observed for words with dense neighborhoods, relative to those with sparse neighborhoods. However, this effect was uniform relative to reading ability. That is, the facilitative influence of phonological neighborhood did not vary as a function of reading ability. The implications of this finding are discussed.

(2053)
What Spelling Errors Reveal About the Nature of Orthographic Representations. ANGELA C. JONES & JOCELYN R. FOLK, Kent State University—Spelling errors by neurologically impaired individuals have demonstrated the complex nature of spelling representations (e.g., Caramazza & Miceli, 1990). In the present study, we found convergent evidence for complexly structured spelling representations in a sample of skilled, neurologically intact spellers by inducing spelling errors. Under normal conditions, the participants made few spelling errors, all of which could be classified as lack of knowledge (e.g., thief → their). However, under cognitive load, errors increased and reflected the complex nature of spelling representations. For example, when letter identity information was lost, spellers preserved the consonant/vowel status of letters (e.g., table → trole), supporting hypotheses of multidimensionally structured representations. Additionally, we found evidence that spelling representations are textured such that letters within a word vary in representational strength; certain letters within words were more vulnerable to errors than were others. We also examined the role of orthographic constraints on the spelling errors that were produced.

(2054)
Influence of Lexical-Orthographic Variables in Children's Spelling Skills. SUSAN J. RICKARD LIOW & MELVYN J. YAP, National University of Singapore, LAY CHOO LEE, Kandang Kerbau Hospital, & STEPHANIE M. PHAN, National University of Singapore—Theories of children's spelling acquisition in English typically stress the role of phonological awareness. We examined whether three lexical-orthographic variables (word frequency, word length, and number of orthographic neighbors) are related to spelling abilities in Malay, a shallower alphabetic script. A 40-item test comprising disyllabic words was dictated to a sample of skilled, neurologically intact spellers by inducing spelling errors. Under normal conditions, the participants made few spelling errors, all of which could be classified as lack of knowledge (e.g., thief → their). However, under cognitive load, errors increased and reflected the complex nature of spelling representations. For example, when letter identity information was lost, spellers preserved the consonant/vowel status of letters (e.g., table → trole), supporting hypotheses of multidimensionally structured representations. Additionally, we found evidence that spelling representations are textured such that letters within a word vary in representational strength; certain letters within words were more vulnerable to errors than were others. We also examined the role of orthographic constraints on the spelling errors that were produced.

(2055)
Orthographic and Phonological Variables Affecting Written Spelling. LUCIA COLOMBO, SERENA FUDOSHI, & GIUDITTA MOSNA, University of Padua—The effect of the disruption of the graphemic buffer, a working memory system used to store the identity and order of the graphemes in written spelling, was investigated by means of a dual task involving spelling in response to dictation and concurrent articulation in Italian. Two variables were examined: lexicality and context-sensitive rules (Burani, Barca, & Ellis, 2006). Both latencies to initiate spelling and errors were measured. The results showed strong effects of concurrent articulation and were consistent with the hypothesis that this task disrupted the serial operations of readout and sequential planning of the graphemic buffer. There were reliable effects of lexicality, but no effect of context-sensitive rules, suggesting that they only affect reading performance.

(2056)
Semantic Priming: Testing Normatively Associated and Statistically Associated Relationships. JON A. WILLITS & MARK S. SEIDENBERG, University of Wisconsin, Madison (sponsored by Mark S. Seidenberg)—Word association strength (the likelihood that a word will elicit another in a word association task) is predictive of cognitive tasks such as semantic priming and cued memory recall. However, what causes one word to be associated with another is still unknown. We examined the hypothesis that associative effects derive in part from two language statistics: (1) co-occurrence probability (CP), how often the two words co-occur within a sentence, and (2) distributional similarity (DS), the similarity of the two words with respect to the other words with which they co-occur. The effects of these factors were examined in two semantic-priming experiments. In Experiment 1, all related prime-target pairs were normatively associated but varied in terms of their CP and DS. In Experiment 2, none of the related pairs were normatively associated, but again, they varied in terms of their CP and DS. The results show effects of both associative and statistical relationships.

• SPEECH PERCEPTION •

(2057)
Learning Nonnative Speech Categories with a Video Game. SUNG-JOO LIM & LORI L. HOLT, Carnegie Mellon University (sponsored by Lori L. Holt)—Various studies have attempted to train adult listeners to categorize nonnative speech sounds, but even with extensive response-feedback training, observed learning has been modest. The present study exploited a video game shown to be effective in training adults to categorize novel nonspeech auditory categories (Wade & Holt, 2005) to train native Japanese adults to categorize English /r/ and /l/. Game characters were associated with distinct speech-sound categories, and the game environment provided participants with rich visual, spatial, motor, and auditory correlations with the speech categories but with no explicit feedback. The participants evidenced more native-like perception following 5 days of training, suggesting that experience with nonnative speech categories in an immersive environment with rich cue correlations may promote speech category learning, even without explicit feedback. Learning was observed in overall pretest versus posttest performance and also in listeners' fine-grained use of acoustic cues in speech categorization.

(2058)
Acquiring Novel Words and Their Tenses: Evidence From Lexical Effects on Phonetic Categorization With Undegraded and Degraded Stimuli. SHANE LINDSAY, LEANNE SEDIN, & GARETH GASKELL, University of York (sponsored by Gareth Gaskell)—This research investigated how novel words come to be represented in the auditory input lexicon and how novel inflected forms of such words are recognized, using the lexical effects on phonetic categorization paradigm, the Ganong effect (Ganong, 1980). Participants were exposed to novel phonological forms in phoneme-monitoring and past tense generation tasks. Ambiguous phonemes were categorized consistently with learned items or past-tense-inflected forms of learned items. Lexical effects on categorization were primed immediately and a week following exposure. Additional studies attempted to replicate these findings, in order to examine the emergence of lexical effects on phonetic categorization with noise and a present tense generation task. These findings are taken as evidence for an account of lexicalization in which novel form information is stored very quickly, since novel phonological forms were able to influence the categorization of word-final ambiguous phonemes in those novel phonological forms.

(2059)
Motor Compatibility Effects on Speech Perception. NAVIN-VISWANATHAN, STEPHEN J. TOBIN, CAROL A. FOWLER, & JAMES S. MAGNUSON, University of Connecticut and Huskins Laboratories. (sponsored by Gareth Gaskell)—This research investigated how novel words come to be represented in the auditory input lexicon and how novel inflected forms of such words are recognized, using the lexical effects on phonetic categorization paradigm, the Ganong effect (Ganong, 1980). Participants were exposed to novel phonological forms in phoneme-monitoring and past tense generation tasks. Ambiguous phonemes were categorized consistently with learned items or past-tense-inflected forms of learned items. Lexical effects on categorization were primed immediately and a week following exposure. Additional studies attempted to replicate these findings, in order to examine the emergence of lexical effects on phonetic categorization with noise and a present tense generation task. These findings are taken as evidence for an account of lexicalization in which novel form information is stored very quickly, since novel phonological forms were able to influence the categorization of word-final ambiguous phonemes in those novel phonological forms.
/b/ judgments). We provisionally explain the reversal as a function of the position and trajectory of the articulators when the speech stimulus was presented. Our results indicate an intimate link between speech perception and production. (2060) Norwegian Toneme Perception by Nonnative Speakers, VERA KEMPE, University of Aberdeen, JOHN C. THEORESEN, University of Durham, & PATRICIA J. BROOKS, City University of New York—Kempe, Thoresen, and Brooks (2007) presented results of two studies demonstrating a male advantage in sensitivity to Norwegian toneme differences by native speakers of English. In those studies, the stimuli had been recorded by a male native speaker of Norwegian. The present study examined whether the observed gender difference would persist if the stimuli were presented by a female speaker. We also measured potential predictors of L2 learning success, such as experience with various L2s, musical ability, verbal working memory capacity, fluid intelligence, and need for cognition. Preliminary results indicate a trend toward a female advantage in the perception of nonnative toneme differences that cannot be attributed to gender differences in any of the predictor variables. Consistent with the idea of perception–action links advocated in the motor theory of speech perception (Galantucci et al., 2006), we discuss this own-gender voice perception advantage as an effect of gender-specific motor competence on speech perception. (2061) The Mental Lexicon is Fully Specified: Evidence From Eyetracking, HOLGER MITTERER, Max Planck Institute for Psycholinguistics (sponsored by James M. McQueen)—According to the theory of underspecification (Eulitz & Lahiri, 2004, Journal of Cognitive Neuroscience), default phonological features are not specified in the mental lexicon. This predicts asymmetric lexical matching, because mismatching input (“pin”) activates lexical entries with underspecified alveolar stops (“tin”), whereas lexical entries with specified labial stops (“pin”) are not activated by mismatching input (“tin”). I present four visual-word experiments contradicting this proposition. Listeners heard spoken words and saw printed words. Printed words that were phonologically similar to the spoken target attracted more looks than did unrelated distractors, but this effect was symmetric (“peacock” → “teacake” = “teacake” → “peacock”). Underspecification also assumes that /t/ is underspecified for place and voice. Hence, both “pin” and “bin” should equally activate the lexical entry “tin.” However, /t/-initial words (e.g., “tin”) attracted more looks if the spoken input mismatched only in terms of place (“pin”) than if it mismatched in place and voice (“bin”). (2062) Eyetracking Reveals Decreased Sensitivity to Phonetic Features in Children With Developmental Dyslexia, AMY S. DESROCHES & MARC F. JOANISSE, University of Western Ontario—Although there is extensive evidence of phonological deficits in dyslexia, it is less clear whether these extend to speech perception. One source of uncertainty is the overt metalinguistic nature of task paradigms typically used to examine speech categorization. In the present study, we used an eyetracking measure to compare dyslexic and control children’s offline decisions and online eye movements in response to auditory words. Speech stimuli were constructed in a way that varied their prototypicality. As in our earlier studies, overt responses suggested that both control and dyslexic children perceived these stimuli categorically. However, fixation data yielded different results: Typical readers showed graded effects such that the proportion of fixations to targets increased with goodness of fit, suggesting that they are sensitive to phonetically irrelevant acoustic differences. In contrast, dyslexic children showed weaker sensitivity to such cues, marked by similar fixations to different within-category stimuli. The results suggest imprecise phonetic representations in dyslexia. • READING • (2063) The Missing Missing-Letter Effect: An Examination of Letter Detection Accuracy Across a Long Text, ANNIE ROY-CHARLAND, Laurentian University, JEAN SAINT-AUBIN, University of Moncton, & RAYMOND M. KLEIN, Dalhousie University—When reading for comprehension while searching for a target letter, participants detect letters in frequent function words than in less frequent content words. This effect, called the missing-letter effect, is usually observed with short prose passages. Here, eye movements of 32 participants were monitored as they searched for a target letter while reading a long text in which there were 100 occurrences of a function word and 100 occurrences of content words. For the first part of the text, corresponding to the usual length of a text used in studies investigating the missing-letter effect, results revealed the typical findings, with more omissions and longer response latencies for function than for content words. The effect appeared on the last part of the text, because the omission rate increased for content words and decreased for the function word. The results are interpreted in light of the attentional disengagement model. (2064) Reading Disappearing Text: Effects on Children’s and Adults’ Oculomotor Control, HAZEL I. BLYTHE, University of Southampton, HOLLY S. S. L. JOSEPH, Durham University, SARAH J. WHITE, University of Leicester, & SIMON P. LIVERSEDGE, University of Southampton—We investigated whether there is a developmental change in the speed with which visual information is taken up during fixations in reading. Readers’ eye movements were monitored as they read disappearing text, where each word disappears at a fixed delay after fixation onset. In Experiment 1, adults and 7- to 11-year-olds read 60-msec disappearing text, as compared with normal text. In Experiment 2, adults, 7- to 9-year-olds, and 10- to 11-year-olds read disappearing text with three delays—40, 80, or 120 msec—as compared with normal text. We replicated Rayner et al.’s (2003) finding that adults can read normally under disappearing text conditions. However, both groups of children showed different oculomotor behavior when reading disappearing text, as compared with normal text. These differences do not reflect developmental change in the speed of visual information uptake; instead, they reflect differences in cognitive processing between beginning and skilled readers. (2065) Reader Inferences From Credible and Noncredible Sources, JESSE R. SPARKS & DAVID N. RAPP, Northwestern University—Inference processing is a crucial component of reading experiences. To date, however, most studies of text inferences have examined the influence of content that is unlikely to be called into question. The present project investigated whether the credibility of a particular source might affect the inferences readers construct and apply. Participants read stories containing descriptions of characters and their ostensible traits; subsequent text events provided the participants with the opportunity to construct an inference about characters’ future behaviors. When a credible source provided the character descriptions, the participants expected those characters to behave in trait-consistent ways and readily rejected trait-inconsistent future behaviors. However, when those descriptions came from a noncredible source, the readers demonstrated difficulty rejecting the trait-inconsistent behaviors. These data suggest that readers’ inferences can be influenced by beliefs about source credibility. Models of inference construction can be enriched by understanding how such traditionally ignored factors impact the processes and products of reading experiences. (2066) The Influence of Irrelevant Spoken Word Type on Reading Depends on Memory Span Size, BRIANNA M. EITER, Hofstra University—The purpose of this study was to determine whether the influence of irrelevant spoken word (ISW) type on reading depends on memory span size. Thirty participants took part in a memory span task and then read sentences that contained targets coupled with ISWs (identical, phonologically similar, or dissimilar) while eye movements were monitored. The results show an effect of ISW type on target reading, with shorter gaze durations during identical relative to similar and dissimilar presentations, but only for high-span readers; there was no identity advantage for low-span readers. During posttarget reading, high-span readers showed evidence of similar ISW interference, as compared with identical and dissimilar ISW presentations. In contrast, low-span gaze durations were approximately equal.
for similar and dissimilar ISW presentations. These results suggest that high-span readers are more susceptible to sound-specific interference, whereas low-span readers are more generally susceptible to interference.

(2067)
Semantic Asymmetries Are Modulated by Phonological Ambiguity. ORNA PELEG & ZOHAR EVIATAR, Haifa University (sponsored by Zohar Eviatar) — Research using the DVF technique has led to the conclusion that the two hemispheres differ significantly in the way in which they deal with homographs like bank: In the LH, all meanings are immediately activated, and shortly afterward, one meaning is selected on the basis of frequency and/or contextual information. In contrast, the RH activates both meanings more slowly and maintains these meanings irrespective of context or frequency. On the basis of such findings, current hemispheric models have converged on the proposal that LH language processing is relatively more focused and faster and takes place at higher levels of analysis. In a series of DVF priming experiments and computational simulations, we demonstrate that this conclusion is too strong and that RVF/LH advantage in lexical selection is qualified by the phonological status of the homograph. Specifically, LH advantage can be eliminated and even reversed in the case of heterophonic homographs, such as wind.

(2068)
Patterns of Reading Performance in Acute Stroke. LAUREN L. CLOUTMAN, Johns Hopkins University, MELISSA NEWHART, Johns Hopkins University School of Medicine, & CAMERON L. DAVIS, VIJAY C. KANNAN, & ARGYE E. HILLIS, Johns Hopkins University (sponsored by Brenda C. Rapp)—One of the main sources of information regarding the underlying processes involved in both normal and impaired reading has been the study of reading deficits that occur as a result of brain damage. However, patterns of acute reading deficits found after brain injury have been little explored. Method: 112 acute left-hemisphere stroke patients were administered a reading task within 1–2 days of hospital admission; performance was examined for error rate and type and was compared with that on tasks involving visual lexical decision, visual/auditory comprehension, and naming. The results: Several distinct patterns of performance were identified. Although similarities were found between the patterns of reading performance observed acutely and the classical acquired dyslexias generally studied more chronically, some notable differences were observed. Of interest was the finding that no patient produced any pure semantic errors in reading, despite finding such errors in comprehension and naming.

• WORKING MEMORY •

(2069)
Relationship Between Working Memory Capacity Measures and the Time Course of Short-Term Item Recognition. ILKE ÖZTEKIN & BRIAN McELREE, New York University—The speed–accuracy trade-off (SAT) procedure was used to investigate the relationship between measures of working memory capacity and the time course of short-term item recognition. High- and low-span participants (HSs, LSs) studied sequentially presented six-item lists, immediately followed by a recognition probe. Analyses of composite list and serial position SAT functions showed no differences in retrieval speed. Overall, accuracy was higher for HSs than for LSs, with more pronounced differences for earlier serial positions. Analysis of false alarms (FAs) to recent negatives (lures from the previous study list) revealed no differences in the timing or magnitude of early FAs, thought to reflect familiarity-based judgments. However, analyses of FAs later in retrieval indicated that recollective information accrues more slowly for LSs, which suggests that recollection may also contribute less to judgments concerning studied items for LS participants. These findings can provide an explanation for the greater susceptibility of LSs to interference.

(2070)
On the Relationship Between Working Memory and Attentional Disengagement. CHANDRAMALLIKA BASAK, WALTER R. BOOT, & ARTHUR F. KRAMER, Beckman Institute—In working memory, focus of attention (FoA) is capacity limited; hence, to access an item outside the FoA, an item inside is swapped out. This focus-switching phenomenon could be due to engagement of attention to the new item, disengagement of attention from the old item, or both. We used another task that involved engagement and disengagement of attention (the antisaccade task) to explore these possibilities. We obtained two key measures from this task (along with measures of n-back and operation span): engagement of attention to the target in the first saccade and, when this was not possible, disengagement of attention from the distractor to attend to the target in the subsequent saccade. Preliminary results suggest that even after controlling for 1-back accuracy, 2-back accuracy is related to the disengagement of attention from the distractor in the antisaccade task. This suggests that focus switch costs are the result of attentional disengagement in memory.

(2071)
Unconsciously Perceived Competition Can Impair Reflective Processing. JULIE A. HIGGINS, CHE-YU J. TAI, & MARCIA K. JOHNSON, Yale University—Selectively thinking of (i.e., refreshing) one item from a set does not benefit from semantic relatedness. This absence of a relatedness benefit is attributed to competition from semantically related distractors. We tested the influence of unconsciously experienced semantic competition on selective refreshing. Participants read a word that was sometimes flanked by briefly flashed, immediately masked words. The participants then refreshed the just-seen word, read the same word presented again, or read a new word. The presence of masked items did not influence response times (RTs) to read the word a second time. In contrast, the presence of masked items slowed RTs to refresh, but only if they were semantically related to the refreshed word. This increase in RTs suggests that unconsciously perceived competition can impair reflective processing of just-experienced information if this competition is of a sufficient degree. The effect of resolving unconsciously perceived competition on subsequent processing will be discussed.

(2072)
Working Memory Capacity, Updating, and Maintenance: Selective Effects of Interference on Relationships With Fluid Intelligence. THOMAS S. REDICK, Georgia Institute of Technology, ALEJANDRA CALVO, York University, & RANDALL W. ENGLE, Georgia Institute of Technology—The ability to temporarily maintain information in order to successfully perform a task is important in many daily activities. However, the ability to quickly and accurately update these existing mental representations in distracting situations is also imperative in many of these same tasks. In the present study, individuals varying in working memory capacity (WMC) performed a conditional go/no-go task that has been hypothesized to measure inhibitory ability. The results indicated that low-WMC individuals showed worse performance specifically on infrequent lure trials, relative to high-WMC individuals. Further analyses indicated the specific effects of temporal lag/number of intervening items upon the performance of the low-WMC group and indicated that these trials accounted for the relationship with measures of fluid intelligence. The results indicate a relationship between WMC and the ability to selectively update and maintain goal-related information, especially in interference-rich conditions.

(2073)
Domain-Specific Effects of Processing on Working Memory Performance. HELEN TAM & CHRISTOPHER JARROLD, University of Bristol, & ALAN D. BADDELEY, University of York (sponsored by Simon Farrell)—In this research, we examined whether the detrimental effects of concurrent processing on recall from working memory are domain specific. Participants were given three tasks in which lists of objects were presented for later verbal recall. In the unfilled-delay task, recall occurred after an unfilled delay. In the filled-delay task, the participants performed a processing requirement during the delay. In the complex span task, the processing requirement and the presentations of memory items were interleaved. The type of processing (verbal vs. nonverbal) was manipulated between participants. On the basis of this design, our experiments showed that (1) verbal processing, but
not nonverbal processing, impaired verbal recall and (2) this domain-specific effect of processing on working memory was eliminated in the complex span paradigm, where we argued that recall was enhanced by the increased temporal distinctiveness of the memory items and/or increased opportunities for covert rehearsal during switches between item encoding and processing episodes.

(2074) Serial Order Representation in Immediate Serial Recall. SIMON FISCHER-BAUM & MICHAEL MCCLOSKEY, Johns Hopkins University—In immediate serial recall, participants are asked to recall novel sequences of items in the correct order. How is order information encoded in these tasks? In the list [ZEBRA, CLASH, YACHT], is YACHT encoded as the last word, the third word, or the word after CLASH? We analyzed intrusion errors (responses not appearing in the stimulus list) from two serial recall experiments. Intruded words often appeared in prior responses and often appeared in the same list position in the prior and current response (e.g., FENCE intruded into the third position after being correctly recalled in the third position on the immediately preceding trial). Using new analysis methods to extend work by Henson (1999), we assessed what form(s) of position representation was maintained by intruded words, finding that errors maintained position relative to both edges of the list and also maintained position on the basis of the context in which the word appeared.

(2075) Proactive Interference and Practice Effects in Working Memory Span Performance. LISA D. BLALOOK & DAVID P. MCCABE, Colorado State University (sponsored by Carol A. Seger)—The effects of proactive interference (PI) and practice on working memory (WM) span performance were examined, as was the relationship between WM span performance and fluid intelligence (gF). Participants completed complex and simple WM span tasks under high-PI (standard span task) or low-PI (15-sec verbal distractor task between trials) conditions. One trial of each of five lengths was included in each of three blocks, allowing an examination of practice across the task for trials equated for length. Performance increased across blocks for both PI conditions, indicating practice effects, and the increase was steeper for the high-PI condition than for the low-PI condition. Additionally, gF correlated with complex span performance in the low-PI condition only, particularly in the first block. Taken together, these results indicate that the low-PI condition disrupted practice effects and that practice effects attenuated the relationship between WM span and gF.

(2076) Articulatory Suppression Increases Proactive and Semantic Interference in a Working Memory Task. ALEXANDRA S. ATKINS, MARC G. BERMAN, JOHN JONIDES, & PATRICIA A. REUTER-LORENZ, University of Michigan (sponsored by Patricia A. Reuter-Lorenz)—Proactive interference (PI) in short-term item recognition tasks causes participants to be slower and less accurate when rejecting negative probes that were members of the memory set on a recent trial (see Jonides & Nee, 2006). Using a similar item recognition task, we have also documented within-trial semantic interference and false recognition in responses to lure probes, using semantically themed memoranda (Atkins & Reuter-Lorenz, 2008). Here, we present a series of experiments examining the effect of articulatory suppression on both PI and semantic interference. The results show that articulatory suppression selectively increases both forms of interference in working memory. Articulatory suppression presumably decreases verbatim memory, thereby lowering the signal-to-noise ratio between current memoranda and items previously remembered or activated via spreading activation in a semantic network.

(2077) Semantic Similarity Effects of Proactive Interference Resolution. MARC G. BERMAN, JOHN JONIDES, & RICHARD L. LEWIS, University of Michigan (sponsored by John Jonides)—We present data from a series of experiments exploring the effects of semantic similarity on proactive interference resolution in working memory. Utilizing an item recognition task, we examined the degree to which previously seen stimuli interfered with item recognition performance on current memoranda. Here, we altered the task by having stimulus sets alternate between different categories of stimuli (e.g., fruit words and country words) to explore whether stimuli from previous sets were interfering even if they came from a category of stimuli different from that of the current set. In addition, we parametrically varied similarity to determine whether the degree of semantic match affects processing, as predicted by a number of existing working memory retrieval theories. The results are also presented from depressed and control participants who performed the same task with words of positive and negative affect.

(2078) Age Differences in Effects of Display Size on Visuospatial Rehearsal. SATORU SUTO & TAKATSUNE KUMADA, National Institute of Advanced Industrial Science and Technology—Several studies have revealed that visuospatial working memory is associated with some types of cognitive performance. In this study, we examined the effect of display size on performance of a visuospatial working memory task for young and older participants. Some studies have suggested that shifts of spatial attention play an important role in the rehearsal for spatial information and that performances of shifts of spatial attention are disrupted by aging and displayed size. Therefore, if shifts of spatial attention are related to spatial rehearsal, it can be predicted that there should be interference effects of large display size and aging. Contrary to the prediction, older participants showed better recall performance on the Corsi block task in the larger display than in the smaller display. These results suggested that there are different features of spatial rehearsal for older people. Older people may select other strategies for spatial rehearsal, if shifts of attention cannot be controlled adequately.

(2079) Different Roles for Context in Recall and Recollection. RACHEL A. DIANA, CHARAN RANGANATH, & ANDREW P. YONELINAS, University of California, Davis—Recollection and recall are often assumed to rely on similar memory processes. However in recollection, an item cue is used to retrieve context, whereas in recall a context cue is used to retrieve items. Thus, context plays different roles in these processes. We manipulated the uniqueness of the encoding context such that some words were studied using a shared semantic-encoding question, whereas others were studied using unique semantic-encoding questions. We predicted that shared contexts would enhance recall because repeated presentation increases the memory strength of the context. We also predicted that, if recollection depends on the degree to which contextual information is uniquely associated with an item (Diana et al., 2004; Reder et al., 2002), recollection would be greater in the unique context condition. As was expected, contextual uniqueness dissociated recall and recollection, so that shared contexts led to better recall and unique contexts led to better recollection.

(2080) The Malleability of Narrative Content and Structure in Autobiographical Memory Recall. ALISHA C. HOLLAND, MAYA TAMIR, & ELIZABETH A. KENSINGER, Boston College—Individuals selectively recall autobiographical memories (AMs) to regulate how they feel. To determine how the structure and content of particular AMs might change depending on individuals’ emotion regulation goals, 40 Boston College freshmen recalled three preselected events (e.g., high school graduation) both at a baseline session and 2 weeks later following a happy or sad emotion regulation goal induction. As compared with baseline, narrative structure was preferentially affected in the first memory recalled following a goal induction (e.g., following a happy goal induction, the participants’ narratives became more syntactically complex). In contrast, narrative content was most affected in the second memory recalled (e.g., the participants in the happy goal induction group used fewer negative emotion words in the second event). These results suggest that details recalled about the same events can vary depending on emotion regulation goals and the order in which events are recalled.
(2081) Effects of Study Modality on the Neural Correlates of Encoding Operations Supporting Recollection. HEEKYEONG PARK & MICHAEL D. RUGG, University of California, Irvine—The present study investigated whether the neural correlates of episodic encoding vary according to the modality of the study items. While undergoing fMRI scanning, participants were presented with a random series of visually or auditorily presented words, making pleasantness judgments to each item. The findings indicated that emotional valence largely mediated the neural correlates of encoding, which were found in the medial prefrontal cortex and the left temporal lobe.

(2082) Turn-Taking Versus Consensus in Collaborative Recall. CELIA B. HARRIS, AMANDA J. BARNIER, & JOHN SUTTON, Macquarie Centre for Cognitive Science—Although we often remember with others, surprisingly, individuals remembering together recall less than do the same number of individuals recalling alone, an effect termed collaborative inhibition. We addressed inconsistencies in the collaborative recall literature and extended the procedure to emotional material. First, 135 individuals learned positive, negative, and neutral words and recalled them alone (Recall 1). Then, 45 participants in three-member groups took turns recalling the words; 45 participants in three-member groups reached consensus in recalling the words; and 45 participants worked alone to recall but were later analyzed as three-member nominal groups (Recall 2). Finally, all the participants recalled alone (Recall 3). Collaboration in both turn-taking and consensus groups came at a cost—collaborative inhibition—relative to nominal groups, although emotional valence influenced both the costs and the benefits of collaboration.

(2083) Characteristics of Earliest Memories in Turkish Culture. BURCU DEMIRAY, University of Florida, & SAMI GÜLGÖZ, Koç University (sponsored by Sami Gülgöz)—The purpose of the study was to examine the characteristics of earliest childhood memories and compare them with later important memories in Turkish culture. University students (N = 85) reported earliest memories and five important memories from their lives on a questionnaire. Average age at earliest memory (M = 5.29) was later than the age found in Western cultures. Length of earliest memory narratives was predicted by references to self and others, imagery, vividness, and rehearsal of childhood memories in general. Rehearsal of childhood memories and references to self, in addition to positivity, also predicted rehearsal of the earliest memory. Gender differences in earliest memory showed that women rehearse them more, whereas men make more references to self and others. Earliest memories were less vivid than later memories but were not different in positivity or number of indicated emotions. The results are discussed in the context of narrative construction and life stories.

(2084) The Structuring Effect of Cultural Life Scripts on African-Americans’ Memories of Unfair Treatment. ROBERT F. BELLI & JUSTIN T. COLEMAN, University of Nebraska, Lincoln, & SHERMAN A. JAMES, Duke University (sponsored by Robert F. Belli)—A sample of 1,170 predominantly working class African-Americans 38 to 66 years of age reported autobiographical memories of subjection to unfair treatment—a negative event—in face-to-face interviews. In total, the participants reported 1,879 incidents of unfair treatment in school, employment, accessing housing, police, police interactions, or other, and the age at which the event occurred. The participants attributed unfair treatment to race, age, gender, height or weight, shade of skin, or other. The results indicate increased retention of remote memories of unfair treatment that defy expectations of a monotonically decreasing retention function common to normal forgetting or random distribution across the life span found with memories of negative emotional events in previous studies. Instead, the retention function showed a reminiscence bump. Cultural life scripts can structure recall for all classes of emotional memories, not just positive ones, depending on a specific population’s unique historic and cultural experience.

(2085) fMRI Analysis of the Hippocampus: Implicit Inference. PETER D. LEO, KEITH A. HICE, & ANTHONY J. GREENE, University of Wisconsin-Milwaukee (sponsored by Fred J. Helmstetter)—According to the declarative memory model, task awareness is the critical characteristic of semantic and episodic memory, which depend upon the hippocampus and related medial temporal lobe structures. However, several lines of evidence have called into question whether awareness is necessary for hippocampal-dependent tasks. In the present study, we used fMRI to investigate an inference task that is dependent upon the hippocampus and can be performed without explicit awareness of task contingencies. This result adds to a growing body of literature showing that awareness is not the critical determinant of hippocampal-dependent learning and memory. It is proposed, instead, that the role of the hippocampus is to quickly and efficiently learn the relations among stimuli and then flexibly apply those learned relations.

(2086) Effects of Delay and Additivity on Implicit Activation for DRM Critical Items in a Naming Task. KEITH A. HUTCHISON, MICHELLE L. MEADE, & KRISTINA M. RAND, Montana State University—Previous experiments testing long-term implicit activation of critical items (CIs) following presentation of DRM word lists have shown conflicting results, possibly due to differences between paradigms in postlexical relatedness-checking by participants. To eliminate relatedness-checking, the present study tested implicit CI activation, using a naming task. In addition, the present study tested the potential additivity of long-term implicit activation. Participants were presented with 14-item lists in which either all 14 were unrelated, the first 7 were related, the second 7 were related, or all 14 were related to the CI. The CI was presented in Positions 1, 3, or 9 of the naming list. Priming occurred for the 14-related list in the first position only, and this priming showed an additive pattern typical in semantic-priming studies. However, there was also evidence for long-term semantic priming in other conditions that was not due to relatedness-checking.

(2087) The Influence of Word Frequency and Time of Day on Age Effects in Priming. LISA GERACI, Texas A&M University, MARYELLEN HAMILTON, St. Peter’s College, & JIMMEKA GUILLORY, Texas A&M University—Older adults sometimes show less priming on implicit memory tests than do younger adults. This study examined whether word frequency and time of day mediate age effects in priming. Younger and older adults studied high- and low-frequency words and were later given an implicit test of word stem completion. Study–test sessions took place either in the morning or in the afternoon. The results showed that there was an age effect in priming for the low-frequency words, but not for the high-frequency words. Time of day did not influence this pattern of results. Several factors, including certain types of response competition, may mediate age effects in implicit memory.

(2088) Implicit Learning for Contextual Cuing in Multiple-Object Tracking. HEATHER M. MONG & BENJAMIN A. CLEGG, Colorado State University—Contextual cuing, a benefit observed for deploying
attention when the same array reoccurs several times across an experiment, was examined in a multiple-object-tracking paradigm. Participants tracked an indicated subset of items for 7 to 15 sec per trial. Unbeknownst to them, on every third trial, the targets and distractors featured the same starting points and movement paths (but different ending positions). Experiment 1 showed significant improvement in tracking these multiple, dynamic targets that were repeating, as compared with the interspersed random trials. Experiment 2 extended practice to a second session, producing more robust learning. Evidence of retention found following a 1-week interval was consistent with a suggested property of implicit learning. Moreover, in both experiments, no participant was able to explicitly identify what aspect of the task was repeating. Nor did having a sense of the presence of a reoccurring pattern lead to a tracking benefit.

(2089) When You Hear “Frog,” You Look at the Peas (Even When They’re in Black and White): Why Attention is Drawn to Objects That Share a Typical Color. EILING YEE & SHARON L. THOMPSON-SCHILL, University of Pennsylvania—Many theories of semantic memory describe the representation of object concepts as patterns distributed across semantic features, such that objects sharing features have overlapping representations. We used eye movements to explore whether activating one object leads to the activation of other objects that are similar in color. Participants were presented with two-picture displays and were instructed to click on the picture that corresponded to a heard word. In critical trials, the conceptual representation of one of the displayed objects was similar in color to that of the heard word. Importantly, this related object appeared in grayscale (e.g., for the target “frog,” the color-related object was a grayscale image of peas). Therefore, color similarity was not apparent in the visual depiction of the related object, eliminating the possibility of visual confusion. Color-related objects were preferentially fixated, demonstrating that objects related in color have overlapping representations.

(2090) The Procedural Learning of Timed Action Sequences Across the Life Span. JACQUELINE C. SHIN & JAI MENON, Indiana State University—Motor skill learning was investigated in a cross-sectional study involving elementary school children, college-age adults, and elderly adults. A version of the serial reaction time task was used in which visuo-spatial stimuli triggered manual responses, and the timing of responses was manipulated in terms of response-to-stimulus intervals. Both the responses and the timing followed repeating sequences that were phase-matched with each other. Procedural learning was assessed for the response and timing sequences and for the integration of timing into the response sequence. This was done by measuring reaction time slowing when either sequence or the phase relationship between them was altered. Tests of executive functions and declarative verbal learning were also administered. The results will be reported that address two questions: (1) What is the developmental trajectory of procedural learning for timed action sequences? (2) How do executive functions and declarative learning mechanisms contribute to this type of learning?

(2091) Mediated Priming Without Association. LARA L. JONES, Francis Marion University—Mediated priming refers to the activation of a target (e.g., bean) by a prime (e.g., coffee). In previous mediated-priming studies (e.g., McNamara & Altarriba, 1988), the mediator was associatively related to the prime. In contrast, pure mediated priming entails no association between the prime and the mediator (e.g., morning → coffee) or between the mediator and the target (e.g., coffee → bean). This study investigated the existence of pure mediated priming and examined which semantic-priming model (spreading activation, expectancy, correspondence, or semantic matching) best accounted for the results. Pure mediated priming was found across five experiments using various lexical priming paradigms and across two stimulus sets. Overall, the results indicated that semantic-matching theories provide the best explanation of pure mediated priming.

(2092) Monitoring Retrieval Experiences: Judgments of Remembering and Knowing. NICHOLAS SODERSTROM & DAVID P. MCCABE, Colorado State University—The remember–know paradigm was developed in order to examine retrieval experiences accompanied by contextual details (i.e., remembering) versus those that were not (i.e., knowing). We investigated whether explaining the distinction between remembering and knowing to participants prior to study and asking them to predict whether they would experience these states (i.e., judgments of remembering and knowing [JORKs]) would be more accurate in predicting recognition than are more traditional judgments of learning (JOLs). We found that JORKs were more predictive of recognition memory than were JOLs in two experiments. These results are consistent with the idea that participants were able to predict their later retrieval experience if the nature of that experience was explained prior to study. These data also demonstrate that the accuracy of metamemory judgments depends on the nature of the information monitored during study.

(2093) Are We Aware of Our Forgetting? Metacognitive Ratings of Directed Forgetting. MICHAEL C. FRIEDMAN & ALAN D. CASTEL, UCLA—It is often important to accurately predict what information we will later remember, but what about predicting how we forget information? Previous research has suggested that people are not always aware about certain principles of forgetting. The present research examined this issue in the context of item-method directed forgetting. Participants studied words, each of which was followed by a cue to remember (R) or forget (F) the word for an upcoming test, and also made predictions of how likely it was that they would later recall each word. The participants were fairly accurate at predicting recall of R items but overestimated how likely it was that they would recall F items. A similar pattern was found when words were assigned positive or negative point values. The findings suggest that item-based cues are used when making judgments of forgetting and that participants are largely unaware of the control they have over forgetting.

(2094) Aging and Self-Assessment of Metamemory: Role of Executive Functioning. BADIA BOUZZAOUI, LAURENCE TACONAT, SÉVERINE FAY, DAVID CLARYS, SANDRINE VANNESTE, & MICHEL ISINGRINI, CeRCA, CNRS, Université François-Rabelais Tours (sponsored by Laurence Taconat)—To examine the relationship between aging, executive functioning, and self-assessment of metamemory, 315 participants from 20 to 90 years of age completed four scales of the Metamemory in Adulthood questionnaire: internal and external strategy scales referring to metamemory control and capacity and change scales referring to metamemory knowledge. Executive functioning was evaluated with the Wisconsin Card Sorting Test and two verbal fluency tests. The first aim was to confirm age-related change on these four scales, and the second was to test the hypothesis that only the age effect on metamemory control scales is the result of executive limitations associated with aging. The results supported the first aim. However, regarding control scales, they showed that only the age effect on the use of internal strategies was mediated by executive functioning. This observation suggests that the use of internal memory strategies is a high-resource-dependent cognitive process associated to executive functioning.

(2095) Separating Judgments of Learning From Memory Retrieval: An Event-Related Potential Study. IDA-MARIA SKAV-HAUG, University of Stirling, EDWARD L. WILDING, Cardiff University, & DAVID I. DONALDSON, University of Stirling—to determine the basis upon which judgments of learning (JOLs) are made, we investigated whether JOLs correlate with memory retrieval processes, using event-related potentials (ERPs). Participants learned word pairs, assigning a JOL to each pair. Memory for studied material was then assessed using a recognition memory test. We compared activity associated with recognition of items originally assigned low versus high JOLs. Relative to correctly rejected
new items, both high- and low-JOL items elicited the ERP correlates of familiarity (an early mid-frontal effect) and recollection (a later left-parietal effect). The magnitude of the familiarity effect was constant across JOLs; however, items assigned high JOLs elicited a significantly larger recollection effect, as compared with items assigned low JOLs. These findings indicate that JOLs are based upon an assessment of whether studied material will be recalled on a later test.

(2006) Metamemory and Memory Under Conditions of Retroactive Interference: Contextual Cues About Source Do Not Reduce Retrieval Blocking Effects. DEBORAH K. EAKIN & HEATHER M. WOLF, Mississippi State University—The effects of retrieval blocking on memory was examined by Eakin et al. (2003) using an eyewitness memory paradigm. Retrieval blocking was demonstrated to impair memory for an original event, especially if the misinformation was highly accessible and people were warned immediately after exposure to the misinformation. The present study was designed to determine whether providing contextual information to distinguish the source of the original versus the misleading information would alleviate retrieval blocking. Altering the voice (male vs. female) that presented word pairs between the control and interference conditions in a typical retroactive interference paradigm did not reduce retrieval blocking. Metamemory predictions were also examined, and providing additional source context had no effect on metamemory, although metamemory and memory were dissociated in terms of the interference conditions, replicating Eakin (2005). The findings will be discussed in terms of the theoretical framework provided by SAM (e.g., Raaijmakers & Shiffrin, 1981).

(2007) Episodic Memory and Metamemory for Nouns and Verbs in Parkinson's Disease. BENGI BARAN & ALI I. TEKCAN, Bogazici University, HAKAN GÜRVIT, Istanbul University, & AYSECAN BUDOĞLU, Bogazici University—This study investigated memory and metamemory for episodic information and the contribution of executive function to metamemory accuracy in patients diagnosed with Parkinson's disease (PD). Given that earlier work implied differential processing of verbs and nouns in PD, we also included word type as a variable. PD patients and healthy control participants were asked to recall word pairs and to provide feeling-of-knowing (FOK) judgments for the nonrecalled items, followed by a recognition test. The patients were impaired in both recall and recognition. Regarding metamemory, PD patients were less likely to give positive FOK judgments and were less accurate in their FOK judgments than were the control participants. Regarding the type of metamemory, PD patients performed worse than the controls on the recognition of verbs, but no other effect of word type was observed. Different measures of executive function contributed to FOK performance of PD patients and control participants.

(2008) Confidence and the Reversed Testing Effect of Misinformation: A Two-Process Model of Subjective Experience. AYANNA K. THOMAS, Tufts University, JOHN B. BULEVICH, Rhode Island College, & JASON C. K. CHAN, Iowa State University—Chan, Thomas, and Bulevich (2008) demonstrated that when participants were given a cued recall test before misleading information, they were more susceptible to memory errors than were those who did not get a test before misinformation, contrary to typical testing effect findings (Roediger & Karpicke, 2006). In the present study, subjective experience associated with this reversed testing effect was examined. We adopted a view of metacognition that emphasized a bidirectional link between subjective experience and behavior, or between monitoring and control. The effects of control on monitoring and the converse were assessed through confidence judgments, latencies associated with retrieval, and warnings. We found effects of strategic-monitoring processes on control, consistent with predictions made by Koriat, Ma’ayan, and Nussinson (2006). In contrast, the effects of strategic control processes on monitoring were better accounted for by a two-process feature overlap model (i.e., Smith, Shoben, & Rips, 1974), as compared with a single-process model.

• ASSOCIATIVE LEARNING •

(2009) Haptics in Learning of Association Between Visual and Auditory Entities. ANNE M. HILLAIRET DE BOISFERON, BENJAMIN B. FREDEMBACH, & EDOUARD P. GENTAZ, LPNC, CNRS, Université Pierre-Mendès-France (sponsored by Morton A. Heller)—This study examined whether the addition of a visuo-haptic exploration allows adults to learn more efficiently arbitrary associations between visual and auditory entities. Adults had to learn 15 associations between unknown visual entities and their corresponding sounds, using two methods that differed in the modalities involved in the exploration of the visual entities. Adults used vision in the classic method and both visual and haptic modalities in the multisensory one. After both methods, the performances in recognition were assessed in two intramodal (visual and auditory) and two intermodal (visuo–auditory and auditory–visual) tests. Performances in the two intramodal and the audio-visual tests increased similarly after both methods. In the visuo–auditory test, the performances increased after both methods, but with higher magnitude after the multisensory method. These results are discussed in relationship to the specificities of the haptic modality and to the haptic bond hypothesis between visual and auditory entities.

(2010) The Effect of Testing on Memory: Does Enhanced Retention Transfer to New Test Situations? RENEE ZEELENBERG, DIANE PECHEER, & HUIJN K. TABBERS, Erasmus University Rotterdam—Recent studies have suggested that, as compared with additional study, intermediate tests enhance long-term retention. We investigated whether this enhanced retention effect transfers to new test situations. Participants initially studied unrelated word pairs (A–B). Subsequently, these pairs were presented in an intermediate cued recall test (A→?), or received additional study: A final test administered immediately after the study phase showed no benefit of intermediate testing. After a 1-week retention interval, however, intermediate testing clearly enhanced recall over and above additional study. Moreover, the benefit of intermediate testing was obtained even when memory was tested in the opposite direction (B→A), but performance was best when memory was tested in the same direction (A→?).

(2011) Peak Shift: Is it Perceptual Learning or a Temporary Attentional Adjustment? MATTHEW G. WISNIIEWSKI, BARBARA A. CHURCH, & EDUARDO MERCADO III, University at Buffalo—Learning to discriminate similar stimuli can alter one's capacity to discriminate related stimuli. For instance, repeatedly distinguishing two similar stimuli can lead individuals to classify novel items as if they were more recognizable than the familiar stimuli. This phenomenon is known as peak shift. We examined peak shift in individuals who were trained to distinguish similar sounds. In Experiment 1, we tested whether learning to identify complex sounds would generate a peak shift effect. Auditory training did produce the effect, confirming earlier reports that repeated experiences with complex stimuli can warp an individual's perceptual sensitivities. In Experiments 2 and 3, we investigated the role of memory in peak shift by introducing a delay after training and testing. Peak shift was observed even when testing occurred 24 h later. Our findings suggest that peak shift may reflect long-term perceptual learning mechanisms, rather than, or in addition to, a short-term attentional shift.

(2012) Applying Hazard Function to Learning Theory. LARA N. SLOBODA & RICHARD A. CHECHILE, Tufts University—This research explores how hazard function analysis provides a powerful means for understanding learning. Within this context, the Weibull distribution is a general formulation that can describe, depending on the value of a shape parameter, monotonically increasing, constant, or monotonically decreasing hazard. The Weibull model fits well many existing learning data sets. For studies with a high degree of homogeneity for subjects and items, the Weibull shape parameter is close to 1.0, but for other studies with possible mixtures of item types or individual differences, the shape
parameter is less than 1.0. This pattern is directly related to fundamental theorems in the area of hazard function analysis.

**The Effects of Retrieval Practice on Associative Recall of Word Pairs.** SHANA K. CARPENTER, University of California, San Diego and Iowa State University; & HAL PASHLER & JASON JONES, University of California, San Diego—Cued recall tests enhance memory retention, relative to restudy opportunities. However, it is unknown whether this enhancement is comparable in both the forward (A→B) and the backward (B→A) directions. In Experiment 1, participants learned 60 unrelated word pairs (e.g., coffee-roof) through either cued recall testing with feedback (test/study) or restudying (study). In Experiment 2, the same word pairs were learned through one, two, or three repetitions of test/study or study. On a final test 24 h later, forward recall (coffee?) was superior to backward recall (roof?), but only for items learned through test/study and not during study. The forward recall advantage for items learned through test/study became more pronounced with a greater number of repetitions. For items learned through study, on the other hand, forward recall was comparable to backward recall, regardless of the number of repetitions.

**Differences in Sustained Operant Variability Levels.** DEBORAH E. RACEY, MICHAEL E. YOUNG, & ERICA J. JACOBS, Southern Illinois University, Carbondale—Contingencies calling for variability at levels both above and below the baseline level elicited by the task were introduced. Participants pressed four key responses on a computer keyboard in one of four contingency conditions: a lag 50 contingency (L50–0), a lag 50 contingency combined with a within-sequence variability requirement (L50–1), a lag 1 contingency (L1–0), and a lag 1 contingency combined with a within-sequence requirement (L1–1). Within-sequence entropy was increased, relative to baseline, in the L50–2 and L1–2 conditions. Between-sequence entropy increased in the L50–0 and L50–2 conditions, decreased in the L1–2 condition, and was unchanged in the L1–0 condition. Only the withins- and between-sequence entropy increases were sustained (partially) when the contingency was removed. Both types of variability contingency seemed to bring the type of variability they addressed under the control of the contingency while they were in effect, but they had differential effects on sustained variability in extinction.

**Expertise and Organization of Knowledge.** SOPHIE CALLIES & DENIS COUSINEAU, Université de Montréal (sponsored by Denis Cousineau)—Proposed in 2002 by Lewandowsky et al., the theory of knowledge partitioning refers to the context-dependent aspect of knowledge. The more complex the learning process is, the more likely it is that knowledge will be organized in separate parcels, each matching with a specific context. Nonetheless, we found several limitations in the authors’ methodology. We chose, therefore, to resume their experiment after controlling problematic variables. Since the aim of this study was to understand expertise in complex learning, we categorized learners on the basis of performance. As surprising as it may seem, knowledge partitioning occurred only for low-performing learners, whereas experts (i.e., high-performing learners) integrated their knowledge in a single entity. Consequently, knowledge partitioning is not a predictor of expertise; on the contrary, we are experts when our knowledge is homogeneous, no matter the context.

**Counting Broken Causal Links: A Pattern-Based Heuristic Model of Bottom-Up Causal Induction.** RALF MAYRHOFER, YORK HAGENMAYER, & MICHAEL R. WALDMANN, University of Göttingen—Although humans can undoubtedly learn causal model representations, there has been a debate about whether they are capable of inferring causal structure from covariation data alone in the absence of other cues (e.g., temporal order). Using the mind-reading alien paradigm introduced by Steyvers et al. (2003), we found impressive learning performance over a wide range of parameterizations for some causal structures but also systematic failures for others. Our experiments suggest that participants’ learning can be explained by a heuristic that is based on counting patterns that violate local causal hypotheses within the hypothesized structures. Furthermore, we show that the proposed heuristic roughly approximates a model selection procedure that selects the causal structure that maximizes the causal strength of the causal relationships involved.

**Smarter Than We Think: A Little Feedback Goes a Long Way.** WIM DE NEYS & JOHAN WAGEMANS, Katholieke Universiteit Leuven—Logical reasoning is often biased by intuitive heuristics. Contrary to popular belief, we show that this bias does not result from a lack of logical knowledge per se. We presented classic reasoning tasks in which cued intuitions conflicted with logical considerations. After each problem, we simply told the participants whether their response was right or wrong. Such minimal feedback does not help people to suddenly acquire the logical knowledge needed to solve the problems. Nevertheless, we observed that the feedback resulted in a spectacular performance boost (~25% correct responses). A second group of reasoners received erroneous feedback (i.e., correct responses were labeled as incorrect). Erroneous feedback hardly affected performance. Findings suggest that reasoning errors are no mere “mind-gaps” but result from metacognitive uncertainty. The problem is not that people do not know what the correct response is but, rather, that they are not sure whether it is actually right.

**Game, Set, and Match: Attentional Processes in a Novel Card Game.** MOLLY M. POTTRUFF, McMaster University; JONATHAN A. FUGELSAN & DANIEL SMILEK, University of Waterloo; & DAVID I. SHORE, McMaster University (sponsored by David I. Shore)—The game “Set” requires participants to identify 3 cards in a 12-card array using a complex grouping rule. In order to investigate the underlying cognitive and perceptual mechanisms of this game, we asked participants to discriminate between complete and incomplete 3-card sets. As the number of shared features increased, the reaction time (RT) to identify complete sets decreased. Interestingly, time to detect incomplete sets was significantly shorter than that for complete sets. We then examined these results in a more naturalistic setting by monitoring eye gaze while participants searched for complete sets in a 9-card array. We replicated the basic effect of shared features on RT and showed that the target cards received proportionately more fixations 14 sec prior to selection. We speculate that implicit awareness of the target cards precedes explicit decision and selection and that these implicit processes are evident in the gaze position.

**Divergent Thinking: Cognitive Predictors and Problem Incubation.** HENK J. HAARMANN, DIMITRIOS DONAVOS, & ANITA R. BOWLES, University of Maryland, College Park—Incubation effects have been frequently examined and demonstrated in convergent, but not divergent, thinking. In the present study, we assessed whether passage comprehension and visual fluid intelligence predict divergent thinking in a verbal consequences test and whether there is an incubation effect upon performance on this test (i.e., greater benefit of extra work on a problem after distracting attention temporarily away from it, as compared with a control condition without task interruption). We found that passage comprehension (but not visual fluid intelligence) predicted fluency, originality, and flexibility of divergent thinking. The predictive relationships involving originality and flexibility were mediated by fluency. There was no incubation effect on these measures, contrasting with findings from two peer-reviewed studies that demonstrated an effect of incubation on originality (Fulgosi & Guilford, 1968) and fluency (Fulgosi & Guilford, 1972) of divergent thinking. Future studies are needed to investigate under what conditions divergent thinking benefits from incubation.

**The Relationship Between Cues to Solution, Restructuring Patterns, and Reports of Insight.** PATRICK J. CUSHEN & JENNIFER WILEY, University of Illinois, Chicago—The “Aha!” or “Eureka!” moment of
sudden realization in creative problem solving has been considered by many as definitional of insightful solution (Davidson, 1995; Duncker, 1945; Metcalfe & Wiebe, 1987). However the relation of this phenomenological experience to the pattern of solution-related restructuring is unclear. The present study used an importance-to-solution rating task to examine solution patterns on the triangle of coins problem, the effect of attentional direction on solution patterns, and the relation between solution patterns and subjective reports of insight. Both incremental and insight-like solution patterns were observed, but directing attention to particular problem features made incremental solution more likely. Interestingly, individuals' patterns of change in problem representation did not align with their reported perceptions of solution insightfulness.

**JUDGMENT/DECISION MAKING**

(2114) Enhancing Self-Control Via Mental Simulation: Thinking of the Future Increases the Subjective Value of Delayed Rewards. GIOVANNA EGIDI & HOWARD C. NUSBAUM, University of Chicago—People often attribute lower values to delayed profits; they will choose a smaller immediate reward over a larger delayed reward (e.g., $100 now vs. $150 in a year). We examined the cognitive basis of this phenomenon by manipulating temporal framing. Specifically, we tested whether people will attribute a higher value to delayed profits if the psychological distance to the delayed rewards is reduced. We initially established participants' discounting rate of future monetary rewards. We then asked the participants to think of future positive and negative events. Subsequently, we again assessed the participants' discounting rate for future rewards. The manipulation induced the participants to attribute higher value to future rewards, but this effect was limited to larger amounts (e.g., $200) and did not hold for smaller ones (e.g., $50). This illustrates that self-control may be enhanced when the appropriate contextual situations are created and may be modulated by the magnitude of the delayed profits.

(2111) Do Time-Based and Probabilistic Decisions Require the Same Amount of “Attention”? ANA M. FRANCO-WATKINS, Auburn University, & JOSEPH G. JOHNSON, Miami University—Do people evaluate time and probability options in the same manner? Past research has demonstrated similar patterns of discounting behavior between temporal discounting and probabilistic rewards. The same mathematical function, a hyperbolic function, appears to fit both time and probabilistic decisions quite well (Green & Myerson, 2004). However, the question remains as to whether or not the same psychological processes underlie both types of decisions. It has been posited that attention or inattention to different elements of the decision space might be a factor in the choice. We examined oc- culomotor measurements between two types of decisions to investigate attentional processing. Additionally, we tested whether a process-based model could better account for and provide more explanatory power than the hyperbolic function in time and probabilistic decisions.

(2122) The Cross-Cultural Variation of Probability Judgment Accuracy: The Influence of Reasoning Style. JULIA LECHUGA, Medical College of Wisconsin (sponsored by Wendy S. Francis)—Research has corroborated the cross-cultural variation of the overconfidence phenomenon (Wright & Phillips, 1980; Yates et al., 2002). However, research efforts attempting to explain the mechanisms behind this effect remain elusive. The purpose of the present study was to investigate whether preference for holistic reasoning (Nisbett, 2003) could be isolated as the cause of the cross-cultural variation. Specifically, the influence of experimentally inducing an intuitive decision-making strategy in three groups of culturally and linguistically diverse participants (N = 180), by inducing feelings of knowing (Koriat, 2001), was investigated. The results indicated that the knowledge calibration index varied as a function of experimental conditions in participants who had a greater tendency to reason holistically. It is proposed that psychology should engage in more generalization attempts to uncover true universals.

(2113) A Cognitive Comparison of Complex Risky-Decision-Making Tasks. TIMOTHY J. PLESKAC, Michigan State University, ELDAD YECHIAM, Technion University, & CARL W. LEJUEZ, University of Maryland, College Park—Risky decision making requires the use of several different cognitive processes. Recently, complex risky-decision-making tasks, such as the balloon analogue risk task and the Iowa gambling task, have been used in tandem with formal cognitive models to examine individual differences in these processes. The results from these tasks have been provocative, offering quantitative measures of differences in latent cognitive processes of interest, such as reward evaluation or learning from experience. In this study, we investigated whether these two paradigms identify similar or divergent risky decision processes. The results show that both tasks identify substance use, but for different cognitive reasons. Furthermore, the task-specific processes are associated with different personality dimensions. These results imply that risky decision making is the result of different component processes and that these tasks provide a powerful vehicle for investigating long-standing questions such as the relation between personality and cognitive processes.

(2116) Loss Aversion in Contrastive Explanations. DANIEL HEUSSEN, SOPHIE BELARDI, & PETRO KUSEV, City University London—People do not explain a fact per se but generate explanations by contrasting the target fact with some alternative comparison. Why did Obama receive more votes than Clinton? What is considered the to-be-explained fact and what the contrast affects the way we explain the difference. Miller, Taylor, and Buck (1991) showed that for differences in voting behavior, men were considered the contrast group, whereas women's behavior had to be explained. Here, 242 participants explained differences between males and females in typical and neutral attributes for stereotypical gender roles, such as being ambitious for professional football players or ballet dancers. Explanations were coded as predominately about either males or females. Presenting the difference, as “females are more ambitious than males,” focused most explanations on males. However, exactly the same difference, presented as “males are less ambitious than females,” divided explanations equally between males and females.

(2117) Information Integration: Modeling Stimulus Differences. ANDREW L. COHEN, University of Massachusetts, Amherst, & JEROME R. BUSEMeyer, RICHARD M. SHIFFRIN, & JARED HOTALING, Indiana University, Bloomington—The goal of this research is to uncover the fundamental mechanisms by which a judgment is fashioned from multiple sources of information. Whereas an assumption of suboptimal integration of information tends to dominate such areas as judgment, an assumption of optimal information integration is common in such fields as perception. This project bridges these areas through a common experimental paradigm and uniform methods of analysis and modeling. One possibility is that differences in processing mode lead to differences in task performance. Stimuli that require intentional integration of information, such as the quantitative stimuli commonly found in judgment studies, may lead to suboptimal performance. Optimal integration might be more likely for stimuli that invite automatic processing, such as the...
images often used in perceptual research. This possibility is investigated within a shared framework by manipulation of images to encourage intentional integration of information in some conditions and automatic integration in others.

(2118) The IAT and Race: Results From the “Black Belt” of the Rural South. GARY D. FISK, Geor gia Southern State University, & STEVEN J. HAASE, Shippensburg University—An important internal validity issue for the Implicit Association Test (IAT) is that responses might be affected by stimulus familiarity (Ottaway, Hayden, & Oaks, 2001). To this end, we compared participants with differing degrees of exposure to African-Americans. IATs with different stimuli (faces, names) were administered to participants from rural Pennsylvania (about 5% African-American) and rural Georgia (about 48% African-American). The preliminary results (total N = 65) showed no differences between Caucasian participants from Georgia or Pennsylvania (however, the traditional IAT preference effect was obtained, p = .003). Interestingly (although with small ns), African-American participants from Georgia (n = 5) showed a greater preference for African-American faces, whereas African-American participants from Pennsylvania (n = 4) preferred Caucasian faces (p = .14, d = 1.11). These results suggest that differential responses measured by the IAT are more than a mere stimulus familiarity effect, thereby supporting the validity of the IAT.

• COGNITIVE AGING •

(2119) Low-Level Perceptuo-Motor Control in Old Age. KULIBIR S. BIRAK, ELIZABETH A. MAYLOR, & FRIEDERIKE SCHLAGHECKEN, University of Warwick—Within the domain of voluntary motor control, there is compelling evidence for an age-related impairment of the ability to inhibit a prepotent response. Few studies to date have investigated low-level or automatic inhibitory motor control in old age, and the results so far are mixed. We assessed the extent to which low-level control is influenced by (1) older adults’ perceptual limitations and/or (2) generally slower information processing in old age. We present two experiments using the masked prime paradigm in which responses to supraliminal targets were influenced by previously presented subliminal primes. Prime duration and prime−mask−target intervals were manipulated in order to establish the boundary conditions of inhibitory low-level motor control in normal aging. Implications of the results for prominent theories of cognitive aging, including the reduced inhibition hypothesis, are discussed.

(2120) The Relationship Between Vision and Age-Related Memory Loss. BRITTANY FAUX & AIMÉE M. SURPRENANT, Memorial University of Newfoundland (sponsored by Aimée M. Surprenant)—Correlational studies of memory and aging have highlighted a prominent link between memory and sensory decline in older adults. One theory suggests that strain ing resources to meet sensory demands may result in less effort being available for encoding specific features into memory and can result in a more abstract representation of stimuli being stored. This view explains why older adults commonly rely on gist-based processing. In the present study, older adults completed a number of vision tests, including acuity and contrast sensitivity, and also performed cognitive and memory tasks that compared recall of stimuli that were visually confusable with those that were categorically related. This design allows examination of within-subjects performance with meaningful stimuli versus visually similar characters, as well comparisons of cognitive performance in older adults with better and worse vision. The results are discussed in terms of the common cause and perceptual degradation hypotheses of aging and memory.

(2121) Hierarchical Event Segmentation and Memory in Young and Older Adults. CHRISTOPHER A. KURBY & JEFFREY M. ZACKS, Washington University (sponsored by Jeffrey M. Zacks)—People segment ongoing activity into discrete events, and this segmentation is related to what they remember later. Segmentation tends to be hierarchical, with small units of activity grouped into larger ones. Older adults’ segmentation differs from that of younger adults, and this is associated with group and individual differences in event memory. Here, we investigated the effects of aging on the perception of hierarchical structure in events. Older adults were more variable in their segmentation and remembered less well, as in previous research. Additionally, older adults segmented events less hierarchically than did young adults. In previous studies, asking younger adults to describe events as they segmented improved segmentation. In the present study, however, concurrent describing made older adults’ segmentation more variable and less hierarchical. Concurrent describing did not improve event memory. These data suggest that older adults are less able than younger adults to identify events that are effective for memory encoding.

(2122) Aging Affects Memory for Valenced Character Information. MEGAN J. LIMBERT & ANGELA H. GUTCHESS, Brandeis University—Some evidence suggests that memory for socioemotional information is preserved with age (Rahhal, May, & Hasher, 2002), whereas other evidence suggests that primarily positively valenced information is maintained (Mather & Carstensen, 2005). We assessed whether these findings extended to memory for character information. Additionally, we hypothesized that memory for general impressions would be preserved with age but that memory for specific details would be impaired. Twenty young and 20 elderly participants learned about 48 individuals, characterized as positive, neutral, or negative. The participants then recalled general impressions and specific information for each individual. We found that the young performed better than the older adults on both general and specific memory measures. Both age groups remembered socioemotional information (positive and negative) better than neutral in general memory, but there was no evidence for a positivity bias. We conclude that aging affects memory for character information and that valenced information is prioritized in memory for both age groups.

(2123) Familiarity Assessment in Normal and Pathological Aging. SALVADOR ALGARABEL, University of Valencia, JOAQUIN ESCUDERO & JOSE MAZON, Valencia General Hospital, ALFONSO PITARQUE, University of Valencia, & VICENTE PESET & LAURA LACRUZ, Valencia General Hospital—Whereas there is agreement that recollection is a process that deteriorates with age, a disagreement exists with regard to the assessment of familiarity. Most studies on aging show that healthy old controls perform similarly to young controls. However, there is less consensus on whether familiarity is still preserved in some forms of dementia. Recently Westenberg and collaborators (2006) and Anderson and collaborators (2008) have presented data indicating that there are no deficits in familiarity, as estimated by process dissociation procedures, in mildly cognitively impaired patients, with regard to healthy controls. We present data obtained with samples of university students, healthy old Alzheimer’s disease patients, and amnesic and nonamnesic cognitively impaired samples of participants, showing selective impairment of familiarity, as evaluated with direct recognition tasks.

(2124) Age Effects on Contextual Cuing. ANDREA C. SMYTH & DAVID R. SHANKS, University College London (sponsored by David R. Shanks)—In contextual cuing, a spatial context of stimuli in a display comes to guide visual search toward the location of a target stimulus. Faster responses are made to repeated displays containing context−target associations, as compared with novel displays that do not contain this covariance. We have found that healthy older people show learning impairments on a contextual-cuing task when compared with younger people. However, when younger participants’ response times are artificially matched to those of older adults via manipulations of the display properties, learning is attenuated, and they perform like older adults. These results suggest that the deficit in contextual cuing shown by older adults is not intrinsic but can be attributed to the effects of slower overall response speed.
A Pound of Lead Feels Heavier Than a Pound of Feathers... but performance yields an attractor (variables can be seen simultaneously in a perceptual learning state space both slope and intercept track changes in accuracy. However, separate

Perceptual Learning in Dynamic Touch Quantified by a Perceptual Learning Index. JEFFREY B. WAGMAN, Illinois State University, & PATRICK A. CUBE, University of North Carolina, Pembroke—Perceptual learning, the improvement in perceptual skill with practice, typically results in improvements in both accuracy and consistency of perceptual reports. Regression statistics can be used to track such improvements. Changes in r² track changes in consistency, and changes in both slope and intercept track changes in accuracy. However, separate

Perceptual Processing in Dynamic Touch—You Feel What You Need to Feel. JULIA ADLER, SØREN K. ANDERSEN, & MATTHIAS M. MÜLLER, University of Leipzig (sponsored by Soledad Ballesteros) —We examined whether sustained attentional modulation of the steady state somatosensory evoked potential (SSSEP) is dependent upon specific information integration requirements of the task. We simultaneously stimulated the left and right index fingers for several seconds at 20 and 25 Hz. Subjects performed a target detection task at the to-be-attended index finger. Targets were defined as short changes in either amplitude or frequency. Whereas target detection in the amplitude change condition was, in principle, possible without processing the ongoing vibration, this was not the case in the frequency change condition. Therefore, we expected sustained facilitation of SSSEP amplitude in the frequency change condition only. In line with this reasoning, we found an SSSEP amplitude increase with attention when the subjects had to detect short changes in frequency, but no attentional modulation when subjects had to detect changes in amplitude. We suggest that attentional modulation of stimulus processing is highly dependent upon which properties of the stimulus are currently task relevant.

Peripheral Neuropathy and Length Perception by Dynamic Touch. PAULA L. SILVA, STEVEN J. HARRISON, & JEFFREY KINSELLA-SEN, & MATTHIAS M. MÜLLER, University of Leipzig (sponsored by Soledad Ballesteros) —We examined whether sustained attentional modulation of the steady state somatosensory evoked potential (SSSEP) is dependent upon specific information integration requirements of the task. We simultaneously stimulated the left and right index fingers for several seconds at 20 and 25 Hz. Subjects performed a target detection task at the to-be-attended index finger. Targets were defined as short changes in either amplitude or frequency. Whereas target detection in the amplitude change condition was, in principle, possible without processing the ongoing vibration, this was not the case in the frequency change condition. Therefore, we expected sustained facilitation of SSSEP amplitude in the frequency change condition only. In line with this reasoning, we found an SSSEP amplitude increase with attention when the subjects had to detect short changes in frequency, but no attentional modulation when subjects had to detect changes in amplitude. We suggest that attentional modulation of stimulus processing is highly dependent upon which properties of the stimulus are currently task relevant.

Attention in Two-Finger Roughness Perception. ROBERTA D. ROBERTS & GLYN W. HUMPHREYS, University of Birmingham (sponsored by Glyn W. Humphreys)—Much is understood about how tactile texture perception varies with the physical parameters of surfaces; however, less is known about the influence of the effectors used to acquire the information (e.g., the use of one finger, as compared with more fingers). We examined participants’ ability to judge the roughness of a stimulus presented to one finger independently of a stimulus presented to another, unattended finger. Testing was conducted using various combinations of the left and right index fingers and thumbs to adopt a “pinch grip” posture to slide over two successive, opposed stimulus pairs. The participants reported which of two intervals contained the rougher stimulus on the attended finger. For all finger combinations, roughness judgments at the attended finger were affected by the stimulus at the unattended finger. These results suggest that it is not possible to filter out textural inputs from an irrelevant finger on the same or a different hand.

Phonology Interacts With Imagability: Further Evidence. GAIL MOROSCHAN & CHRIS WESTBURY, University of Alberta—Very few studies have been done to see whether imagability and phonology interact with one another. An imaging study (Binder, Westbury, McKiernan, Possing, & Medler, 2005) revealed overlapping brain
regions for abstract word access and phonological processing, suggesting the hypothesis that abstract words are more sensitive than concrete words to phonological variables. Moroschan and Westbury (submitted) tested this hypothesis by manipulating imageability and phonological neighborhood size in lexical decision and semantic decision tasks, both auditorily and visually. Significant interaction effects were found in experiments with the auditory modality, which stresses phonological processing, but not with the visual modality. We provide evidence of these effects in another task that emphasizes phonology: a rhyme priming task. These findings are buttressed by a dictionary study showing the predicted pattern: Abstract words tend to have smaller phonological neighborhood sizes than do concrete words. The implications of these findings are discussed.

### (3009)

**Distributional Analyses in Auditory Lexical Decision: Neighborhood Density and Word Frequency Effects.** WINSTON D. GOH, LIDIA SUAREZ, MELVIN J. YAP, & SEOK HUI TAN, National University of Singapore — The effects of phonological neighborhood density and word frequency in spoken word recognition were examined using distributional analyses of response latencies in auditory lexical decision. A density × frequency interaction was observed in mean latencies; frequency effects were larger for low-density words than for high-density words. Distributional analyses revealed that this interaction was primarily due to differential shifting of the modal portion of the latency distribution between high- and low-frequency words as a function of density. For low-density words, frequency effects were reflected in both distributional shifting and skewing. For high-density words, frequency effects were mediated purely by distributional skewing. The results suggest that word frequency plays a role in early auditory word recognition only when there is relatively little competition between similar-sounding words.

### (3010)

**Are Two Stimuli Better Than One? Forced Choice Lexical Decisions.** GREGORY O. STONE & MAGGIE GORRAIZ, Arizona State University — We introduce a new version of the lexical decision task (LDT)—forced choice lexical decision. Participants are simultaneously presented with two stimuli, one of which is a word (PEARL) and one of which is not (GLUMP). They must indicate as quickly and as accurately as possible which stimulus is the word (i.e., word on right vs. word on left). In the principal experiment, participants run in a large number of trials in both standard and forced choice LDTs (400 trials each). The full patterns of data (especially reaction time distributions) are used to empirically test hypotheses about how performance in a forced choice LDT relates to performance in a standard LDT. For example, forced choice processing could employ self-terminating serial access for the two stimuli, exhaustive serial access, independent parallel access, and so on. Additional experiments demonstrate some uses for this new task.

### (3011)

**Pathway Control in Visual Word Processing: Consequences for Memory Performance.** SEAN H. K. KANG & DAVID A. BALOTA, Washington University, & MELVIN J. YAP, National University of Singapore — Can readers exert strategic control in speeded pronunciation, and does this have consequences for later memory performance? The pathway control hypothesis claims that the relative contributions of the lexical and nonlexical pathways can be modulated by the task context. In Experiment 1, subjects named high- and low-frequency regular words in the context of low-frequency exception words or nonwords. Frequency effects (faster latencies for high-frequency targets) were smaller in the nonword context, consistent with the notion that nonwords emphasize the characteristics of a relatively frequency-insensitive nonlexical pathway. Importantly, we also assessed memory for targets, and a similar attenuation of the frequency effect occurred in recognition memory. In Experiment 2, we found that neighborhood size effects on naming and recognition memory were similarly modulated. These memorial effects are most consistent with the pathway control account and cannot be fully accommodated by alternative accounts based on changes in response time criteria or target distinctiveness.

### (3012)

**Pupil-Blah-Metry: Word Frequency Reflected in Cognitive Effort.** MEGAN H. PAPESH & STEPHEN D. GOLDFINGER, Arizona State University — We used a modified delayed naming procedure to assess postperceptual word frequency effects. In addition to standard naming latencies, we examined changes in pupil dilation; these served as a real-time index of cognitive effort. Using a dual-task procedure with various delays after word perception and a constant response (“blah”) for catch trials, we extended previous findings (Goldfinger et al., 1997). In two experiments, we observed frequency effects in naming latencies across delays and levels of task difficulty. Pupil dilation was a relatively late-arriving index of attention, reflecting cognitive effort displaced from events by several hundred milliseconds. Pupil dilation was sensitive to word frequency: Low-frequency (LF) words triggered greater increases in dilation, relative to high-frequency (HF) words. Frequency also affected the “blah” trials. Pupillary frequency effects were strongest when the response tone followed shortly (250 msec) after word presentation and were exacerbated as dual-task difficulty increased. We interpret the data as reflecting attentional differences in the processing of LF and HF words.

### (3013)

**Effects of Lexical Status and Morphological Complexity in Masked Priming: An ERP Study.** JOANNA A. MORRIS, Hampshire College, JAMES H. PORTER, Tufts University, JONATHAN GRAINGER, LPC, CNRS, and Aix-Marseille University, & PHILLIP J. HOLCOMB, Tufts University — This study examined event-related potential responses to simplex targets (e.g., work) preceded by masked primes in which the target was embedded. Primes were (1) true derivations of the target (worker), (2) nonwords consisting of the target and a nonmorphological ending (workel), (3) morphologically complex pseudowords consisting of an illegal combination of the target and a suffix (workness), and (4) unrelated primes (musical). Decompositional models of morphological processing predict that priming from both true derivations (worker) and complex pseudowords (workness) should be greater than priming from monomorphic pseudowords (workel). In contrast to this prediction, we found that all prime types—existing derived words, complex pseudowords, and monomorphic pseudowords—led to a similar reduced N400 to the following target. This finding suggests that in some instances, masked morphological priming cannot easily be distinguished from orthographic priming.

### (3014)

**The Time Course of Orthography and Phonology: ERP Correlates of Masked Priming Effects in Spanish.** MARTA VERGARA-MARTINEZ, University of California, Davis, MANUEL CARREIRAS, Universidade de La Laguna, MANUEL PEREA, Universidad de Sevilla, FABRIZIO BERNOI, & ALEXANDER POLLATSEK, University of Massachusetts, Amherst (sponsored by Dr. L. Long) — One key issue for computational models of visual word recognition is the time course of orthographic and phonological information during reading. Previous research has shown that orthographic codes are activated very early and immediately after phonological activations comes into place. Here, we report an ERP masked priming experiment in which a very strict orthographic control condition was used and phonological effects were tested under a maximal orthographic overlap. The critical phonological comparison was between sets of primes that had the same orthographic similarity to the target words but differed in phonological similarity (e.g., conal-canal vs. cinal-canal vis-a-vis ponel-panel vs. pinel-panel), whereas the critical orthographic condition was between sets of primes that had the same phonological similarity but differed in orthographic similarity (e.g., conal-canal vs. konal-canal). The results showed that orthographic priming was observed mainly at the 150- to 250-msec time window, whereas phonological priming occurred at the 350- to 550-msec window.

### (3015)

**No Influence of Articulatory Suppression on Word and Pseudoword Superiority Effects.** MONICA STILLWELL & GIORDANA GROSSI, SUNY, New Paltz (sponsored by Jonathan Grainger) —In this study, we explored the role of orthographic recoding in word and pseudoword superiority effects, previously characterized as pure orthographic effects.
Participants were asked to identify letters embedded in briefly presented words, pseudowords, and nonwords with and without concurrent articulatory suppression. This manipulation had the purpose of occupying the participants’ phonological loop and interfering with the phonological recoding of stimuli in working memory. We predicted that the presence of articulatory suppression would lower accuracy across stimuli and that this decrease would be more dramatic for pseudowords if the participants relied on phonological recoding to perform the task. Word and pseudoword effects were present in both conditions; furthermore, articulatory suppression caused a similar decrease in accuracy for the three types of stimuli. Therefore, word and pseudoword superiority effects were not affected by the lack of phonological recoding. These results suggest that these effects mainly reflect orthographic processing.

SNAKES (and COBRA) Priming PLANE: Semantic (and Mediated) Priming for New Associations. JENNIFER H. COANE, Colby College, & DAVID A. BALOTA, Washington University (sponsored by David A. Balota)—Feature overlap models of semantic priming propose that shared features between primes and targets determine the organization of semantic memory (e.g., CAT–DOG). Associative accounts propose that contextual co-occurrence is critical and that the system is organized along associations independently of similarity (e.g., MOUSE–CHEESE). If unrelated concepts can become related as a result of contextual co-occurrence, this would provide support for associative accounts. In the present study, naturally co-occurring recent associations (e.g., SNAKES–PLANE) were tested under conditions that minimized strategic influences (i.e., short SOA, low relatedness proportion) in a semantic priming paradigm. Priming for new associations was observed in naming and in a lexical decision task (LDT) and did not differ from the priming found for preexisting relations (e.g., AIRPORT–PLANE). Mediated priming (e.g., COBRA–PLANE) was found in the LDT. These results suggest that contextual associations can result in the reorganization of the network that subserves “semantic” priming effects.

The Effect of Phonological Neighborhood Frequency on Visual Word Recognition. MARK YATES, University of South Alabama—Past research has shown that words with many phonological neighbors are processed more rapidly than words with few phonological neighbors. In an attempt to extend this research, the present experiments were designed to test whether the frequency of the phonological neighbors influences word recognition. Two groups of words were selected that were matched on number of phonological neighbors but differed in terms of average word recognition. Two groups of words were selected that were matched in both language and in terms of average word recognition. In an experimental design, words with many phonological neighbors were processed more rapidly than words with few phonological neighbors. These results suggest that these effects mainly reflect orthographic processing.

Examining Attention Allocation in Visual Search Tasks. POLINA M. VANYUKOV, TAMAR DEGANI, TESSA WARREN, & ERIK D. REICHE, University of Pittsburgh—Two eye movement experiments examined whether attention is allocated serially or in parallel during three visual search tasks: (1) single-feature detection, (2) conjunctive-feature detection, and (3) ordered-feature detection. In the first experiment, participants’ eye movements were recorded; in the second, a gaze-contingent paradigm was used to evince covert attentional shifts. Behavioral and eyetracking data suggest that, in the single-feature detection task, attention is allocated in parallel, with target detection RTs being unaffected by the number of distractors. In contrast, the conjunctive- and ordered-feature detection tasks seemed to require serial attentional shifts, with RTs and number of fixations increasing linearly with the number of distractors. These results suggest that tasks necessitating feature binding and/or maintaining feature order require serial allocation of attention. The implications of these results for models of eye movement control in reading will be discussed.

The Frequency Effect in Second-Language Visual Word Recognition. WOUTER DUYCK, Ghent University, DIETER VANDERELST, University of Antwerp, & TIMOTHY DESMET & ROBERT J. HART-SUIKER, Ghent University—A lexical decision experiment with Dutch–English bilinguals compared the effect of word frequency on visual word recognition in the first language with that in the second language. Bilinguals showed a larger frequency effect in their second language, even though corpus frequency was matched across languages. Experiment 2 tested monolingual, native speakers of English on the English materials from Experiment 1. This yielded a frequency effect that was comparable to that of the bilinguals in Dutch (L1). These results constrain the way in which models of word recognition can be extended to unbalanced bilingualism. In particular, the results are compatible with a theory by which the frequency effect originates from implicit learning. They are also compatible with models that attribute frequency effects to serial search in frequency-ordered bins (Murray & Forster, 2004), if these models are extended with the assumption that scanning speed is language dependent or that bins are not language specific.

Lexical Ambiguity Effects in Reading: Evidence From Eye Movements. HEATHER SHERIDAN, EYAL M. REINGOLD, & MEREDYTH DANEMAN, University of Toronto, Mississauga (sponsored by Meredith Daneman)—The influence of the preceding context on the processing of ambiguous words was investigated by monitoring the eye movements of participants while they read sentences containing biased homonyms in either a single-meaning context condition that instantiated the subdominant meaning of the homonym (“The man with a bad tooth had a crown made”) or a dual-meaning “pun” context condition that supported both the subdominant and the dominant meanings (“The king with a bad tooth had a crown made”). Early duration measures (first fixation; single fixation) produced longer fixation times for homonyms presented in the single-meaning condition than for those in the dual-meaning condition, whereas later measures (gaze duration; total time) showed a nonsignificant trend in the same direction. Theoretical implications are discussed.

Development of Parafocal Processing Within and Across Words in Reading. TUOMO HÄIKÖ, RAYMOND BERTRAM, & JUKKA HYYÖNEN, University of Turku (sponsored by Raymond Bertram)—The boundary paradigm was used to examine whether the amount of information extracted from an upcoming word in reading depends on that word’s being the second constituent of a biconstituental compound (as bag in handbag) or a spatially separated word (as bag in blue bag), and whether the amount of extracted information varies between different stages of reading development. To that end, 8-year-old, 10-year-old, and 12-year-old participants read sentences containing a critical target area consisting of a compound word or an adjective–noun combination, either in a normal condition or in a change condition in which the second part of the target area was initially replaced by a visually similar nonword.
Overall, considerably more parafoveal information was extracted within than across words. Furthermore, whereas parafoveal manipulations affected all groups in both conditions, eye movement behavior in response to the change was different for each age group, especially for the adjective–noun condition.

(3023) Revisiting Length and Predictability Effects on Eye Movements in Reading. TESSA WARREN, NIKOLE D. PATSON, PATRYK A. LAURENT, & ERIK D. REICHLE, University of Pittsburgh—Previous investigations into the potential interaction of word length and contextual predictability on eye movements have provided mixed results (e.g., Dreijhe et al., 2004; White et al., 2005). We report a 2 × 3 experiment crossing the length of a contextually predicted word (8–10 vs. 3–5 letters) with the length and predictability of the actually appearing word (predicted word vs. unpredicted/length-matched vs. unpredicted/length-mismatched). Fixation durations on a pretarget region showed potentially interesting differences between the effects of the length match status of an upcoming word when the context predicted a short versus a long upcoming word. For the target word, all early measures showed reliably effects of word length and predicted status, with longer fixations on unpredicted words. There were no reliable differences between unpredicted/length-matched and unpredicted/length-mismatched words on any measure for the target word. Ramifications for models of eye movement control in reading will be explored.

• LANGUAGE ACQUISITION •

(3024) Explicit and Incidental Word Learning Reflected in Eye Movements. BEN E. SEIPEL & PAUL W. VAN DEN BROEK, University of Minnesota (sponsored by Edward J. O’Brien)—For several decades, eyetracking methodology has been used to measure, monitor, and infer cognitive processes during reading. This study examines these processes in relation to learning rare words either explicitly or incidentally. After studying a set of rare words, 35 undergraduate students read short texts that included common words, studied rare words, or nonstudied rare words, while their eye movements were tracked. Students exhibited more and longer eye fixations on learned rare words than on common words; they also exhibited more and longer fixations on “unlearned” rare words than on learned rare words. In addition, students incidentally learned rare words from context at a greater rate than has been previously reported. These results suggest that students engage in different cognitive processes as they read common words, recently learned words, and unlearned words.

• LIMITATIONS OF SECOND LANGUAGE INSTRUCTION •

(3025) Limitations of Second-Language Instruction Using the Keyword Method. JAMES B. WORTHEN, SCUDDY F. FONTENELLE IV, JOSEPH D. DESCAMPS, & ELIZABETH L. FORMAN, Southeastern Louisiana University (sponsored by James B. Worthen)—The influence of imagery type and mode of presentation on the effectiveness of the keyword method as an aid to second-language acquisition was investigated. Native English speakers were taught Spanish vocabulary using either the keyword method or simple presentation of words and their translations. The participants in the keyword condition were instructed using bizarre, common, or both types of imagery as part of their mnemonic-based instruction. The participants in the control condition received words and translations but were given no mnemonic instruction. Half of the participants received instruction visually via computer, and half received auditory instruction. All the participants were given a baseline Spanish vocabulary test and a postinstruction test after both a 5-min and a 48-h retention interval. The results indicated more vocabulary improvement in the keyword condition than in the control condition only when common or mixed imagery was used in conjunction with auditory instruction. These effects were found with both immediate and delayed testing.

(3026) Constraints in Second-Language Learning: Evidence on Grammatical Gender in German. SUSAN C. BOBB & JUDITH F. KROLL, Pennsylvania State University—Grammatical gender is a feature that is typically considered difficult to acquire in a second/foreign language (L2). Particularly for those whose native language does not mark gender, such as English, the question has been raised whether full acquisition of gender can take place. In the present study, native English speakers with intermediate to advanced L2 proficiency in German and native German speakers performed a translation recognition task. They were presented with an article + noun first in English and then in German and had to judge the accuracy of the translation. Preliminary results show Stroop-like interference for native German speakers in conditions in which an incorrect translation matched the gender of the correct translation. In contrast, learners, regardless of proficiency, were insensitive to the match with grammatical gender, depending instead on the semantic relation between the two words. Implications for modeling constraints in acquiring the L2 grammar and lexicon are discussed.

• WORKING MEMORY •

(3027) Does Speech Reading Affect Word Segmentation? ANDREA SELL & MICHAEL P. KASCHAK, Florida State University—Previous studies in the area of speech reading have shown that watching someone speak helps others understand what is said. We present two experiments that explored whether the benefits of speech reading extend to word segmentation tasks of the kind that have been used to study language acquisition. Participants were trained on a stream of speech from a miniature language. The participants were trained such that they heard only the speech stream, saw a speaker produce the speech stream (but did not hear the speech sounds), or both saw and heard the speech sounds. The results show that viewing the speaker during training improved the participants’ ability to recognize the words that were presented in the speech stream. However, this effect appears to be speaker specific.

• LEARNING MORMPHES •

(3028) Learning Morphemes: Insights From Skilled Readers. MARJOLEIN M. MERKKX & KATHLEEN RASTLE, Royal Holloway, University of London, & MATTHEW H. DAVIS, MRC Cognition and Brain Sciences Unit—To examine how orthographic and semantic representations of affixes are learned, participants were taught novel affixes combined with existing word stems (e.g., sleepnule) and were given a definition for each novel word based on the stem and a consistent meaning for each affix. Tests performed 2 days after learning showed that the participants had good explicit knowledge of the novel words and that they treated the novel affixes as independent orthographic and semantic units. The participants segmented ambiguous letter strings according to learned orthographic affix units and selected definitions for new words containing trained affixes based on consistent affix meanings. Approximately 2 months later, a test showed that although the participants’ explicit knowledge of the novel words had deteriorated, their use of the novel affixes as orthographic and semantic units remained constant. This shows that, after semantic learning, novel affixes are treated as independent orthographic and semantic units and that this effect is long-lasting.

• COUNTER TASK STRATEGIES •

(3029) Focus Switch Costs and Processing Strategy as Revealed by the N-Count Task: Two or Three Tiers of Working Memory? TIANYONG CHEN & PAUL VERHAEGHEN, Georgia Institute of Technology (sponsored by Paul Verhaeghen)—Recent work (Oberauer, 2002) proposed a three-tier model for working memory, corresponding to different states of representation (i.e., a passive region that cannot be accessed directly, an active region that can be accessed directly, and a focus of attention). We explored the states of active items and passive items held in working memory, using an N-count task (adapted from Garavan, 1998; N varied from 2 to 4). Latencies for counting operations increased with the total set size, not just the number of active items. Focus switch costs were observed when the count changed from one active item to another active item (Experiment 1) or from one active item to one passive item and vice versa (Experiment 2). The results support a two-tier model of working memory; different strategies for retention can be applied to the outer tier.
(3030) An Evaluation of Scoring Methods for Verbal Working Memory Measures. SUSAN G. CAMPBELL, MICHAEL F. BUNTING, & CATHERINE J. DOUGHTY, University of Maryland, & NASH UNsworth, University of Georgia—Memory span tasks, such as letter span, operation span, and reading span, are used across a wide range of disciplines as measures of individual differences in short-term and working memory capacities. Previous research has suggested that the best option for such tasks is to be administered one on one by an experimenter, which can be difficult and time consuming. Using a large data set that includes 14 self-administered short-term and working memory span tasks, we investigate which methods of calculating span scores are most internally consistent and stable. We compare common methods that yield scores with methods that yield span estimates in order to see which produce scores with the most useful psychometric properties. We also compare the reliability and stability of the self-administered measures with published data on the experimenter-administered measures.

(3031) Eyetracking the Word Length Effect: New Insights Into the Capacity Limit in Serial Memory. JEAN SAINT-AUBIN, Université de Montréal, & SEBASTIEN TREMBLAY, Université Laval—Capacity limit in serial memory has been a central question for over a century. According to many researchers, there are two limits that constrain serial memory: a time limit to activation (or decay) and a limited capacity in the quantity of information to which one can attend (see Cowan, 2004). These premises were tested by manipulating the length of to-be-remembered words (of one to five syllables) within a serial recall task and monitoring eye movements. We observed the typical word length effect, with better recall of short over long words and a positive relationship between speech rate and item recall. Most important, fixation durations dropped markedly after the third item of a list. Implications for the two-limit view are discussed. Our results revealed that fixation durations dropped markedly after the third item of a list. Implications for the two-limit view and models of short-term recall are discussed.

(3032) Phonological Neighborhood Effect on Short-Term Memory for Order. LARISSA CLARKSON & STEVEN ROODENrys, University of Washington—It has been shown that words from dense phonological neighborhoods are recalled better from short-term memory than are words from sparse neighborhoods. This is posited as evidence for a long-term memory influence on short-term memory. The phonological neighborhood not only may benefit recall of item information, but also may influence order of recall. This was investigated using serial recall of words, maintenance of item information, and a reconstruction task, which primarily requires recall of order information with no explicit requirement to retain item information. In recall, neighborhood density had a significant effect on correct recall, but not on order errors. Performance on the reconstruction task was more accurate for sequences of large neighborhood words than for those of small neighborhood words. These results suggest that under some conditions, the long-term lexical system may also exert an influence on a mechanism that maintains memory for order, rather than just on item information.

(3033) Verbal–Visual Binding in Working Memory: Is it Automatic or Cognitively Controlled? CANDICE C. MOREY, University of Groningen, & TODD S. BRAVER, Washington University—In prior research, the requirement to bind or integrate object features in working memory has been associated with both behavioral advantages (Prabhakaran et al., 2000) and behavioral costs (Mitchell et al., 2000), relative to maintenance of these features as unrelated entities. The present study tested these competing findings in a face–name task. Each trial consisted of simultaneously presented names and faces, with a cue indicating whether the names, the faces, both the faces and the names (separate features), or the face–name association (bound features) should be maintained. In one experiment, the trial types were randomly intermixed, whereas in a second they were blocked. Contrary to Prabhakaran et al., behavioral reaction time costs were observed when bound features were probed, as compared with separate features. Contrary to Mitchell et al., no accuracy differences were observed in this contrast. Proposals for reconciliation between views of automatic and cognitively controlled binding in working memory are considered.

(3034) The Impact of Verbal Articulatory Suppression on Memory for Tones. VICTORIA J. WILLIAMSON, ALAN D. BADDELEY, & GRAHAM J. HITCH, University of York, & LAUREN STEWART, Goldsmiths, University of London—The act of articulatory suppression (whispering, talking) impairs performance on a verbal serial recall task. Working memory model theory suggests that this occurs because the suppression occupies the subvocal articulatory rehearsal system. We investigated whether verbal suppression could also impair memory for tonal stimuli. Musicians and nonmusicians carried out serial recall of sequences of letters and tones under conditions of silence, tapping (dual-task control), and articulatory suppression. The results indicated that both groups were at a comparable level of performance in the letter recall task but that musicians were significantly better at tone recall. Despite these differences in performance level, articulatory suppression was found to be detrimental to both groups’ ability to recall letters and tones. The findings are discussed in terms of how the processing of verbal and tonal materials may occur in short-term memory for both musicians and nonmusicians, within the understanding provided by the working memory model.

(3035) Orthographic But Not Visual Similarity Influences Verbal Short-Term Memory for Chinese Characters. CHE-YING LAI & DAISY L. HUNG, National Central University, Taiwan, OVID J.-L. TZENG, Institute of Linguistics, & DENISE H. WU, National Central University, Taiwan (sponsored by Ovid J.-L. Tzeng)—Previous research on short-term memory (STM) has made no distinction between orthographic and visual aspects of verbal materials and has assumed a limited contribution from these factors to the retention of verbal materials. In the present study, the visual similarity of Chinese characters was obtained from participants with no linguistic knowledge of these materials. The characters with different degrees of visual similarity were presented to native Chinese readers in a probed serial recognition task. Characters with high and low visual similarity (e.g., 農 vs. 京) were retained equivalently in STM. Only characters with the same radical in the same position (e.g., 海 vs. 海) were remembered worse than the control characters. These findings indicate that orthographic information, which takes both stroke patterns and their positions into account, plays a role in verbal STM.

(3036) On the Irrelevance of Length and the Word Length Effect. ANNIE JALBERT & JAN NEATH, Memorial University of Newfoundland, TAMRA J. BIRETA, College of New Jersey, & DANIELLE WINSOR & AIMEE M. SURPRENANT, Memorial University of Newfoundland (sponsored by Ian Neath)—When participants are required to remember a list of words in the correct order, recall is hindered for lists of words with more syllables/phonemes, as compared with lists of words with fewer syllables/phonemes. This is known as the word length effect. Although a rehearsal-based explanation of the word length effect has received some empirical support, a number of recent studies using a mixed-list design (in which both short and long words appeared in the same list) have challenged it. We report a series of experiments in which the short and long words were equated for different previously confounded variables. The results showed that the word length effect is explained better by the differences in orthographic neighborhood frequency of short and long words than by rehearsal or other factors. The implication of the results on current theoretical frameworks of short-term working memory are discussed.

• Metamemory/Metacognition •

(3037) Effects of Embedded Multiple-Choice and Calculation Tests on Statistics Learning. CURTIS CRAIG, J. RUDINE, RUTH H. MAKI, ASHLEY JONES, & NATALIE CHENAULT, Texas Tech University—While
(3038) **Interest and Depth of Processing: Examining the Role of Metacognitive Prompts in Learning.** DANIEL M. BELENKY & TIMOTHY J. NOKES, University of Pittsburgh—How does student interest impact learning? We examined the effect of different types of materials (concrete or abstract) and prompts (problem-focused or metacognitive) on student interest and learning of probability concepts. Questionnaires were administered at recruitment, after the learning phase, and after the test phase. These assessed students’ preexisting interests and attitudes about math, engagement with learning materials, and goal orientation. The results show an interaction between flow state (“I was engrossed in the materials”) and prompt type. The participants who were more engaged benefited from problem-focused prompts, whereas those less engaged showed improvements with metacognitive prompts. This result suggests that interest may affect participants’ depth of processing, which is consistent with research in text comprehension (e.g., McDaniel, Wad-dill, Finstad, & Bourg, 2000).

(3039) **Are Judgments of Learning Sensitive to the Amount of Information to Be Remembered?** SARAH K. TAUBER & MATTHEW G. RHODES, Colorado State University—Very little research has explored the degree to which memory predictions are sensitive to the amount of material to be remembered. In several experiments, we examined memory predictions for word lists of varying length. Participants were pre-sented with single words or word pairs and made judgments of learning (JOLs), predicting the likelihood of later recalling each item from a 10-, 30-, or 100-word list. The results showed that JOLs were relatively insensitive to list length, so that memory performance was diminished for longer lists as compared with shorter ones, but JOLs did not differ. However, JOLs were sensitive to list length when predictions were made for related and unrelated word pairs. These data suggest that predictions of memory performance are able to account for the amount of information to be remembered only under limited circumstances.

(3040) **Approaches to Studying Inventory: Evaluation of ASL/English Bilinguals.** M. DIANE CLARK, MELISSA L. ANDERSON, & MILLICENT M. MUSYOKA, Gallaudet University—Fifty-eight deaf students at Gallaudet University completed the short version of the Approaches to Studying Inventory (ASI), a revised version that has been used with deaf university students (Richardson, Barnes, & Fleming, 2004). In the present investigation, deaf students were more likely to adopt a meaning orientation to their studies than to utilize a reproducing orientation. However, data from different methodologies do not support deaf students’ preference for adopting a meaning orientation. This inflation is potentially due to the weak psychometric properties of the ASI when used with deaf students. Indeed, current and previous evaluations of the reliability of the short version of the ASI have indicated low-to-acceptable levels of internal consistency of its subscales. Although the reproducing orientation subscales typically evidence acceptable internal consistency, all four of the meaning orientation subscales demonstrate extremely low internal consistency. Additional analysis of the ASI with deaf students will attempt to identify alternate structures.

(3041) **The Effects of Strategy on Monitoring Accuracy.** AINSLEY L. MITCHUM & COLLEEN M. KELLEY, Florida State University—The accuracy of monitoring performance on a task via confidence judgments depends on the availability and use of valid cues. The strategy one uses to perform a task may affect the cues available for monitoring. Mitchum and Kelley (submitted) found that forcing participants to engage in the strategy of solving figural matrix problems before seeing response options improved calibration and resolution of confidence judgments, because a new, diagnostic cue became available—finding or failing to find the generated solution among the response options. The present studies extend the link between strategy and monitoring to new tasks and to individual differences that affect monitoring by affecting cue validity.

(3042) **The Effect of Delay and Keyword Generation on Metacognition in Children.** ANIQUE DE BRUIN, GINO CAMP, & ELENI PONS, Erasmus University Rotterdam—Although metacognitive skills, such as the monitoring of the understanding of an expository text, are considered paramount to optimizing learning results, learners usually exemplify these skills to a limited extent and with little success. However, research has shown that monitoring accuracy can be improved by asking learners to judge their memory not immediately, but after a delay. Also, generating keywords for a text has been shown to increase monitoring accuracy. These effects had been found in adults but have now been tested in children, to determine whether these low-demanding instructional interventions may also benefit young learners. The effects of keyword generation and delay on monitoring accuracy were tested in an experiment using age groups of 10 and 12 years. Participants generated keywords either immediately after reading an expository text or after a delay, or no keywords were generated. The implications of the results for educational design are discussed.

(3043) **Subject-Chosen Feedback in the Recognition of Deceptive and Non-deceptive Sentences.** ASHLEY N. D. MEYER & JESSICA M. LOGAN, Rice University, & SEAN H. K. KANG, Washington University—How well do students evaluate the need for feedback during learning? Automatic feedback (i.e., given every trial) and subject-chosen feedback yield similar memory performance on foreign language vocabulary tests, despite inequities in the amount of feedback received, indicating that subjects can be adept at knowing when to request or decline feedback. However, the relative effectiveness of these feedback types in learning may differ for materials that are prone to memory and metacognitive errors. The present study investigated whether deceptive stimuli (e.g., The karate champ is hit with the wooden block), in which participants typically show low accuracy and high confidence, would alter the effectiveness of these feedback types (Brewer, 1977). Surprisingly, the subject-chosen feedback group appropriately asked for more feedback for deceptive sentences, allowing them to perform similarly to the automatic feedback group. The results suggest that metacognition allows one to use feedback effectively and extends prior research to more uncertain learning situations.

- **EPISODIC MEMORY**

(3044) **Gender Differences in Autobiographical Narratives for Positive and Negative Events.** MATTHEW D. SCHULKIND, KYLE SCHOPEL, & EMILY SCHEIDERER, Amherst College—One experiment was conducted to determine whether women construct more detailed autobiographical narratives than do men because they remember more about their personal experiences. Collegiate athletes were asked to recall central details from their games within a few days and again after 6 weeks. Narrative accounts of two games (one win and one loss) were also collected after 6 weeks. Men performed better on the memory questionnaires both initially and after the 6-week interval; men also included more central details in their narratives. Women wrote longer narratives and included more evaluative details than did men, especially when recalling negative events. The data suggest that women do not necessarily recall more about their experiences than do men. Rather, men and women pay attention to different
details of their experiences, with men focused on central details and women focused on evaluative details. These data are consistent with socialization accounts for gender differences in autobiographical memory.

(3045)
Characteristics of Memory for Autobiographical and Episodic Events in Women With Dissociative Identity Disorder. M. ROSE BARLOW, Boise State University, & JENNIFER J. FREYD, University of Oregon—In dissociative identity disorder (DID), two or more distinct identities recurrently take control of behavior, and there is an inability to recall important personal information. DID is currently conceptualized as an adaptive response to extreme trauma, in which potentially dangerous awareness and memories are contained. In this study, 11 women with DID were faster than a group of 13 female students at producing autobiographical memories in response to cue words. Participants with DID had difficulty answering detailed questions about a story containing fear, as compared with a neutral story; the student group did not. The student group scored significantly higher on a measure of overall memory than did the DID group. The DID group reported experiencing significantly more childhood trauma and more high-betrayal trauma than did the student group. Effect sizes were moderate to high. This preliminary study is unique in its broad conceptualization of memory functioning in DID.

(3046)
The Role of Cognitive Flexibility in Age-Related Decline on Organizational Strategies in Free Recall. LAURENCE TACCONAT, CeRCA, CNRS, Université François-Rabelais Tours, NAFTALI RAZ, Wayne State University, & CAPUCINE TOCZÉ, BADAÏA BOUZZAOULI, SEVÈRINE FAY, & MICHEL ISINGRINI, CeRCA, CNRS, Université François-Rabelais Tours—The main goal of this experiment was to examine the effect of age on recall and clustering across three successive trials. Sixty-two young (20–40 years) and 62 elderly (60–80) adults learned a categorized word list for subsequent recall. An index of clustering was calculated for each list, and a mean score was calculated for each subject. The results indicated that the clustering index was lower than that of younger adults but increased across trials. The participants were also administered cognitive tests (cognitive flexibility, cognitive speed, and categorical fluency) to explore the mediators of performances. Statistical analyses revealed that the cognitive flexibility was the main reliable predictor of recall, which is associated with clustering for the younger adults only. This finding supports the view that the age-related decline in strategic organization is due to a decrease of cognitive flexibility.

(3047)
Cue-Independent Forgetting Remains Elusive in Retroactive Interference. DENNIS J. DELPRATO, Eastern Michigan University—In retrieval practice experiments and in think/no-think experiments, cue-independent (nonassociative) forgetting seems to occur to novel test cues that are semantically related to tested targets but are not related to targets studied during retrieval practice or to words serving as cues for not thinking of targets in think/no-think experiments. At the 2007 Psychonomic Society Annual Meeting, I reported findings from retroactive interference (RI) experiments with word pairs that failed to yield cue-independent loss over numerous comparisons with cues that were not associated either preexperimentally or episodically to interpolated targets. The present research demonstrates that RI occurs to episodic cues not appearing in interpolated learning that are associates of first-list cues that are paired with interference-producing interpolated targets. On the other hand, in two experiments, RI again failed to occur to episodic first-list cues unrelated to other first-list cues that were paired with interpolated targets, whether the test was under full- or divided-attention conditions.

(3048)
The Reminiscence Bump in Working Memory and Its Relation With Autobiographical Memory. STEVE M. JANSEN, Duke University, MARTIJN MEETER, Vrije Universiteit Amsterdam, & GERT KRISTO & JAAP M. MURRE, University of Amsterdam—The reminiscence bump is the effect that people recall more personal events from adolescence and early adulthood. Previous research has shown that memories from those periods consist of relatively more unremarkable events. The enhanced encoding of those mundane events in adolescence and early adulthood may be caused by a greater efficiency of the memory system.

To examine this hypothesis further, we looked at whether the reminiscence bump could be found in working memory by presenting several tests to a large Internet population. We found that adolescents and young adults performed better on the working memory tests, but not on an additional nonworking memory test. We also examined the relation between working memory and autobiographical memory. Participants had to record a personal event and were asked to recall the event after certain retention intervals. We looked at whether participants with a larger working memory capacity had better retention for those autobiographical events.

(3049)
Visual Perspective in Memory and Episodic Future Thought. CYNTHIA W. WOOLDRIDGE, HEATHER J. RICE, KARL K. SZPUNAR, & KATHLEEN B. McDERMOTT, Washington University (sponsored by Deanna M. Barch)—Autobiographical remembering can occur from both a first- and a third-person perspective. Rice and Rubin (2008) have shown that the third-person perspective is not a single entity; rather, the visual perspective accompanying third-person memories varies widely across events. The present study applies Rice and Rubin’s methodology to the study of episodic future thought—envisioning specific personal events happening in the future. The distribution of perspective location was virtually indistinguishable for memory and future thought. Differences appeared, too, in that (1) memory was experienced as more vivid than envisioning future events; (2) whereas the majority of past and future thoughts were third person, this tendency was amplified for future thought. This work enhances understanding of the similarities and differences between remembering and episodic future thought.

(3050)
Older Adults’ Decline in Associative Memory: Assessing the Role of Speed of Processing and Attentional Resources. MOSHE NAVEH-BENJAMIN, SUSAN OLD, & YOKO HARA, University of Missouri, Columbia, JONATHAN GUEZ, Achva College, & ANGELA KILB, University of Missouri, Columbia—One suggestion put forth to explain age-related episodic memory decline is the associative deficit hypothesis, according to which the decline is partially due to older adults’ reduced ability to encode and retrieve associated or bound units of information. In the present research, we assessed the role of reduced processing speed and decline in attentional resources, thought to mediate age-related changes in cognition, and evaluated their function in the associative deficit. We did so in two experiments, testing whether older adults’ deficits in associative memory could be simulated by presenting information to younger adults at a fast pace and under divided-attention conditions.

• EYEWITNESS MEMORY •

(3051)
Confidence Ratings, Remember/Know Judgments, and Misinformation Effects in Eyewitnesses. AMANDA E. HOLMES & CHARLES A. WEAVER III, Baylor University—We compared accuracy, confidence ratings, and remember/know (RK) judgments in eyewitnesses following different types of misinformation. Detail information encountered at encoding was correctly referenced, contradicted, or additively suggested in a narrative immediately after encoding, and six-alternative forced choice recognition tasks were completed either 10 min or 1 week later. Accuracy was quite good at brief delays, particularly in the control (no-misinformation) condition. Following the delay, errors increased significantly in all conditions, and false alarms for misinformation doubled. Furthermore, “remember” judgments for additive misinformation tripled 1 week later. RK judgments were no better at predicting accuracy than confidence ratings, and confidence ratings and “remember” judgments were positively correlated across all conditions.

(3052)
Can a 1-Week Delay Reverse the Reversed Testing Effect on Eyewitness Misinformation Suggestibility? JASON C. K. CHAN,
Repeated Identification Procedures: Memory, Decision, and Probative Value. RYAN D. GODFREY & STEVEN E. CLARK, University of California, Riverside—Two experiments examined the effects of repeated recognition testing, using an eyewitness identification paradigm. In both experiments, a one-person showup (yes–no recognition task) was followed by a six-person target-present or target-absent lineup. In Experiment 1, the lineup followed the showup by 1 week. Both correct and false identification rates increased with repeated testing, relative to a no-showup control, with no change in the probative value of a suspect identification. Overall, identification rates also increased, suggesting a downward criterion shift. In Experiment 2, the lineup followed the showup within a half-hour. Correct and false identification rates changed little, relative to a no-showup control; however, the confidence of repeated identifications increased. Overall identification rates increased again, but the increase was distributed across foils, rather than for the suspect. Even on a forced choice test, the participants rarely identified the repeated suspect. The results suggest a mixture of misplaced familiarity effects and strategic decision strategies.

Effect of Unpleasant and Pleasant Emotional Pictures on Recall of Peripheral Information. JUSTIN D. HANDY & KIMBERLY K. WEAR, High Point University—The duplicity of emotion's memory-enhancing effects is most pronounced in the salience of memory traces for central and peripheral information of arousing events (Christianson & Loftus, 1991). One explanation posits that narrowed attentional resources toward emotionally arousing details limit our capacity to attend to peripheral details (Easterbrook, 1959). Consequently, memories for elements central to emotion-inducing stimuli are enhanced at the expense of spatially separate information. In response, studies have focused on the effects of negative emotion on associative memory (Touryan, Marian, & Shimamura, 2007). The present study assessed associative binding of peripheral information not only in unpleasant affective scenes, but also in pleasant ones (Lang, Bradley, & Cuthbert, 2001). Participants viewed scenes that included contextually unrelated clip art placed either centrally or peripherally. Memories for both the scenes and the objects were assessed through object and picture free recall, in addition to a cued association task.

Effects of Emotion on Feature Memory and Feature Binding in Event Memory. JULIE L. EARLES, ALAN W. KERSTEN, LAURA L. VERNON, & RACHEL STARKINGS, Florida Atlantic University—Kersten et al. (2008) demonstrated that eyewitnesses often falsely remember having seen a familiar actor perform an action that had actually been performed by somebody else. The actions in this research were largely devoid of emotional content, however, in contrast to traditional eyewitness memory applications. The present research tested whether errors in the binding of actors and actions still occur with emotionally laden events. Participants viewed a series of brief video clips, each involving an actor performing an action that had been independently rated as positive, negative, or neutral in valence. Negative actions were remembered better than positive actions, which were remembered better than neutral actions. The binding of actions with actors was identical for the three types of actions, however, leading to an especially high rate of false recognition of a familiar negative action performed by a familiar actor who had been seen performing a different action at encoding.

Eliciting Internalized False Confessions Using Doctored Video Evidence. KIMBERLEY A. WADE, University of Warwick—More powerful computers and affordable digital video equipment means that desktop video editing is now accessible and popular. In two experiments, we investigated whether seeing fake video evidence, or simply being told that video evidence exists, could lead people to believe that they had committed an act that they never had. Subjects completed a computerized gambling task, and when they returned later the same day, we falsely accused them of cheating on the task. All of the subjects were told that incriminating video evidence existed, and half were also exposed to a fake video. See-video subjects were more likely to confess without resistance and to internalize the act than were told-video subjects, and see-video subjects tended to confabulate details more often than did told-video subjects. We offer a metacognitive-based account of our results.

The Effects of Preidentification Suggestion on Choosing Rates and Eyewitness Confidence. DEAH S. QUINLIVAN & GARY L. WELLS, Iowa State University, JEFFREY S. NEUSCHATZ & JOY MCCUNING, University of Alabama, Huntsville, & MOLLY PETERSON & CIARA LOVIK, Iowa State University (sponsored by Gary L. Wells)—This study was designed to examine the effect of preidentification suggestions on eyewitness confidence. Participants received either biased or unbiased lineup instructions and were presented with one of two forms of preidentification suggestion or with no preentions. Following the lineup instructions, the participants were asked to make an identification from a target-absent lineup. The results demonstrate that preidentification suggestion, even when paired with unbiased lineup instructions, leads participants to be more likely to choose and more confident in that choice, when compared with no-feedback controls. Since these interactions occur before the standard eyewitness procedure begins, they are not necessarily going to be discovered by the defense. However, the effects on participants are similar to those that occur with postidentification feedback. The implications of the research are discussed.

Adding Versus Altering Information in a Co-Witness Paradigm. CHARLOTTE REAY, LUCY KITCHNER, & GIULIANA MAZZONI, University of Hull (sponsored by Giuliana Mazzoni)—The effect of co-witness report versus reading a passage with the same information was tested in a paradigm investigating posttest suggestion. After watching a video, participants were assigned to two conditions. In the read-only condition, participants read a description of the video. In the co-witness condition, the participants were paired with a confederate acting as a co-witness, who described the video. The description contained accurate details, invented details, and altered details. One week later, the participants were given a recognition test on which they were asked to judge which elements were in the video (true) and which were not (false). We found an interaction between mode of presentation and PEI. False added details and altered details were endorsed more in the co-witness condition than in the read-only condition, and the effect was greater for added than for altered items in the co-witness condition.

Own-Race Bias Within a Change Blindness/Eyewitness Paradigm. STEVEN ROSS, ALISON FINSTAD, F. RICHARD FERRARO, HEATHER HOWE, & JESSICA JURGENS, University of North Dakota (sponsored by F. Richard Ferraro)—Two hundred twenty-five Caucasian students viewed a video depicting a house robbery before answering questions regarding video content and subsequently being asked to identify the perpetrator from a lineup. Halfway through the video, the actor playing the burglar was changed to a different actor. In one condition, both actors were African-American; in another condition, both actors were Caucasian. The results confirmed the hypothesis that an own-race bias would emerge.
Caucasian participants were less likely to detect a change in the African-American video condition than in the Caucasian video condition.

**FALSE MEMORY**

(3060) Child-Normed Categorical Materials Produce Age Differences in False Memories. ROBYN E. HOLLIDAY, University of Leicester, CHARLES J. BRAINERD, Cornell University, TIMOTHY N. ODEGARD, University of Texas, Arlington, & VALERIE F. REYNA, Cornell University. We report an experiment that investigated children’s false memories for categorically related word lists, using child-normed lists. The effects of an encoding manipulation (read vs. generate) and an instruction manipulation (accept targets, accept related lures, accept targets, and related lures) on 7- and 11-year-old children’s true and false recognition was investigated. Children studied two blocks of four categorical lists of words, one “read” and the other “self-generated.” Each block was followed by a recognition test. Child-appropriate lists of categorized materials reduce developmental increases in false memory. This reduction is due to verbatim suppression; older children use verbatim target memories to suppress the effects of age increases in gist memory.

**JUDGMENT/DECISION MAKING**

(3061) Output Order of Children’s True and False Memories. MARINA C. WIMMER & MARK L. HOWE, Lancaster University (sponsored by Mark L. Howe). We examined children’s (7- and 11-year-olds’) output serial position curves for true and false recall in the Deese/Roediger–McDermott paradigm. The results indicated that (1) both true and false recall was well described by a single, decreasing function across serial output positions, a finding consistent with activation strength models of recall. More important, (2) false items had an earlier peak output position than did true items. Although older children recalled more than younger children, Effects 1 and 2 were age invariant. These findings are consistent with the activation strength assumptions in the associative-activation account of memory but are inconsistent with dual-retrieval models of true and false recall.

(3062) Aging and Fluency-Based Illusions in Recognition Memory. ANJALI THAPAR, Bryn Mawr College, & DEANNE L. WESTERMAN, Hamilton University. This study assessed age-related differences in susceptibility to fluency-based memory illusions. In two experiments, using two different methods to enhance the fluency of recognition test items, fluency-based memory illusions were comparable in size for older (age range = 60–80 years) and younger adults. Older and younger adults were not different in their ability to discount the fluency of test items; when there was a mismatch in the sensory modality of the study and test phases. Overall, the results suggest that older adults are not more vulnerable to fluency-based memory illusions than are younger adults. Moreover, younger and older adults appear to be comparable in their ability to modulate the influence of fluency on recognition decisions.

(3063) How Imagination Influences Memories of the Past and Expectations of the Future. LINDA HENKEL & CAITLIN MCDONALD, Fairfield University. We examined whether imagination influences not only people’s memories of their past, but also their expectations about their future experiences. Participants completed life events inventories to indicate events that they had rated as uncertain. Once week later, a second life events inventory was administered. The results showed that previously uncertain events that were imagined were now rated with higher confidence that they had occurred in the past or would occur in the future, in comparison with events that were not imagined. The quality of the imagery mediated this: Events imagined more vividly and with greater detail resulted in greater change in confidence. These findings illustrate the strong influence of imagination on both our autobiographical past and our future: Imagery can create not only false beliefs about the past, but also changed expectations about the future.

(3064) When Seeing Is Better Than Hearing: Generalizing Modality Effects Across Source Memory Tasks. BENTON H. PIERCE, Texas A&M University, Commerce, & DAVID A. GALLO, University of Chicago. A number of studies using the DRM task have shown that false recognition of semantic associates is greater following auditory than following visual study. Pierce and Gallo (2007) generalized this modality effect to the criterial recollection task, which uses unrelated lures and more focused source memory tests. Importantly, we found that the study modality effect did not depend on the modality in which the test items were presented, a finding that is at odds with results from the DRM task. Here, we attempted to reconcile these findings, using a hybrid task. Participants studied DRM lists, half of which were presented auditorily and half visually, and then took criterial recollection tests. Consistent with our criterial recollection study, we found an equivalent modality effect for both visual and auditory tests. These results suggest that study modality may be more important than test modality when instructions focus participants on recollecting modality-specific information.

(3065) Cues to Deception: Nonverbal Influences on Judgments of Truth. KAY L. LIVESAY, Linfield College, & ANDREW SAGE, Western Illinois State University. Researchers (Akehurst, Köhnen, Vrij, & Bull, 1996; Sporer & Schwandt, 2007) have shown that people have strongly held beliefs about behaviors that indicate lying (i.e., increases in gaze aversion, hand movements, leg/foot movement, and postural shifts). However, research has shown (Vrij et al., 2004) that a discrepancy exists between the believed behavioral cues and the actual behaviors that have been found to be reliable indicators of lying. The present experiment examined the influence of believed behavioral cues associated with lying on lie detection. Thirty college students judged the truthfulness of suspects’ responses while viewing four videotaped interviews. The results showed an overall truth bias; however, when believed behavioral cues for lying were incorporated into truthful statements by the suspects, the participants were twice as likely to judge them as lying. Preliminary results of a follow-up experiment suggest that this outcome is modified when positive or negative bias about the interviewee is introduced.

(3066) Reducing Probabilistic Weather Forecasts to the Worst Case Scenario: Anchoring Effects. SONIA SAVELLI, SUSAN JOSLYN, Limor NADAV-GREENBERG, & QUEENA CHEN, University of Washington (sponsored by Susan Joslyn). Can nonexperts understand probabilistic weather forecasts? Many forecast providers believe that just the worst case scenario should be given. We tested this suggestion in two experiments that used realistic weather-related decision tasks concerning high wind speed and low temperature. Participants who were given the statistical equivalent of the worst case scenario (one boundary of the 80% predictive interval) demonstrated a biased understanding of future weather conditions, as compared with those with either full uncertainty or no uncertainty information. This appears as an anchoring effect in which estimates are closer to the worst case scenario than is warranted. We also found that anchoring effects increase linearly as the anchor becomes more extreme. These results suggest that providing the worst case scenario alone, rather than full uncertainty information, can seriously mislead the user. It appears to convince people that the wind speed will be higher and temperatures will be lower than what is indicated in the forecast.

(3067) Information Theoretic Analysis of Probability Statements. KUNI NORI NAKAMURA, JSPS and Tokyo Institute of Technology, & KIMI HIKO YAMAGISHI, Tokyo Institute of Technology (sponsored by Kimiti Yamaishi). This research aims to establish a quantitative relation between probability statements and their “informativeness.” Keren and Teigen (2001) proposed the search for definitive predictions principle. According to this principle, relatively high or low probabilities are preferred to medium ones because high or low probabilities denote the occurrence or nonoccurrence of a single outcome more strongly than do
medium ones. This research formalizes the judgment of the informativeness of probability statements in terms of information theory and argues that the search for definitive predictions principle can be interpreted as rational information estimation under the rarity assumption (Oaksford & Chater, 1994). The results of two empirical studies supported this argument.

(3068) Systematic Biases in Evidence Evaluation and Hypothesis Judgment. JENNIFER C. WHITMAN & TODD S. WOODWARD, University of British Columbia (sponsored by Todd S. Woodward)—We examined how individuals evaluate and integrate evidence when assessing hypotheses, using a task in which the strength of evidence was objectively quantifiable. On each trial, participants rated their agreement with a focal hypothesis. They also rated the strengths of two types of evidence, pertaining to the focal hypothesis and to an alternate hypothesis. We observed two cognitive biases. First, the perceived strength of one type of evidence was affected by the strength of the other type of evidence. Second, if the strength of one type of evidence was intermediate (neither strongly supporting nor strongly refuting its corresponding hypothesis), whereas the strength of the other type of evidence was not, there was a tendency to neglect the evidence of intermediate strength. Specifically, a change in the value of the intermediate evidence affected focal hypothesis acceptance less than did an equivalent change in the value of the other evidence.

(3069) Hypothesis-Guided Information Search and the Deployment of Visual Attention in Judgment Tasks. SHARONA ATKINS & MICHAEL R. DOUGHERTY, University of Maryland (sponsored by Michael R. Dougherty)—We tested the prediction that hypotheses maintained in working memory (WM) can influence information search in hypothesis-testing situations. We manipulated the hypothesis maintained in WM and then examined performance, using the dot-probe paradigm. We found that holding hypotheses in WM influences peoples’ attention, so that they attend more to hypothesis-congruent information, and that this bias cascaded to participants’ recall and judgment processes. Our research suggests a tight connection between WM, deployment of visual attention, and processes involved in judgment and decision making.

• CATEGORIES AND CONCEPTS •

(3070) Class Inclusion and Kind Hierarchies in Common Sense Conception. LAURA P. HENNEFIELD & SANDEEP PRASADA, Hunter College, CUNY (sponsored by Virginia Valian)—According to a recent proposal, our conceptual systems distinguish between two types of representations of multiplicities: kinds and complex types. Kinds are typically expressed via nouns and noun–noun compounds; complex types via adjective–noun phrases. Both kind and complex type representations support class inclusion relations (e.g., polar bears are bears, white bears are bears). Only kind representations support kind specification relations (e.g., polar bears are a kind of bear, white bears are a kind of bear). Experiment 1 demonstrated this basic difference. Established subkinds (e.g., sunflower) were paired with randomly generated adjective–noun phrases for the same basic-level categories (e.g., pristine flower). Experiment 2 included randomly generated noun–noun compounds (e.g., umbrella flower) for the same basic-level categories to demonstrate that this difference was not driven by a difference in familiarity. Other conceptual and linguistic differences between kinds and complex types are currently being investigated and will be discussed.

(3071) Ways of Probing Situated Concepts. ANA S. MORAIS, HENRIK OLSSON, & LAEL J. SCHOLER, Max Planck Institute for Human Development (sponsored by Jeffrey Stevens)—What kinds of information do object concepts contain? Experiments designed to elicit the content of concepts typically give participants a list of concept names (e.g., hammer) and instruct them to report either the intrinsic properties exemplars possess (e.g., has a handle) or simply any thoughts that come to mind (e.g., can be understood as a symbol). The present study compared the two retrieval probes with regard to the content they yield for superordinate and basic concepts (e.g., tool and hammer, respectively). The results suggested that (1) the two probes mainly differ in the proportion of properties they yield and (2) the unrestricted probe is, in general, more sensitive to content differences between superordinate and basic concepts.

(3072) Conceptualizing Abstract Words. CHRISTINE D. WILSON, Emory University, KYLE SIMMONS & ALEX MARTIN, Laboratory of Brain and Cognition, NIMH, & LAWRENCE W. BARSALOU, Emory University (sponsored by Lawrence W. Barsalou)—Previous functional neuroimaging evidence suggests that abstract concepts are processed in left-lateralized language systems. However, these studies used shallow word-processing tasks to investigate differences between abstract and concrete concepts. An alternative is that the meaning of an abstract concept is represented by simulating property-specific information captured from real-world situations in which the concept was experienced. We developed a new neuroimaging paradigm that required participants to process the two abstract concepts (convince and arithmetic) repeatedly and deeply in meaningful contexts. The results show that property-specific brain regions central to the meanings of the abstract concepts become active, not just language areas. Furthermore, behavioral and neuroimaging results suggest that the participants focused their knowledge over time, a form of learning, as they received more contexts. These findings suggest that simulating the specific content of an abstract concept, as opposed to simply accessing linguistic information, is critical to representing its meaning.

(3073) Sources of Semantic Knowledge. SIMON DE DEYNE & GERT STORMS, Katholieke Universiteit Leuven (sponsored by Gert Storms)—A neglected aspect of models of word meaning is a systematic comparison of different sorts of knowledge that are used to model word meaning. In this paper, we compare four types of semantic knowledge based on (1) word associations, (2) concept features, (3) word co-occurrences, and (4) knowledge ontologies. These different types of knowledge are widely used and can be compared systematically using a semantic vector space representation. First, an internal evaluation of the model representation through clustering shows that these models capture qualitatively different aspects of meaning, such as taxonomically organized meaning or more thematically organized meaning. Next, we evaluate fine-grained semantic distinctions by comparing model similarity coefficients with pairwise similarities judgments collected in an intracategory judgment task. Our main findings show that the association and feature models correlated best with human judgments, followed by the co-occurrence model. The implications of these findings for understanding intuitive similarities are discussed.

(3074) The Differential Roles Played by the Modifier and Head Noun During the Interpretation of Noun-Noun Combinations. THOMAS L. SPALDING & CHRISTINA L. GAGNE, University of Alberta—Noun-noun phrases are often interpreted using a relation to link the constituents (e.g., a prairie storm is a storm located in the prairies). The present project examines the roles of the modifier and head noun in relation selection. We used a priming procedure in which a target noun phrase was preceded by a prime noun phrase that used either the same or a different relation and used either the target’s head or the modifier. The head noun prime produced relation priming in a verification task in which novel combinations were presented with their intended relational interpretation (Experiment 1), but not in a sense–nonsense task (Experiment 2). In contrast, the modifier prime produced relation priming in both tasks. The differential sensitivity of these two tasks to relational availability suggests that the head noun’s primary role is to “rule out” relations, whereas the modifier plays a larger role in “suggesting” relations.

(3075) Priming Effects on Left-Prefrontal-Cortex Activity in a Creative Use Generation Task. EVANGELIA G. CHRYSIKOU & SHARON
Spatial Updating Intrinsic Reference Direction of a Briefly Viewed Lay-out. HUI ZHANG, Chinese Academy of Sciences, WEIMIN MOU, University of Alberta, & TIMOTHY P. McNAMARA, Vanderbilt University—This project examined spatial updating of a briefly viewed layout. Participants briefly viewed an array of five objects. A stick was placed along an imagined line passing two of the five objects to prime an intrinsic spatial reference direction. After a short interval, the participants detected which object had been moved at a novel view that was caused by table rotation, or by locomotion. The results showed that the change in the objects along the spatial reference direction was more accurate in the participant locomotion condition than in the table rotation condition. However, this superiority of participant locomotion was not observed in detecting the position change of the objects not along the spatial reference direction. These results indicate that people update their orientation with respect to the spatial reference direction during locomotion and that position change detection relies on identifying the intrinsic spatial reference direction.

What Can Pointing Errors Really Tell Us About Spatial Representa-tion? STEVEN A. MARCHETTE & AMY L. SHELTON, Johns Hopkins University—Judgments of relative direction have long been used to evaluate the properties of spatial memory representations. However, the error in these judgments can originate from multiple sources, including systematic distortion of the spatial locations in memory and imprecision in the retrieval of those locations. To date, these sources have been largely indistinguishable, because constant and variable error are difficult to assess in these paradigms. We present an alternative method that uses pointing judgments to map the best-fit subjective representation. This representation can then be used to distinguish distortion and imprecision as sources of the observed patterns of error. Here, we apply this method to well-established results in the spatial memory literature to demonstrate the utility of this new mapping tool. The results support contemporary claims about transformational processes and/or interference as the primary source of error in most pointing judgments and provides verification of classic examples of distortions.
Facilitation of Spatial Pattern Learning With Visual Cues in Real and Virtual Environments: Implications for Associative Accounts of Spatial Learning, BRADLEY R. STURZ, Armstrong Atlantic State University, MICHAEL F. BROWN, Villanova University, & DEBBIE M. KELLY, University of Saskatchewan—Participants searched in a real-environment or interactive three-dimensional virtual-environment open-field search task for four hidden goal locations arranged in a 2 x 2 square configuration in a 5 x 5 grid of raised bins. The participants were randomly assigned to one of two groups: pattern only or cues + pattern. The participants experienced a training phase, followed by a testing phase. Visual cues specified the goal locations during training only for the cues + pattern group. Both groups were then tested in the absence of visual cues. The results in both environments indicated that choices were controlled by the spatial configuration of goal locations. However, visual cues during training facilitated learning of the spatial configuration of the goal locations. In both environments, the participants trained with the visual cues made fewer errors during testing than did those trained with the pattern only. The results suggest that spatial pattern learning may not be susceptible to cue competition effects.

Identity-Location Binding and Movement Extrapolation of Invisible Objects, KRISTA OINONEN, National Defence University and University of Turku, & LAURI OKSAMA & JUKKA HYÖNÄ, University of Turku (sponsored by Jukka Hyönä)—We tested observers’ ability to keep track of the locations of moving objects when they temporarily disappeared from view. This was achieved using an identity tracking task, in which objects (line drawings of familiar objects) first moved for 5 sec, after which they temporarily disappeared from view. In the move condition, the objects moved as before, but with the exception that they had reached during occlusion. In the nonmove condition, they reappeared in the same location that they had occupied at the beginning of occlusion. Target set size and occlusion time were also manipulated. When the targets reappeared, the participants had to indicate as quickly as possible the location of the auditorily probed target. The results showed that extrapolating movement for invisibly moving objects is possible for one target, but not for multiple targets. We conclude that observers possess only a limited capacity for dynamically updating object information in memory, and that observers possess only a limited capacity for dynamically updating object information in memory.

Individual Differences in Reward Sensitivity Predict Moral Judgment, ADAM B. MOORE & ANDREW R. A. CONWAY, Princeton University (sponsored by Andrew R. A. Conway)—Dual-process models of moral judgment propose that such judgments are produced by interacting neural systems: a controlled-cognitive system and an automatic-affective system. Here, we report new evidence that clarifies the nature of the automatic-affective system and the impact of its function on moral judgment. Group-level results replicate findings from Moore, Clark, and Kane (2008), and individual differences in sensitivity to reward and punishment (BAS/BIS) are strong predictors of moral judgment. Higher reward sensitivity (high BAS) positively correlates with willingness to sacrifice one life to save multiple others and the differential integration of more abstract factors in subjects’ judgments. Higher punishment sensitivity (high BIS) negatively correlates with willingness to kill, particularly when negative affective information is present. These results are interpreted within a revised dual-process model of moral judgment that makes use of computational formalisms of value-based decision making.

The Affective Simon Effect Is Moderated by Emotion Word Type, JEANETTE ALTARRIBA & DANA M. BASNIGHT-BROWN, University of Calgary—An affective Simon task was administered to English-speaking monolinguals and Spanish–English bilinguals. Participants classified words in white on the basis of valence (positive or negative) and then classified those words on the basis of color (blue or green), via keypress. Words were either emotion words (e.g., happy; anxious) or emotion-laden words (e.g., dream; shark). Bilinguals viewed words in English and Spanish. Although only negative emotion words produced the typical effects, both negative and positive emotion-laden words produced significant Simon effects, in monolinguals. Similar effects emerged for bilinguals, in both languages. The results indicate that emotion word type moderates the affective Simon task and also provide a first demonstration of these effects in bilinguals. Overall, the data provide further evidence that affective coding in both a dominant and subordinate language can occur and that subsequent responses in seemingly irrelevant tasks are discussed within a theoretical framework focused on the representation of emotion.

Investigating the Relationship Between Executive Control and Theory-of-Mind Abilities, RALUCA PETRICAN, University of Toronto, & MORRIS MOSCOVITCH, Rotman Research Institute—Our study investigates the effect of higher order cognitive abilities on perception and interpretation of social situations in younger and older adults. Forty-two older adults (age range, 60–80) and 42 younger adults (age range, 17–30) completed a battery of offline theory-of-mind tasks encompassing seven theory-of-mind stories and two false belief (one first-order and one second-order) stories. Additionally, the participants viewed and rated 12 silent animations as a measure of online social cognitive abilities. Finally, the participants completed a working memory task as a standard measure of higher order cognitive abilities. Although all three measures of offline social cognition were significantly correlated, only a second-order false belief task predicted performance on our online social cognitive ability task. Working memory capacity predicted nonsocial inferential abilities but did not predict social cognitive ability scores. We discuss how our findings could further our understanding of the underlying mechanisms and age-related changes in social behavior and understanding.
(3089) Searching for Perceptual Effects of the Economy of Action in Virtual Space. DANIEL RAVER & J. SCOTT JORDAN, Illinois State University (sponsored by J. Scott Jordan)—Proffit et al. (2006) claimed that spatial perception is constrained by energy demands on behavior. Recently, Taipalus, Coey, and Jordan tested whether this would translate to virtual environments. Specifically, participants controlled or observed a moving stimulus that appeared to be under different levels of implied friction and then indicated its vanishing point (VP). VP was beyond the actual vanishing point in the direction of stimulus motion. For observers, this forward displacement decreased with implied friction, whereas for controllers it increased. The finding is consistent with the theory of energy constraints on perception. In addition, controllers produced significantly more buttonpresses (work). However, the number of presses, press latency, and variability in press latency all varied with implied friction, for both observers and controllers. Since these variables did not vary with implied friction in a manner that would account for the perceptual data, the data imply that the perceptual effects are due to the work the stimulus “implies,” versus actually requires.

(3090) Mindsight in Action: A Sensorimotor Advantage to Implicit Change Detection. PHILIP TSENG & BRUCE BRIDGEMAN, University of California, Santa Cruz (sponsored by Bruce Bridgeman)—Change blindness is a robust effect that has been used extensively over the past decade to demonstrate the impoverished nature of our visual representation. The measure of verbal report in this paradigm, however, tends to underestimate the amount of information that is stored in such a representation, since it requires the observers to be absolutely aware of the changes and put them into words. Indeed, past researches have suggested that implicit detection is possible and, perhaps, better assesses the nature of our visual representation (Henderson & Hollingworth, 2003; Thornton & Fernandez-Duque, 2002). The present study demonstrates that when change detection fails, people can guess the location of changes better when asked to guess with a jabbing motion (dorsal stream), rather than with a verbal report (ventral stream). This advantage, however, disappears when the distance between the stimuli and the observer is stretched beyond arms’ reach, thus no longer affording actions.

(3091) SenseCam and Autobiographical Memory. JASON R. FINLEY, WILLIAM F. BREWER, & AARON S. BENJAMIN, University of Illinois, Urbana-Champaign—Emerging “life-logging” technologies have tremendous potential to augment human autobiographical memory by recording and processing vast amounts of information from an individual’s experiences. In this experiment, participants wore a SenseCam—a wearable camera equipped with motion, light, and infrared sensors—as they went about their normal daily activities for 5 consecutive days. The cameras were set to capture images either at fixed intervals or as triggered by their sensors. On 2 nights, the participants watched an end-of-day review of a random subset of images captured that day. The participants returned for memory tests at intervals of 1, 3, and 8 weeks. On probed recall and recognition memory tests, end-of-day review enhanced performance, relative to no review. In addition, images captured in sensor mode were better remembered than images captured in timer mode. These results demonstrate the promise of SenseCam as a tool that supplements human memory.

(3092) Cultural Differences in Functional Field of View. AYSECAN BODUROĞLU, Boğaziçi University, & XUEZHAO LAN & PRITI SHAH, University of Michigan, Ann Arbor—Chua and colleagues (2005) showed differences in how East Asians and Westerners process visual scenes that they attributed to cultural cognitive style differences. We argued that these differences may be driven by how East Asians allocate their attention to a wider region. In support, we demonstrated that East Asians were better than Americans at detecting color changes when the layout of a set of colored blocks was expanded to cover a wider region and were worse when it was shrunk (Boduroğlu, Shah, & Nisbett, in press). To corroborate this argument, we investigated cultural differences in attentional breadth by measuring functional field of view. Chinese participants performed significantly worse than Americans, suggesting that they allocated their attention more diffusely. Low accuracy was not driven by a speed–accuracy trade-off, nor was it due to ability differences between the two samples; no cultural differences were found in control tasks requiring resistance to distractors.

(3093) Failure of Temporally Separated Visual Information Integration: An fMRI Study. AYAKO SAN EyosHi, Tokyo University, RYO SUKE NIHII & TOMOKO SUETSUGU, University of Tokyo, TATSURO KAMINAGA, Teikyo University, & KAZUHIKO YOKOSAWA, University of Tokyo—Functional magnetic resonance imaging was used to investigate the neural basis of integration failures of temporally separated visual information. Participants performed an empty cell localization task, in which two arrays were displayed sequentially under three different stimulus onset asynchrony (SOA) conditions. In the short-SOA condition, in which two arrays were integrated in iconic memory, the superior occipital gyrus and posterior parietal cortex were activated. In the long-SOA condition, in which two arrays were integrated in short-term memory, the prefrontal cortex and interior temporal cortex were activated. However, activation of these areas was weak in the middle-SOA condition, in which performance dropped off. It was suggested that first-array information in iconic memory would be lost by the time the second array was presented in the middle-SOA condition. It was thus difficult to integrate the two arrays in both memory systems.

(3094) Implicit Learning of Change Probability Information. AMANDA E. VAN LAM SweerDe & MELISSA R. BECK, Louisiana State University—Research indicates that probability information can guide visual attention and that this information can be learned implicitly. In this experiment, we examined whether participants could implicitly learn, in a change detection task, that a certain type of change was more likely to occur than another and then use this information to detect changes. We found evidence that location changes are detected most frequently, followed by color and then shape changes. However, when shape changes were more likely to occur than color or location changes during a training phase, performance on color change detection decreased, and this did not arise from explicit awareness of probability information. In addition, when color or location changes were most likely to occur during training, change detection for shape information was impaired. Capacity for the features of an object may be limited; by directing attention toward one feature of an object, memory for other features is impaired.

(3095) Occlusion and Visual Memory: Masking Affects Target, But Not Distractor, Memory. CARRICK C. WILLIAMS, Mississippi State University—Occlusion is ubiquitous in real-world visual perception, leading to difficulties in visual search because objects may need to be amodally completed to identify a target. The present study had participants search through unoccluded or partially occluded real-world objects for conjunction targets (e.g., yellow leaf) to investigate the impact of occlusion and amodal completion on search and visual memory. When objects were partially occluded, search took longer than unoccluded searches, and the greater the occlusion of targets, the more search was slowed. Following the search, the participants’ object memory was tested. Memory for targets was significantly worse if they had been occluded during search and was more affected the greater the amount of the target occluded. Surprisingly, however, memory for distractor objects was not significantly affected by the presence or amount of occlusion during search. The memory results may indicate differences in how amodal completion affects object representations retained in visual memory.

(3096) Independent Effects of Color on Object Identification and Memory. TOBY J. LLOYD-JONES, Swansea University, & KAZUYO NAKABAYASHI, University of Teeside—We examined the effects of color on object identification and memory, using a study–test priming procedure with a colored-object decision task at test (i.e., deciding whether...
an object was correctly colored). Objects were selected to have a single associated color and were either correctly or incorrectly colored in addition to object shape and color were either spatially integrated (i.e., color fell on the object surface) or spatially separated (i.e., color formed the background to the object). Transforming the color of an object from study to test (e.g., from a yellow banana to a purple banana) reduced priming of response times, as compared with when the object was untransformed. This utilization of color information in object memory was not contingent upon the color’s falling on the object surface or whether the resulting configuration was of a correctly or incorrectly colored object. In addition, we observed independent effects of color on response times, whereby colored-object decisions were more efficient for correctly than for incorrectly colored objects, but only when the color fell on the object’s surface. These findings provide evidence for two distinct mechanisms of shape–color binding in object processing.

• Selective Attention •

(3097) Familiarity Breeds Inattention: A Driving-Simulator Study. MATTHEW R. YANKO, THOMAS M. SPALEK, & VINCENT DI LOLLO, Simon Fraser University—Many traffic accidents occur because of inattention. We hypothesized that familiarity with a route may lead the driver to pay less attention to details in the environment. To examine this hypothesis, we tested two groups of participants in a high-fidelity driving simulator. In an initial training session, one group was familiarized with Route A, the other with Route B. In the test session, both groups drove through Route A, thereby making one group familiar and the other unfamiliar with the route. Sudden events (a car pulling out, people running onto the road) were presented during the test session, and reaction times (RTs) to activate the brakes in response to those events were recorded. RTs were significantly slower in the familiar group, consistent with the hypothesis that familiarity leads to inattention. In a further study, we investigated how the familiarity-based inattention interacts with divided attention due to cell phone use.

(3098) The “Writing Cure” As a Solution to Choking Under Pressure in Math. GERARDO RAMIREZ & SIAN L. BEILOCK. University of Chicago (sponsored by Sian L. Beilock)—Work examining the impact of math anxiety, stereotype threat, and pressure on math performance has shown that declines in working memory, via performance-related worries, underlie poor performance under stress. Using Klein and Boals’s (2001) finding that individuals engaged in expressive writing showed less intrusive thinking and working memory gains across a semester, we reasoned that expressive writing might lessen stress-induced math decrements as well. Participants (N = 28) performed math problems before (pretest) and after (posttest) engaging in expressive writing or no writing at all. Additionally, some individuals were put in a high-pressure situation (involving monetary incentives, peer pressure, social evaluation) before the posttest. A pressure × writing × test interaction obtained [F(2,22) = 9.44, p < .001]. Pressure-related drops in math performance were seen for those who did not write. The participants who wrote expressively did not show a decline. Expressive writing eliminates pressure-induced performance decrements via the regulation of situational worries.

(3099) How Does Awareness Modulate Feature Processing? YOON-JUNG JUNG, NAM NGUYEN, YUNJI KIM, HYE YOUNG NAM, & MINSHIK KIM, Yonsei University—Previous experiments demonstrated that masked primes influenced the processing of task-relevant information. However, there has been a limited number of studies examining intertrial influences, especially those involving the ramifications brought on by consciousness. This study, therefore, aimed to investigate the effects of conscious and unconscious primes on intertrial processing. Each trial in our experiments consisted of a prime trial followed by a probe trial. Participants responded to the direction of an arrow (target) appearing with a masked (Experiment 1) or an unmasked (Experiment 2) distractor arrow (prime) in the prime trial and then responded to another arrow (probe) in the probe trial. Our findings revealed that masked primes brought on reduced reaction times (RTs) to the probe in subsequent trials, when the prime and the probe were congruent. Unmasked, the prime did not demonstrate the same influence. Rather, higher RTs to the probe occurred when the target and the prime were incongruent.

(3100) Visual Field Asymmetry in the Top-Down Control of Attention. FENG DU & RICHARD A. ABRAMS, Washington University—Contingent attentional capture occurs when a visual stimulus attracts attention by virtue of its match to the observer’s goals or attentional set. Onset capture occurs when attention is attracted by a sudden onset, regardless of attentional set. We found a larger contingent capture effect for stimuli in the left visual field than for those in the right. No asymmetry was present for onset capture. The asymmetry in contingent capture reveals details of the brain mechanisms involved in the top-down control of attention.

(3101) The Influence of Verbal Instructions on Pro- and Antisaccade Performance. ALISDAIR J. TAYLOR & SAMUEL B. HUTTON, University of Sussex (sponsored by Brendan Stuart Weekes)—In the antisaccade task, participants are required to overcome the strong tendency to saccade toward a sudden onset target and, instead, to saccade to its mirror image location. The task thus provides a powerful tool with which to study the neurocognitive processes underlying goal-directed behavior. Healthy participants typically make antisaccade errors (saccades toward the target) on around 20% of trials, but the error rate differs widely across participants and experiments. We explored the role of top-down processes on antisaccade performance by varying the instructions that participants received. Across two experiments, instructions emphasizing the need for maintaining fixation before initiating a saccade resulted in a significant reduction in antisaccade errors and an increase in correct antisaccade latency. Instructions to make antisaccades as quickly as possible resulted in faster correct responses but no increase in errors. Both of these results are difficult for current models of antisaccade performance to accommodate.

(3102) The Stroop Matching Task: Semantic Competition and Response Interference. KERSTIN DITTRICH & CHRISTOPH STAHL, University of Freiburg (sponsored by Ute J. Bayen)—In the Stroop matching task, participants compare the meaning of a color word with the color of a color patch, while attempting to ignore task-irrelevant color information. The underlying processes are not well understood. Semantic competition accounts fail to predict basic findings. Recently, a response interference account has been proposed but has not been thoroughly tested. An integrated account is presented here that is based on a combination of both semantic competition and response interference principles. The integrated account can accommodate a diverse set of published findings. Predictions were derived and tested in a series of experiments. Initial studies demonstrated the superiority of the response competition approach in accounting for the basic pattern of performance. Follow-up studies manipulated stimulus onset asynchrony and revealed limits of the response competition account. The integrated account fared well across all the experiments. The results are discussed in terms of current working memory models.

(3103) Exploring the Conditions Necessary for Semantic Selective Attention. CHRISTOPHER M. MASCIIOCCHI & VERONICA I. DARK, Iowa State University—Last year, we showed that the benefit to reporting semantically primed words resulted in a cost to reporting unprimed words in the same display, relative to a baseline condition in which the prime was unrelated to either word. Because selective attention is defined by benefit with cost, we described the results as semantic selective attention. Davenport and Potter (2005), however, found no cost for unprimed words. We explored whether procedural differences are responsible for this discrepancy. Prime–target stimulus onset asynchrony (300 vs. 750 msec) had no effect, but presenting the related and unrelated (baseline) primes in pure versus mixed blocks was important. Report of baseline words was higher in pure than in mixed blocks, but report of
(3104) Nonverbal Assessment of Drug-Seeking Behavior. HENRY GORMAN, JR., Austin College—Drug recovery courts integrate contingency management techniques with cognitive behavioral therapy to obtain abstinence from drugs and alcohol by felons. The drugs courts have to assess whether clients have reduced their drug seeking. This is difficult, because the felons are high in sociopathy and often have been through several treatment programs where they have learned to “talk the talk.” Most drug court felons have not completed high school and have only rudimentary reading skills, which further compounds the difficulty of assessing their drug-seeking behavior. In the present study, participants searched a display of line drawings for a neutral target. Half the displays also contained sketches of drug-related objects; half the drawings (orthogonal to drug object presence) contained the target. RT on drug distractor no-target trials less RT on no-drug distractor no-target trials showed attention capture by drug-related objects. The RT differences for drug court felons were compared with those for college students.

(3105) Action–Effect Transformations in Unimanual Coordination. SANDRA DIETRICH, MARTINA RIEGER, & WOLFGANG PRINZ, Max Planck Institute for Human Cognitive and Brain Sciences (sponsored by Martina Rieger)—Visuomotor transformations are ubiquitous in everyday life and are usually adapted to be quite fast and efficient. We investigated how different types of visuomotor transformations affect unimanual coordination performance. The task required participants to perform circling movements and to coordinate the (transformed) movement effects with a continuously circling stimulus in an instructed pattern. The relation between the hand position and the visual presentation of the movement effect was transformed by different gains. The results suggest that with simple transformations, effect–stimulus coordination takes place. As the transformation between movement and visual effect becomes more complex, movement-related information seems to interfere, and performance decreases.

(3106) Shaping Eliminates the Simple Interval-Ratio Advantage for Unimanual Tapping. JEFFREY R. EDER & DAVID A. ROSENBAUM, Pennsylvania State University (sponsored by David A. Rosenbaum)—Evidence from bimanual and unimanual finger-tapping experiments indicates that participants are more accurate at producing sequences of taps that require simple intertap interval ratios (1:1 or 2:1) than at producing more complex intertap interval ratios (e.g., 1:4:1). Such results have provided the basis for many models of timing. The present experiment used a shaping procedure in which participants learned to produce a sequence of two temporal intervals through trial and error. The results indicated that the participants were better at learning 1:1 ratios than at learning other ratios but were equally capable of learning the other ratios: 2:1 was not learned any better than 1:4:1, for example. This outcome challenges the generality of the simple interval-ratio advantage that has been observed in other studies, where the series to be generated were imitated rather than discovered. The implications of the results are discussed.

(3107) Intentional Fractal Movement. JACOB J. SOSNOFF, University of Illinois, Urbana-Champaign, & KARL M. NEWELL, Pennsylvania State University (sponsored by Karl M. Newell)—There is growing evidence that human motor output is fractal in nature. The vast majority of these investigations have examined output to tasks that do not specify fractal properties. The present experiment examined the ability of participants to intentionally produce fractal dynamics in isometric force output. Participants produced isometric force to targets with predictable demands (constant and sinusoidal) and fractal noise waveforms (white, pink, brown, and black) that also varied in the frequency bandwidth represented. The force signal (0–4 Hz, 0–8 Hz, and 0–12 Hz). The range of within-trial force dynamics produced was between darker-than-pink noise and lighter-than-black noise, according to task conditions. The exponent of the respective fractal force dynamics decreased as a function of the frequency bandwidth of the target. The findings reveal that individuals can intentionally produce fractal motor output and that this ability is modulated by task constraints.

(3108) Perceptual Complexity and Older Adults’ Target Acquisition Performance. MIN-JU LIAO & YING WU, National Cheng Kung University—Older adults may experience more difficulties in processing complex information. Xing (2005) identified three factors of complexity—numeric size, variety, and structure—and proposed that these factors could be studied in each of the three stages of cognitive processes: perception, cognition, and action. The present study investigated the impact of perceptual complexity on older adults’ target acquisition performance within a computer display. Older and younger participants used a mouse to move a cursor into a target icon among numerous icons as quickly and accurately as possible. Numbers of icons (numeric size) and icon colors (variety) on the display were manipulated. The participants’ acquisition times and movement trajectories were recorded. The preliminary data analyses revealed that older participants moved with lower velocity, via longer path, and thus had greater average acquisition time than did younger participants. Older participants’ acquisition times also increased as the amount of various icon colors in the display increased.

(3109) Subliminal Priming of Continuous Movement Parameters. FRIERDERIKE SCHLAGHECKEN, ANDREW WILSON, & JAMES R. TRESILIAN, University of Warwick (sponsored by Elizabeth A. Maylor)—Studies employing the masked prime paradigm, where responses to supraliminally presented targets are influenced by subliminally presented primes, have shown that response selection processes are subject to low-level inhibitory motor control. It is as yet unknown whether the same is true for the programming of continuous movement parameters, such as amplitude and force. Two experiments are reported investigating the susceptibility of movement parameterization to masked priming. The results show systematic differences between priming effects for continuous parameterization and discrete selection, highlighting some of the complexities in the processes underlying movement preparation and control.

(3110) Observational Effects on Action Planning. JOSEPH P. SANTAMARIA & DAVID A. ROSENBAUM, Pennsylvania State University (sponsored by Jonathan Vaughan)—In four experiments, we manipulated the amount of observational information available in an object transport task. Participants moved a plunger from a fixed start location to a low or high target location. Would observing another’s actions affect the typical grasp height effect (GHE), wherein people grasp high to move low and vice versa? Each experiment manipulated the amount of modeled information and measured participants’ grasp heights. The results indicated that increases in observational information resulted in increased influence on the GHE. The results indicate that the GHE is susceptible to observational information. That this simple motor task and observational information give rise to significant effects is taken as evidence that the observational and motor systems are closely interconnected at a relatively low level of processing.

(3111) Probing Processes and Representations Underlying Sequential Control: Insights From Typewriting. MATTHEW J. C. CRUMP, Vanderbilt University—The ability to sequence responses is fundamental to almost every behavioral act, yet the processes and representations supporting sequential control are not well understood. We develop a novel prime–probe technique for exploring sequential control in the context of a typewriting task. Participants were primed with words, random consonant strings, or CVVCVC strings and then were probed to type out the prime, a single letter.
occurring in the first, middle, or last position of the prime, or a novel letter. Our results demonstrate that the first object in verbal short-term memory (STM; e.g., word, first letter of a random consonant string, first syllable of a CVVCV string) is translated into keystrokes in the motor buffer. We elaborate on the single-letter probe paradigm as a tool for understanding how verbal STM and motor processes are coordinated to afford control over sequential responding during online performance.

**Task Switching**

(3112)

**How Active Preparation Influences Task Switch and Cue Switch Costs: A Distributional Analysis.** LEIGH E. ALEXANDER & AKIRA MIYAKE, University of Colorado, Boulder (sponsored by Lewis O. Harvey, Jr.)—A randomly cued task-switching paradigm was used to separate the effects of task switches and cue switches. Although it is widely assumed that switch trials result in an overall slowing of reaction times (RTs), De Jong (2000) proposed an alternative failure-to-engage hypothesis, suggesting that the effects of switches result from a combination of occasional unprepared trials with long RTs (perhaps reflecting lapses of attention) and prepared trials with shorter RTs. Unlike typical task-switching experiments that focus exclusively on the means of trimmed RTs and, thus, discount potentially theoretically important long RTs, this experiment used ex-Gaussian analysis to estimate the normal portion and the tail end of RT distributions. Consistent with the failure-to-engage hypothesis, the results suggest that, when the preparation time is sufficiently long, costs of switching are driven primarily by the effects in the tail, with task switches incurring costs over and above cue switches, thus challenging previous assumptions about task switching.

(3113)

**Shape School’s Asymmetrical Switch Costs.** MICHELLE R. ELLEFSON, Virginia Commonwealth University; ELISABETH BLAGROVE, University of Warwick; KIMBERLY ESPY, University of Nebraska, & NICK CHATER, University College London—Traditionally, a switch cost is defined as an increased response time after switching between two tasks, as compared with repeating the first task. Asymmetrical switch costs occur when the cost of switching is smaller for the more complex of two tasks. Previously, we have documented the developmental trajectories of asymmetrical switch costs across different tasks domains. Using an extended version of Shape School, we found clear asymmetrical switch costs from 7-year-olds, 10-year-olds, 13-year-olds, and adults during all three experimental conditions: inhibition, switch, and both. These asymmetries increased as task difficulty increased, with the smallest asymmetries for the inhibition condition and the largest for the both condition. Furthermore, there was a remarkable consistency in the results across ages, suggesting a universal switch cost asymmetry for this task.

(3114)

**Losing the Switch Cost in Serial Memory: A Dire Challenge to the Universality of the Effect.** CINDY CHAMBERLAND, MICHELPIERRE COLL, & SEBASTIEN TREMBLAY, Université Laval—Although the phenomenon of the switch cost—whereby switching between simple cognitive tasks carries a cost in performance—has received considerable attention over the last decade, very little is known about the switching cost in serial memory. In the present study, we explored the effect of switching between verbal and spatial versions of a serial memory task, which required participants to remember series of items in their order of presentation. Serial memory is well established as undergoing a wide range of higher level cognitive activities, such as language and problem solving. Our results are unequivocal in showing the absence of a switch cost with serial memory tasks. Task alternation even had a beneficial effect on recall. This pattern of results calls into question the universality of the switch cost and allows us to temper the rather serious conclusions of counterproductivity in work settings drawn from previous task-switching studies.

(3115)

**Converging Evidence for Task Set Inhibition in the Voluntary Task-Switching Paradigm.** MEI-CHING LIEN, Oregon State University, & ERIC RUTHRUFF, University of New Mexico—This study looked for evidence of task set inhibition in voluntary task selection (as in real-world multitasking scenarios). Participants freely chose which of three tasks to perform on a digit (parity, size, or distance), with encouragement to be random and perform each task equally often. The question was whether the participants would avoid performing a task that they had recently switched away from (e.g., the task performed on trial $n-2$), because the task set was still inhibited. The results confirmed that the participants strongly avoided performing the $n-2$ task in favor of performing other tasks. This occurred both when the participants were required to switch tasks on every trial (Experiment 1) and when they were allowed to repeat tasks (Experiment 2). In addition, we observed $n-2$ repetition costs on response time. The results suggest that task sets are inhibited when switching to a new task, reducing the likelihood that this task will be selected in the near future.

(3116)

**Exploring the Task Set Decay Hypothesis in Task Switching.** HIMEH HOROUFCHIN, IRING KOCH, & ANDREA M. PHILIPP, RÜTH Aachen (sponsored by Jochen Müseler)—Activation decay is a prevalent assumption in task-switching models. Decay of task set activation is commonly assessed in the cuing version of the task-switching paradigm by manipulating the response-to-cue interval (RCI). The typical empirical indication of decay—namely, a decrease of switch costs with increasing RCI—was explored in two experiments. In Experiment 1, the RCI was manipulated in a blocked versus random design. The results showed that lengthening the RCI leads mainly to a loss of repetition benefit, which occurs under the condition of RCI switches in randomized RCI blocks only. In Experiment 2, predictable RCIs were introduced. The results revealed that the effects of RCI on switch costs are enhanced with predictable RCI. The results challenge the generality of the task set decay hypothesis. Possible alternative explanations are discussed.

(3117)

**Prefrontal Cortex and Task Switching: Cues, Stimuli, and Types of Switches.** ROBERT WEST, KIRA M. BAILEY, & MOSES M. LANGLEY, Iowa State University—Studies using functional magnetic resonance imaging have consistently revealed activation in the medial and lateral frontal cortex associated with task switching. In contrast, modulations of the event-related brain potentials (ERPs) over the frontal region of the scalp have been observed far less consistently. In a series of experiments, we examined the influence of variation in the type of cue (task vs. transition), the size of the stimulus set (small vs. large), and the type of switch (attention vs. response) on modulations of the ERPs elicited during task switching. The experiments revealed that frontal recruitment was greater with transition cues than with task cues; when the stimulus set was large, relative to when it was small; and when individuals switched both the attention and the response set, relative to when either the attention or the response set switched.

**Cognitive Aging**

(3118)

**Modeling Spoken Discourse Comprehension Across the Adult Life Span.** SANDRA HALLE, MITCHELL S. SOMMERS, JOEL MYERSON, NANCY TYE-MURRAY, NATHAN ROSE, & BRENT SPEHAR, Washington University—A large ($N > 400$) sample of adults, 20–90 years of age, with typical hearing for their age, was assessed using a test battery that measured basic cognitive and sensory abilities. In addition, spoken discourse comprehension was assessed with three tests, one of which was the LISN, a test we recently developed using transcripts of actual lectures, interviews, and spoken narratives. Structural equation modeling was used to determine the relations between age and four latent constructs (processing speed, working memory, audition, and comprehension). The best-fitting model involved direct paths to spoken discourse comprehension from working memory (mediated by processing speed), audition, and age. Surprisingly, the path coefficient between age and spoken discourse comprehension was positive, suggesting that aging is associated with development of a compensatory skill (e.g., the ability to use context) that partially offsets the effects of the age-related costs.
decline in working memory and hearing loss (presbycusis) on spoken discourse comprehension.

(3119) Phonological Availability and Word-Finding Failures Across the Life Span. MEREDITH A. SHAFTO, TAEYANG KIM, JOHN GRIFFITHS, & LORRAINE K. TYLER, University of Cambridge—Tip-of-the-tongue (TOT) states are a worrying problem for older adults, because they feel like a serious memory failure. However, priming studies implicate a specific failure in phonological retrieval, with fewer TOTs following phonological priming, especially of target word onsets. To test the phonological hypothesis, we used a picture-naming task and manipulated a measure of phonological availability—cohort size, the number of words with the same onset as the target. Words with smaller cohorts should have less frequent onset phonology. Cohort size is intrinsic to the target word, so it may be useful in identifying words vulnerable to TOTs. In a picture-naming task, target words varied in cohort size and various sublexical and lexical variables. Both older and younger adults were affected by cohort size, generating fewer TOTs for words with higher cohorts. Age differences are discussed in terms of interactions between phonological variables and other measures.

(3120) Intentional Encoding: Can Older Adults Regulate Strategy Use? HEATHER R. COLLINS & BRIAN T. GOLD, University of Kentucky—This study investigated the role of cognitive control and encoding strategies on recognition memory in older and younger adults. Although previous research has shown that older adults benefit from encoding strategies such as mental imagery, it is unknown whether older adults can self-regulate strategy use. Participants encoded words under three conditions: blocked intentional memorization, blocked mental imagery, and switching between memorization and imagery (cued by the word's color). A recognition test was administered 1 min after each encoding session. Overall, young adults had greater memory accuracy than did older adults. In the mixed instruction task, both younger and older adults showed greater recognition for items associated with an encoding strategy (imagery) than for items with no encoding strategy (memorize). These results show that older adults can exhibit the cognitive control required to use encoding strategies in a flexible manner and can improve memory performance when provided with environmentally supportive strategies.

(3121) Age Differences in Strategy Choice Selection Using a Computational Estimation Task. GREGORY P. KRATZIG & JAMIE I. D. CAMPBELL, University of Saskatchewan (sponsored by Jamie I. D. Campbell)—Lemaire, Arnaud, and Lacacheur (2004) concluded that older adults' strategy choices were less adaptive than that of younger adults. In their study, participants estimated the product for two-digit × two-digit problems by rounding both operands either up or down to the nearest decade. The participants’ task was to select the strategy that provided the closer estimate to the exact product. Lemaire et al. found that older adults' strategy choices were less accurate, but their participants did not receive accuracy feedback. We repeated the Lemaire et al. study and manipulated feedback between subjects. Contrary to Lemaire et al., without feedback, older adults were more accurate than younger adults (72% vs. 52%), but younger adults benefited from feedback (87%), whereas older adults did not (74%). Our older adults appeared to be more skilled at estimation without feedback but did not exploit feedback to optimize strategy choice.

(3122) Elemental and Configural Associations in Younger and Older Adults: Causal Learning. SHARON A. MUTTER, LESLIE F. PLUMLEE, BRANDY N. JOHNSON, & KRISTI M. SIMMONS, Western Kentucky University—We used a concurrent patterning discrimination task to examine how age influences associative processes in causal learning. In Experiment 1, young and older participants simultaneously learned two positive (A+, B−, AB+; E−, F−, EF+) and two negative (C+, D−, CD−; G+, H−, GH−) patterning discriminations, as well as simple discriminations for parts of two additional positive (I−, J−, KL+) and two additional negative (M+, N+, OP−) patterning problems. Older participants used elemental associative processes to achieve simple discrimination but were less able to use configural processes to acquire the patterning discriminations. In Experiment 2, parts of positive and negative patterning problems (e.g., A−, B−, EF+, CD−, G+, H−) were presented prior to full patterning problems to reduce the impact of competing associations. This manipulation improved the older participants’ performance but did not eliminate age differences in configural learning.

(3123) The Effect of Dehydroepiandrosterone (DHEA) on Verbal Memory in Postmenopausal Women. ELLIOT HIRSHMAN, University of Maryland, Baltimore County, BETHANY STANGL, George Washington University, & JOSEPH VERBALIS, Georgetown University—The present experiment examined the effect of a 4-week daily administration of 50 mg oral dehydroepiandrosterone (DHEA) on verbal recognition memory, verbal memory span, and verbal semantic memory in postmenopausal women. DHEA is known to metabolize into androgens and estrogens that impact cognition, and anecdotal reports suggest that DHEA enhances cognitive performance. However, double-blind placebo-controlled trials of DHEA's effects have not demonstrated enhanced cognition. We hypothesize that DHEA's effects on cognition depend on the complex and contrasting cognitive effects of its androgenic and estrogenic metabolites, with androgenic effects predominating due to the primacy of androgenic metabolites. We tested this hypothesis by examining whether DHEA impairs performance on verbal memory tasks that are generally hypothesized to be impaired by androgens and enhanced by estrogens. Analyses focus on the experimental effects of DHEA administration and the within-participants and across-participants correlations between serum levels of androgens/estrogens and verbal memory performance.

(3124) Enjoying the Sunrise: Preschoolers and Older Adults Share Peak Times. CYNTHIA P. MAY & LEANDRA WICKERSHAM, College of Charleston—Circadian arousal impacts both physiological and cognitive functioning and has been shown to vary significantly over the life span. Norms indicate that older children (7–12 years of age) tend to have morning peaks in arousal but that adolescents shift to eveningness. This evening preference continues through young adulthood and then shifts back to morningness late in life. Whereas circadian patterns for older children, adolescents, and seniors are well documented, less is known about these tendencies in very young children. The present study assessed circadian patterns for 525 children 2–6 years of age. The data indicate that preschoolers, like seniors, show extreme morningness tendencies, with roughly 90% of 2- to 3-year-olds and 75% of 4- to 5-year-olds scoring as morning types. These findings suggest that circadian patterns come full circle across the life span and hold important implications for cognitive evaluation, standardized testing, and psychological assessments.
Dissociation of Object Recognition and Mental Rotation: Evidence From Orientation Priming. GUOMEI ZHOU & XI CHEN, Sun Yat-sen University, & WILLIAM G. HAYWARD, University of Hong Kong (sponsored by William G. Hayward)—Some researchers believe that mental rotation is embedded in the object recognition process, because they share the effects of viewpoint cost. The purpose of the present study is to examine the effect of orientation priming on viewpoint costs in mental rotation and object recognition. The participants were asked to complete both a mental rotation and an object recognition task. The participants were divided into two groups: One group received orientation priming; the other group did not receive any cues. The orientation prime was identical to the background of the stimuli. Between the first stimulus and the second stimulus, the background was rotated so as to cue the orientation of the second stimulus. The results showed that orientation priming could reduce viewpoint costs in mental rotation; however, there was no such observed benefit in the object recognition task. Thus, the results of this study support the dissociation between object recognition and mental rotation.

Influence of Psychological Perspective on Scene Viewing and Memory. JOHANNA K. KAAKINEN, MINNA VILJANEN, & JUKKA HYÖNÄ, University of Turku—We examined how a psychological perspective (imagine that you are a burglar/housebuyer and decide which house you would choose as your target/new home) influences viewing and memory of natural scenes. Twenty-six participants viewed pictures depicting the interiors of three houses while their eye movements were recorded. Half of the participants were given the burglar perspective and half the house buyer perspective before viewing. After viewing, the participants completed a memory distractor task and were then asked to produce a free recall of what they saw. The results showed that the psychological perspective guided gaze to perspective-relevant details in the pictures: The participants looked at the relevant details earlier, stayed on them longer, and returned to them more often than to irrelevant details. The participants also recalled more perspective-relevant than perspective-irrelevant details, although the memory was not always accurate. The results demonstrate the importance of top-down control in eye guidance in scene viewing.

Scene Layout is Automatically Extracted and Extrapolated, But Not by Much. MONICA S. CASTELHANO, Queen’s University, & ALEX-ANDER POLLATSEK, University of Massachusetts, Amherst—Does the visual system construct a usable 3-D representation of a scene after a single view? In the present study, we examined this question by investigating the priming of spatial layout across depth rotations of the same scene. Participants had to indicate which dot (right vs. left) was closer to them in space (Sanocki & Epstein, 1997). Large differences in rotation from prime to probe resulted in little or no improved performance. However, some spatial information was retained for small rotations in depth. These results suggest that some 3-D information of a scene’s spatial layout can be extracted from a single view. We explore the implications of these results and the possible functionality of the visual system’s ability to extrapolate spatial layout.

Object Recognition in Monkeys: A Behavioral Contribution to the Edge- and the Surface-Based Theories. CAROLE PARRON, INCM, CNRS, and Université de la Méditerranée, & DAVID A. WASHBURN, Georgia State University (sponsored by David A. Washburn)—In order to assess whether monkeys rely more on the edges or on the surface information of an object to store its representation, macaques were trained to discriminate simple volumetric objects (geons) and were tested for their ability to recognize line drawings, silhouettes, and light changes of these geons. Macaques performed above chance for all the testing stimuli and showed equal transfer to line drawings and silhouettes, suggesting the use of the outline shape. They also showed better transfer for the geons with a light changes, highlighting the importance of the shading information. Moreover, the recognition performance for geons filled with new textures showed that a radical change in the surface cues does not prevent object recognition. Our findings rather support the prevalence of a surface-based theory of object recognition in macaques but do not exclude the importance of the edges, especially when surface details are not available.

Extrafoveal Preview of Multiple Objects in an Array: Evidence for Parallel Processing. ELIZABETH SCHOTTER, VICTOR S. FER-REIRA, & KEITH RAYNER, University of California, San Diego—Are multiple objects processed extrafoveally? To address this, we asked participants to name three objects (arranged in the top left corner, the top right corner, and the bottom middle) and a digit (in the lower right-hand corner) presented on a computer screen. The third object changed from an interloper (mirror image or unrelated) to the target when the eyes crossed an invisible boundary located (1) before the second object or (2) before the target. The participants looked longer at the target only when the interloper was unrelated in the second boundary condition. They also looked longer at the second object when the interloper was unrelated in the first boundary condition. The results indicate that information about the third (target) object is accessed even when the eyes are two positions ahead of it, indicating that more than one object is processed in parallel extrafoveally.
interpretation of ambiguous figures. The primes were objects or object names that were related in some way to one of the alternative organizations of the ambiguous figures. In Experiment 1, an orienting question was used to focus attention on the semantic relationship between the prime and the figure; whereas in Experiment 2, the orienting question diverted attention away from the relationship by asking about physical features of the stimulus figures. Recognition responses to biased features of the stimulus figures. Recognition responses to biased primes that were loosely and indirectly associated with one of the alternative versions of an ambiguous figure were found to be effective at biasing the interpretation of an ambiguous figure in the direction of the primed alternative, but only if attention was focused on the semantic relationship between the two stimuli.

(4009) Using the Standing Wave Illusion to Explore Correspondence Cues in Apparent Motion. ELISABETH HEIN & CATHLEEN M. MOORE, University of Iowa—Can surface features such as color or texture serve as correspondence cues for disambiguating ambiguous apparent motion? We investigated this question using the standing wave illusion. A central bar becomes invisible when two flanking bars are presented in counterphase with it. Previously, we showed that the visibility of the central bar depends on the perception of apparent motion between the central and the flanking bars, suggesting that the flanking bars are represented as a single object in motion, causing the representation of the central bar to be overwritten through an updating process. Given the dependence of the standing wave on apparent motion, the further dependence of central bar visibility on correspondence cues would suggest an influence on apparent motion. Thus, the standing wave illusion can be used to investigate the correspondence problem without relying on subjective judgments of motion.

(4010) Perceptual Identification of Fingerprints: MDS “Fingerprint Space” and Performance Under Manipulations of Difficulty. JESSICA L. MARCON & CHRISTIAN A. MEISSNER, University of Texas, El Paso—The FBI’s misidentification of a latent print as that of Brandon Mayfield in the Madrid train bombing case shed light on the growing problems with fingerprint evidence. Similarity between Mayfield’s and the perpetrator’s prints and the examiner’s failure to assess these similarities were primary causes of the error. In the present experiments, we sought to understand how individuals process fingerprint similarity and the factors that influence matching performance. The first experiment asked participants to rate fingerprint similarity; multidimensional scaling was applied to these ratings to develop a “fingerprint space.” The second experiment used a three-alternative forced choice task assessing accuracy over a range of different tasks designed to influence difficulty, including print type (partial print vs. fully rolled), similarity of foils (high vs. low), and inversion of the target print. The results are discussed for their theoretical and applied implications, and future directions are proposed.

• MATHEMATICAL COGNITION •

(4011) Nothing Is Something That Is Not Perceived As a Natural Number. MICHAL PINHAS, Ben-Gurion University, & JOSEPH TZELGOV, Ashva Academic College (sponsored by Joseph Tzelgov)—Recent research suggests that positive numbers are represented on a mental number line, with no extension for negative numbers. To address how zero is represented, participants performed numerical or physical size comparisons of numbers from −9 to 9. Number range was manipulated to perceive zero in the middle (i.e., −9 to 9) or as a range edge (i.e., −9 to 0, 0 to 9). In numerical comparisons, unlike with positive and negative numbers, processing of zero was affected by range. Distance effects were evident only when comparisons were made to zero at the edge of the range, implying that it is usually not perceived as a number. Size congruity effects were found with physical size comparisons to zero, but it did not interact with numerical distance or size, supporting a special discrete representation for zero.

(4012) More on the Arithmetic N400 Effect. KRISTIE J. FISHER, MIRIAM BASSOK, & LEE OSTERHOUT, University of Washington (sponsored by Miriam Bassok)—The N400 effect in ERP methodology is well established by language researchers, and it indicates the integration of a word with its semantic context. A similar N400 effect has also been documented in arithmetic (Jost, Henninghausen, & Rösler, 2004; Niedeggen & Rösler, 1999). These researchers found that incorrect answers to multiplication equations (e.g., 4 × 5 = 21) evoke larger N400 amplitudes than do correct answers and that the magnitude of such effects reflects the organization of multiplication facts in memory. We replicated these findings with addition and division equations. We also tested equations in which the numerically far incorrect answers were correct for a different operation (e.g., 14 + 2 = 7). These incorrect answers elicited a high N400 effect that was identical in magnitude to that elicited by numerically close incorrect answers (e.g., 14 + 2 = 15), suggesting that the addition and division memory networks are interrelated.

(4013) Alternative Arithmetic Algorithms Having Lower Cognitive Load. PATRICIA BAGGETT, New Mexico State University, & ANDRZEJ EHRENFUECHT, University of Colorado, Boulder—Because the time spent on mastery and practice of the standard arithmetic algorithms in the elementary grades is at present limited, many students never acquire a useful level of proficiency. We taught several groups of students some selected alternative algorithms that are as efficient as the standard ones but are easier to learn and put a much smaller load on working memory during their execution. These alternative algorithms are flexible; that is, they often provide users with several options, all of which lead to the same correct answer. This feature prevents users from achieving complete automaticity, but it makes execution of the algorithms more interesting. The poster presents a description of these alternative algorithms, their use by students, and students’ evaluations of the algorithms according to several criteria.

(4014) How to Cook a SNARC: Number Placement in Text Changes Spatial–Numerical Associations. MARTIN H. FISCHER & RICHARD A. MILLS, University of Dundee—Background: Western people associate small/large numbers with left/right space (SNARC effect). Objective: To determine the role of directional reading habits in this spatial preference for numbers. Method: Twenty-two normal adults read cooking recipes for comprehension; the numbers in these texts appeared left/right on the monitor so as to be congruent/incongruent with SNARC (between groups). Analysis: Regression analyses of parity decision times were conducted after reading the recipes. Results: The congruent group showed reliable SNARC before and after reading; the incongruent group’s SNARC was significantly reduced. Conclusions: Numbers become rapidly associated with spatial positions despite left-to-right reading. SNARC reflects recent spatial associations and is thus only a temporary aspect of number representation.

(4015) Adding and Subtracting Imaginary Dollars. DAVID E. COPELAND & MARK H. ASHCRAFT, University of Nevada, Las Vegas, & JODY S. BLIZZARD, Cleveland State University—Numerous studies have demonstrated that people have difficulty with math. Even seemingly minor problem factors, such as carrying, borrowing, or decimal points, can have detrimental effects on both accuracy and response times. However, in everyday life, people do math quite frequently in the context of money, such as when figuring how much to pay while in line at a drugstore, or how much money is left in one’s checking account. In this study, we considered whether imagining numbers in different contexts could influence math performance. People were presented with three digit addition and subtraction problems and were asked to imagine them as decimals (e.g., 1.23), small dollar amounts (e.g., $1.23), or large dollar amounts (e.g., $123) or to think of them normally, as whole numbers (e.g., 123). Surprisingly, although the results showed an advantage for imagining numbers as small dollar amounts, there was no advantage for large dollar amounts.
Cognitive Interferences Between Spatial Representations of Numbers and Action Goals. OLIVER LINDEMANN & HAROLD BEKKERING, Radboud University Nijmegen (sponsored by Martijn H. Fischer)—It is unclear whether spatial associations between numbers and actions (SNARC effect) are based on environment-centered or body-centered frames of reference. We required participants to move Arabic digits, depending on their parity status (odd or even), via one of two gates (left or right gate) into a target area (rectangular frame). In the ipsilateral action–effect group, left-hand responses produced movements to the left gate and right-hand responses movements to the right gate. Participants in the contralateral action–effect group had the opposite movement control mapping. Interestingly, although we observed a normal (left-to-right) SNARC effect for ipsilateral action–effects, the SNARC effect was found to be reversed if responses produced movements toward the contralateral side. Our finding shows that the SNARC effect is not driven by body-centered spatial features of the motor responses and depends, rather, on spatial aspects of the intended action consequences in the environment.

Embodyed Cognition

Do We Need to Represent Categories as Containers? Automaticity of Conceptual Mapping. INGE BOOT, DIANE PECHER, & REMY RIKERS, Erasmus University Rotterdam (sponsored by Remy Rikers)—In the present study, we used the categories are containers mapping to investigate whether metaphorical mappings are conceptual and automatic, as is claimed by the conceptual metaphor theory. In Experiment 1, participants decided whether two pictures were from the same category (animal or transportation) or not. Both or only one of the pictures was presented in a square. The square should activate the container schema. Performance to pictures from the same category was better when both, as compared with only one, were in the square, whereas performance to pictures from different categories was better when only one picture, as compared with both, was presented in the square. In Experiment 2, we found the same effect for less similar pictures within the categories. These results show that the metaphorical categories are containers mapping is conceptual, rather than linguistic, and automatic, rather than strategic.

Sun Up, Mole Down: Object Semantic Representations Specify Object-Typical Positions. Evidence From a Simon-Like Paradigm. CLAUDIO MULATTI, BARBARA TRECCANI, & FRANCESCA PERESSOTTI, University of Padua, & REMO JOB, University of Trento—According to the perceptual symbol theory, perceptual experience sets up semantics. Therefore, when accessing an object’s semantic representation, perceptual information—such as the typical position of that object—should be retrieved. We tested this hypothesis using a semantic categorization task in a stimulus–response spatial compatibility paradigm (Simon-like paradigm). Participants had to press one of two vertically arranged buttons to classify centrally presented words as belonging to the category of animals or not. Animals and nonanimals were associated with either upper or lower spatial positions (e.g., eagle vs. mole, sun vs. rug). Reaction times were faster when the position associated with the item corresponded to the response position (e.g., mole–lower buttonpress) than when the position associated with the item did not correspond to the response position (e.g., mole–upper buttonpress). The result corroborates the hypothesis.

Modality Effects on Conditional Reasoning Task. SRIKANTH DANDOTKAR & KATJA WIEMER-HASTINGS, Northern Illinois University—Modality-switching costs have been reported in support of modality-specific category representations (Pecher et al., 2003). In this study, we examined modality-switching effects on reasoning time in conditional syllogisms, in which both parts of the conditional rule were of the same or a different modality. Response time and accuracy of the participants’ evaluation of the validity of a conclusion were measured. The results show no modality-switching effect, suggesting that no modality-specific simulations are constructed. However, an interesting interactive effect was observed between modality and reasoning type. Conclusions were evaluated significantly more slowly if the second premise required processing a negated visual property than for any other modality, regardless of the modality of the other part of the rule. The effects were not moderated by accuracy. The results offer interesting implications with respect to logic instruction, access to modal representations, and differences between modalities in the processing of negation.

Embodyed Relations Self-Organize Into New Representations. REBECCA A. BONCODDO, DAMIAN G. STEPHEN, & JAMES A. DIXON, University of Connecticut—Theories of embodied cognition propose that representations are distributed across multiple levels in the cognitive system, including those traditionally considered responsible for action. Here, we show that the multilayered cognitive system self-organizes into new representations. Prior work showed that elementary school students spontaneously discovered a new representation while solving gear system problems. In gear system problems, a static display of interlocking gears is presented; participants are asked to predict the turning direction of the final gear (Dixon & Kelley, 2007). Most participants begin this task by simulating the motion of the gears with their hand and subsequently discover that the gears form an alternating sequence. The discovery of alternation marks the emergence of a new representation. In the present study, preschool children solved the gear problems while we tracked the motion of their hand. Signature changes in measures of self-organization (e.g., power law behavior) predicted discovery of alternation.

Actions, Action Effects and Timing in the Action-Sentence Compatibility Effect. CHRISTIANE HAUSER, CRISTINA MASSEN, & MARTINA RIEGER, Max Planck Institute for Human Cognitive and Brain Sciences, ARTHUR M. GLENBERG, Arizona State University, & WOLFGANG PRINZ, Max Planck Institute for Human Cognitive and Brain Sciences—In line with research on embodied approaches to language comprehension, the action-sentence compatibility effect (ACE) shows that sensibility judgments for sentences are faster when the direction of the described action matches the direction of the response movement. In a first experiment, we investigated whether this compatibility is effective between sentence direction and movement direction or direction of the movement effect. We used a go/no-go task in which the direction of the required response was cued at the onset of the sentence. Movements were dissociated from their effects by presenting transformed action effects on the screen. Because this procedure yielded a negative effect-related ACE, we manipulated the point in time at which the cue was presented in a second experiment. Preliminary results suggest that the sign of the ACE and, also, its relation to movement or movement effect are influenced by the relative timing between movement preparation and sentence comprehension.

Cognition and Emotion

Misery Loves Company: Sad Listeners Like Sad-Sounding Music. PATRICK G. HUNTER & E. GLENN SCHELLENBERG, University of Toronto, Mississauga (sponsored by E. Glenn Schellenberg)—A typical finding in the laboratory is that listeners like happy-sounding music more than sad-sounding music. Why, then, do people often choose to listen to sad-sounding music? A match between the listener’s mood and the emotion conveyed by the music may play a role, so that listeners like sad-sounding music when they are themselves feeling sad. The present experiment tested this hypothesis. Forty undergraduates were shown sets of pictures of happy, neutral, and sad images. They rated their affective response to each picture and wrote about their response to one picture from each set. They subsequently listened to musical excerpts that were either happy sounding or sad sounding and rated how much they liked each excerpt. After exposure to happy and neutral pictures, the participants liked happy-sounding music more than sad-sounding music. This difference disappeared, however, after the participants were exposed to sad pictures.
(423) Memory for Music: Listeners Remember What They Like. STEPHANIE M. STALINSKI & E. GLENN SCHELLENBERG, University of Toronto, Mississauga—We examined whether liking for novel musical excerpts predicts subsequent recognition. Participants initially heard 24 excerpts from musical recordings and rated how much they liked each excerpt, on a scale from 1 (dislike a lot) to 7 (like a lot). In a subsequent phase, the participants heard the same 24 musical excerpts, as well as 24 previously unheard excerpts, and judged whether they recognized the excerpts and how confident they were in their judgments. Recognition was better for excerpts that were liked (i.e., ratings of 6 or 7) in the initial phase, as compared with excerpts that were disliked (liking ratings of 1 or 2) or neither liked nor disliked (ratings of 3–5). The recognition benefit for liked items was evident whether the liking and recognition phases were separated by minutes or by an entire day. In short, recognition memory for music is related to preferences across both long and short delays.

(4027) Effects of Object-Based Attention on Simultaneous and Sequential Matching. YONGNA LI, PATRICK A. O’CONNOR, & W. TRAMMELL NEILL, University of Albany (sponsored by W. Trammell Neill). Studies of object-based attention have shown a within-object benefit (WOB) in both divided-attention and spatial-cuing paradigms. In the present experiments, we directly compared WOB for divided versus switching attention in the same task, same/different matching. In the divided-attention condition, two letters were presented simultaneously in either the same or different objects. In the switching-attention condition, one letter was presented as a “cue,” and the second letter followed by 250 msec. In Experiment 1, the divided-attention task produced a greater WOB in reaction time. In Experiment 2, stimuli were briefly presented in order to allow a signal detection theory analysis of WOB. Although both tasks yielded WOB in discriminability (d’), the effect was again larger in the divided-attention task.

(4028) Comparing IOR and Visual Marking in a Divided Search Task. J. DEVIN LAND, MATTHEW KAISER, ANDREW EVERSON, & JAMES F. JUOLA, University of Kansas—Both inhibition of return (IOR; Posner & Cohen, 1984) and visual marking (Watson & Humphreys, 1997) are thought to increase the efficiency of visual search through inhibitory processes, yet they are usually viewed as having distinct effects (e.g., Olivers, Humphreys, Heinke, & Cooper, 2002). We compared IOR and visual marking in a visual search task, using a vertically divided visual field designed to place each effect’s presearch processes in direct competition. We also were able to measure hemispheric differences in the extent of IOR and visual marking. The results indicated that the two effects are neither independent nor identical but are related to each other. It is possible that IOR and visual marking are complementary processes in visual search.

(4029) Does Stimulus Familiarity Influence the Preview Effect in Visual Search? JUN-ICHI NAGAI, University of the Sacred Heart—To examine the influence of stimulus familiarity on the preview effect in visual search, this study conducted two experiments using Japanese hiragana characters as the search stimuli with native Japanese participants. All the items were presented in normal orientation in Experiment 1, whereas they were presented with 180° rotation in Experiment 2. Three conditions were compared in each experiment: preview, all-items baseline, and half-items baseline conditions. In the preview condition, 3, 6, or 9 items were presented at once, and 1, 2, or 3 items were added to the display, respectively. In the all-items baseline condition, 6, 12, or 18 items were presented. In the half-items baseline condition, 3, 6, or 9 items were presented. In both experiments, the search performance in the preview condition was almost identical to that in the half-items baseline condition. The results suggest that the preview effect in visual search occurs independently of stimulus familiarity.

(4030) Visual Search Using Magnitude and Parity of Targets as Cognitive Dimensions. PATRICK CONLEY, PADMANABH SUDEVAN, JONNI-RAE BINDER, JEFFREY P. HAYTON, RACHEL A. DORSHORST, & PETER E. GONZALEZ, University of Wisconsin, Stevens Point—Visual search studies are usually based on visual dimensions of targets, principally color, form, and orientation. We used a series of tasks in which participants searched for digit targets among 4-, 8-, 16-, or 32-digit distractors; The target digits were identified by a specific value within-object benefit. The results indicated that searches based on magnitude and parity—cognitive dimensions—showed increasing response times with increases in set size, demonstrating that visual search can, indeed, be based on such dimensions. Interestingly, searches based on the magnitude dimension were much faster than those based on parity. This disparity in speed was slight with set sizes of 4, but increased significantly as set sizes increased.

(4024) The Face-in-the-Crowd Effect: Evolutionary Preparedness or Feature Discrimination? KENNETH L. CARTER, University of Central Missouri; RACHEL C. SLEVIN & MEGAN A. TULEY, University of Southern Indiana; & CHRISTOPHER M. BLOOM, Providence University—Recent studies exploring the face-in-the-crowd effect (Hansen & Hansen, 1988) have opted for schematic faces constructed of simplified line drawings in lieu of photographs (Juth, Lundqvist, Carlsson, & Öhman, 2005; Öhman, 2001). Schematic faces allow for greater control of the visual stimulus, and results corroborate Hansen and Hansen (1988). Downward-sloping eyebrows and angular features associated with angry faces result in shorter response times in visual search paradigms. Schematic stimuli were developed to examine ecological validity and the general relationship between the oval curvature of the schematic outline and internal features (Horstmann, Scharlau, & Ansorge, 2006). RTs decreased as internal features diverged from the external contour, regardless of the orientation of internal features. RTs were also affected by the type of control stimulus. The angles of downward-sloping schematic brow lines resulted in shorter RTs as the slope approximated ecologically valid angry eyebrows.

(4025) Emotional Image Arousal, Not Valence, Elicits Preferential Attention in the Digit Parity Task. PAUL HAERICH, JULIE ALBERT, & BRYAN DA SILVA, Loma Linda University—In the digit-parity task, participants make a speeded judgment about the parity of two digits flanking a central, task-irrelevant stimulus. Using lexical stimuli, previous experiments by other labs have shown that threat words disrupt performance only on the first presentation of the word; however, sexual words of varying valence, which are rated as more arousing than the threat words, produced an increase in parity response time lasting across many trials. We used images from the International Affective Picture System to dissociate the effects of valence and arousal on parity response times. Negative (e.g., snakes, spiders, mutilation) and positive (e.g., cute animals, erotic couples, food) valence images had higher arousal than did neutral images (e.g., household objects, neutral facial expressions), on the basis of the normative ratings. Response time increases were associated with arousal (p < .001), but not with valence (p = .77). Moreover, no generalized processing slowdown was observed for negative valence trial blocks.

(4026) Valence–Arousal Interactions in Affective Processing. SEAN DUFFY, Rutgers University, Camden; MICHELLE VERGES, Indiana University; South Bend; & ZACHARY ESTES, University of Warwick—We tested the combined role of valence and arousal in affective processing. Participants made lexical decisions, valence judgments, and arousal judgments to positive and negative words that varied in high and low arousal across three experiments. In Experiments 1 and 2, the participants made faster valence and arousal judgments to positive and negative words. In Experiment 3, however, the participants made faster lexical decisions to positive, low-arousal and negative, high-arousal words. The results suggest that valence and arousal may combine to produce facilitative or delayed responses to affective stimuli. Possible mechanisms to account for the integration of valence and arousal in affective processing are discussed.

(4028) Comparing IOR and Visual Marking in a Divided Search Task. J. DEVIN LAND, MATTHEW KAISER, ANDREW EVERSON, & JAMES F. JUOLA, University of Kansas—Both inhibition of return (IOR; Posner & Cohen, 1984) and visual marking (Watson & Humphreys, 1997) are thought to increase the efficiency of visual search through inhibitory processes, yet they are usually viewed as having distinct effects (e.g., Olivers, Humphreys, Heinke, & Cooper, 2002). We compared IOR and visual marking in a visual search task, using a vertically divided visual field designed to place each effect’s presearch processes in direct competition. We also were able to measure hemispheric differences in the extent of IOR and visual marking. The results indicated that the two effects are neither independent nor identical but are related to each other. It is possible that IOR and visual marking are complementary processes in visual search.

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increased to 32. We account for these results using a model based on the distance of digit targets from the low–high boundary.

**(4031)**

**Intertrial Facilitation on Visual Feature Search in Infants. YUKO HIBI, Chuo University, TAKATSUNE KUMADA, AIST, SO KANAZAWA, Japan Women’s University, & MASAMI K. YAMAGUCHI, Chuo University.**—In visual feature search, a target is detected earlier when the current target is defined by the same feature as that in the previous trial than when it is defined by a feature different from that in the previous trial (referred to as intertrial facilitation; ITF). We investigated whether ITF can be observed in 4- and 7-month-old infants, using forced choice preferential-looking methods. A prime display contained a feature singleton followed by a target display consisting of two arrays of elements: One contained a color singleton, and the other contained a shape singleton. We measured infants’ looking time for each array. The result was that the infants preferred the target array containing a singleton, which was the same as that in the prime display only for a color target. ITF, a feature-dimension-based carryover effect, was observed even for young infants, suggesting that the neural basis for dimension-based attention is equipped in early developmental stages.

**(4032)**

**Impact of the Visual Appearance of Words on Visual Search Within Word Lists. LAURE LÉGER, JEAN-FRANÇOIS ROUET, CHRISTINE ROS, & NICOLAS VIBERT, CrRCA, CNRS, University of Poitiers (sponsored by Johannes C. Ziegler).**—Two experiments including eye movement recordings were designed to assess how visual search for a word within a list was modified by the inclusion, in the list, of words either visually sored by Johannes C. Ziegler)—Two experiments including eye movement recordings were designed to assess how visual search for a word within a list was modified by the inclusion, in the list, of words either visually similar or semantically related to the target word in two conditions of target definition. The target word was shown in advance in Experiment 1 and was defined by its semantic category in Experiment 2. In both cases, search times and eye movements depended mostly on the type of words present in the list. Orthographic distractors looking like the target induced a bigger increase of search times than did semantic associates, even when the target was not known in advance. A third experiment suggested that this effect of orthographic distractors was not due to the mere presence of several words looking alike in the list, because search times were not modified when the words looking alike did not include the target word.

**(4033)**

**Visual Marking: The Time Course of Ignoring Emotionally Valenced Faces. ELISABETH BLAGROVE & DERRICK G. WATSON, University of Warwick.**—The deprivatization of old (previewed) items already in the field enables increased search efficiency for new items (Watson & Humphreys, 1984). We examined whether the time course for ignoring old items differs between positively and negatively valenced distractors over the time period of 250–3,000 msec. In all cases, negative faces were detected more efficiently than positive faces, with a trend for previewed negative faces to be less easily suppressed. Above 1,000 msec, preview duration had similar effects for both positive and negative distractors. Shorter previews displayed distinct trends, with performance improving over time when negative faces were ignored, but not positive. The results extend our understanding of the differences in processing valenced face stimuli and are interpreted in terms of the ecological properties and constraints of time-based visual selection.

**(4034)**

**Conjunction Search Following Individual Feature Preview (Without Interruption). ELIZABETH S. OLDS, TIMOTHY J. GRAHAM, & JEFFERY A. JONES, Wilfrid Laurier University.**—Olds and Fockler (2004) showed that if a color/orientation conjunction search display is immediately preceded by a preview display that shows the color of each upcoming search item (i.e., a colored square at each corresponding display location), search is faster than if the preview display shows the orientation of each item (i.e., a neutrally colored oriented bar at the relevant display locations). In the present experiments, a small letter L or T appeared on every search item; observers reported whether there was a T or an L on the red, horizontal target that appeared among red vertical and green horizontal distractors. We chose color and orientation feature values that produced roughly equivalent feature search efficiency; nevertheless, color/orientation conjunction search (using those feature values) was performed more quickly after a preview of items’ colors than after a preview of items’ orientations. The results are compared with those for a conjunction of color and size.

**(4035)**

**Effect of Spatial Information in Visual Search With Salient Distractor. KAO D. YAMAOKA & CHIKASHI MICHIMATA, Sophia University.**—Participants searched for a circle target among seven diamond distractors positioned on an imaginary circle around fixation and responded to the line segment inside it. The distractors consisted of one salient attention-capturing distractor in a unique color. The probability of the target’s appearing on a side and the side on which the salient distractor appeared on the screen were manipulated. The target appeared on one side of the screen on 80% of the trials, and the participants were informed of this in advance. The results showed that when both the target and the salient distractor appeared on the side on which the target was more likely to appear, reaction time was shorter than when the salient distractor appeared on the opposite side. Thus, they suggested that when spatial attention is intentionally focused on limited space, the distractive effect of such an attention-capturing distractor is inhibited and the search is carried out efficiently.

**(4036)**

**Attentional Shifts Toward Relevant and Irrelevant Singletons Have a Common Time Course. BRYAN R. BURNHAM, University of Scranton.**—The attentional set one adopts for locating visual stimuli can mediate the capture of attention by visual singletons, so that singletons irrelevant to an attentional set are ignored but relevant singletons capture attention. However, attentional capture may be stimulus driven, and attenuation of capture may result from fast disengagement of attention from irrelevant singletons, as compared with slow disengagement from relevant singletons. This study parametrically manipulated stimulus onset asynchrony between singleton onset and target onset at 25-msec intervals in order to more closely examine the time courses of attentional capture and disengagements of attention from relevant and irrelevant singletons. Attentional capture was mediated by the attentional set but was significant for irrelevant singletons. Little evidence for fast disengagement of attention from irrelevant singletons was observed; however, the time courses of attentional capture were similar for relevant and irrelevant singletons, with the trend shifted down for irrelevant singletons. This suggests a common underlying mechanism mediated by top-down control.

**(4037)**

**Individual Differences in Distractibility. DONALD J. TELLINGHUISEN & KEVIN H. KNOLO, Calvin College.**—Green and Bavelier (2003) found that the spatial extent of visual attention and the ability to process visual information over time were greater for people who habitually play action video games. In the study we report, we explored whether individual differences in these attention measures were related to performance on a well-established self-report index of everyday distractibility, the Cognitive Failures Questionnaire (CFQ; Broadbent, Cooper, FitzGerald, & Parkes, 1982). Forster and Lave (2007) found that the CFQ score was directly related to distractibility in a low-perceptual-load visual distractor task. We found that individuals who had low CFQ scores (indicative of low levels of distractibility in everyday life) had a greater spatial distribution of visual attention in an enumeration task, relative to those with high CFQ scores. In addition, attentional blink duration was shorter for those with low CFQ scores. The results are discussed in relation to distractibility, task load, and overall attentional capacity.

**(4038)**

**Video Gaming and Attention: Distractor Processing in Flanker and Perceptual Load Tasks. JESSICA L. IRONS & ROGER W. REMINGTON, University of Queensland.**—Green and Bavelier (2003, 2006) recently published compelling evidence suggesting that video game playing increases the capacity of attention. In their flanker compatibility task, frequent video game players showed intrusion by compatible
and incompatible distractors even in high-load conditions, signifying increases in the amount of available attentional resources. Experiment 1 failed to replicate this result with 18 gamers and 10 nongamers; neither gamers nor nongamers showed compatibility effects at high load. Experiment 2 compared gamers and nongamers in an Eriksen and Eriksen (1974) flanker task. Although nongamers (n = 8) showed compatibility effects at only the closest target–flanker separation interval, gamers (n = 18) demonstrated compatibility effects at all intervals, indicative of enhanced processing outside the focus of attention without detriment to the central task. The results raise the question of whether gamers possess greater attentional capacity, or whether they strategically allocate attention to enhance peripheral monitoring.

(4039) The Interacting Effect of Load and Space on Visual Selective Attention. SERGE CAPAROS & KARINA J. LINNELL, Goldsmiths, University of London (sponsored by Anne Giersch)—The study of visual attention and, more specifically, distractor interference has focused on the manipulation of two factors: spatial separation and load. Their manipulation has, respectively, generated mappings of the attentional profile in space (Yantis & Johnston, 1990) and shown that the efficiency of distractor exclusion depends on task load (perceptual and cognitive; Lavie, 2000). This study tested the independence of these factors. A flanker paradigm with central target presentation (Eriksen & Hoffman, 1973) was employed, and load (perceptual and cognitive) and spatial separation were manipulated. The findings showed that (1) a “Mexican hat” profile of attention can be revealed with central-target presentation; (2) the shape of the profile is sensitive to load, so that increasing perceptual load focuses attention but increasing cognitive load diffuses it; and (3) published effects of load occur only at certain spatial separations. Load and spatial separation exert interacting effects.

(4040) The Onset of Motion Breaks Through Attentional Control Settings. NASEEM AL-AIDROOS, RUO MU GUO, & JAY PRATT, University of Toronto—Attentional control settings prevent visual properties, such as changes in luminance, the onset of new objects, moving stimuli, and color, shape, and orientation singletons, from capturing spatial attention whenever these properties are task irrelevant. In the present study, however, we demonstrated that this elimination of capture by attentional control settings does not hold for the onset of motion. Subjects searched for a color-defined target, which was preceded by either a color cue (that matched or mismatched the target color) or a motion onset cue (placeholders that began to rotate before the target appeared). Although we found a strong attentional set with the color cues (only matching color cues captured attention), the motion onset cues consistently produced a cuing effect. This result demonstrates that motion onsets are able to break through an attentional control set, causing capture even when the onset of motion is completely task irrelevant.

(4041) Negative Effects of Exogenous Cues at Short SOAs: Why Does the Pattern of RTs Across Uncued Locations Depend on Display Size? PEI (PEGGY) CHEN, University of Medicine and Dentistry of New Jersey, & J. TOBY MORDKOFF, University of Iowa—Previously, we have found that exogenous cuing at a short SOA does not always facilitate detection responses at the cued (as opposed to an uncued) location. This negative effect of exogenous cuing requires the use of more than two display locations and becomes larger as the display size is increased. Furthermore, the specific pattern of RTs across the uncued locations may also depend on display size: With four locations, the distance (to the target) from the cued location does not seem to have an effect; with eight locations, the farther from the cued location, the faster the response. Our working hypothesis for explanation posits that inhibition spreads out from the cued location in a linear fashion only when adjacent locations appear closely enough (e.g., angular separation less than 30°). To test this idea, we investigated the roles of apparent and actual display size and of separation between adjacent display locations.

(4042) Practice Reduces the Attentional Blink. THOMAS G. GHIRARDELLI, MOU NA AT TARHA, MELISSA TALLED A, MONICA ZILIOLI, PAIGE KRETSCHMAR, & LEAH BAILEY, Goucher College—The attentional blink (AB) is a temporary deficit in detecting the second of two targets (T2) when it is presented soon after the first target (T1). A rapid serial visual presentation (Raymond, Shapiro, & Arnell, 1992). Participants first performed a replication of Chun and Potter’s (1995) AB task (i.e., looking for two target letters among a stream of digits) in multiple sessions, using a subset of letters as possible targets. Identification of T2 improved with repeated practice (i.e., the AB was reduced); however, the AB was not completely eliminated. T1 performance also improved. These practice effects did not transfer from the initial letter subset to a second letter subset, consistent with previous findings, using two different single-letter probes as the second target, in the Raymond et al. task (Ghirardelli et al., 2007). These findings have implications for current accounts of the AB.

(4043) Detecting Targets in a Stream of Distractors Boosts Memory for Nonfixed Scenes. KHENA M. SWALLOW & YUHONG V. JIANG, University of Minnesota, Twin Cities—Previous research suggests that attention to and memory for events increases when an observed activity changes (e.g., a person finishes chopping vegetables and begins to throw them into a bowl). We investigated whether similar effects occur when changes in an event are produced by one’s own action. We asked participants to remember hundreds of pictures presented at two pictures per second. During encoding, the participants also performed a secondary target detection task, for which either an occasional target (e.g., a white square) or a frequent distractor (e.g., a black square) was presented with each picture. In a later test, the participants more accurately recognized pictures previously presented with targets than pictures presented with distractors. This was true even when the pictures and the fixed targets were presented at different locations. We suggest that detecting an important goal-relevant event may facilitate, rather than interfere with, the encoding of concurrently presented background information.

(4044) Attentional Capture During Serial Recall by an Across-Trial Change in Irrelevant Auditory Stimulation. FRANÇOIS VACHON, Université de Montréal, & ROBERT W. HUGHES & DYLAN M. JONES, Cardiff University—The presentation of a single, deviant sound within a task-irrelevant auditory sequence typically captures attention. Here, we report an auditory attentional capture effect by which short-term serial recall is disrupted by a deviation occurring across trials. When introducing a change in the voice conveying the irrelevant auditory sequence on every sixth visually presented serial recall trial, impairment was found for each change trial, followed by a recovery across the remaining trials in each same-voice trial quintet. This pattern was not apparent for the first quintet: Performance remained stable across the first five trials of the experiment before any deviation in voice had been encountered. Moreover, because the across-trial deviations occurred in a predictable fashion, their disruptive power waned markedly over the course of several trial quintets. The present findings suggest that attentional capture by an auditory deviation results from a violation of rule-based expectancies, not dishabituation.

• DIVIDED ATTENTION •

(4045) The Source of Execution-Related Dual-Task Interference. DANIEL BRATZKE, BETTINA ROLKE, & ROLF ULRICH, University of Tübin gen (sponsored by Rolf Ulrich)—The present study assessed the underlying mechanism of execution-related dual-task interference in the psychological refractory period paradigm. The motor bottleneck hypothesis attributes this interference to a processing limitation at the motor level. By contrast, the response-monitoring hypothesis assumes that monitoring the execution of the response occupies a central processing bottleneck and, thus, causes interference with Task 2 processing. Participants performed ballistic movements of different distances as Task 1 and a choice reaction time task as Task 2. A propagation effect of movement distance on reaction time in Task 2 indicated substantial execution-related interference. In order to assess the locus of this propagation effect, stimulus-response compatibility in Task 2 was manipulated. In accordance with the motor bottleneck hypothesis, the compatibility effect was partially absorbed.
during movement execution in Task 1. Thus, this study provides evidence for the motor bottleneck hypothesis.

(4046) Benefits and Costs of Vigilance for Dual-Task Performance. PAUL ATCHLEY & MARK CHAN, University of Kansas—Individuals often engage in dual tasks while driving in order to maintain alertness over time. Dual-task research examines the immediate effects of resource competition on task performance. The present research focused on dual-task interference on vigilance. We examined potential benefits for dual tasks if the primary task continues long enough to result in a loss of vigilance. Vigilance tasks were performed for 30 min with and without a dual conversational task. The results suggest that although a dual task does minimize the loss of vigilance over time, as compared with a single-task condition, the benefits do not outweigh the costs. Performance in the dual-task case was comparable to that of individuals who performed the vigilance task alone only toward the end of the session, when vigilance was lowest. This would indicate that although a dual task may help maintain sustained attention, dual-task interference is still more costly.

(4047) Telephone Conversation Impairs Visual Attention Via a Central Bottleneck. MELINA A. KUNAR, University of Warwick, RANDALL CARTER, Colgate University, MICHAEL A. COHEN, Brigham & Women’s Hospital, & TODD S. HOROWITZ, Brigham & Women’s Hospital and Harvard Medical School (sponsored by Todd S. Horowitz)—Recent research has shown that telephone conversations disrupt driving ability. One hypothesis suggests that this occurs because conversation impairs visual attention. Here, we provide the first direct test of that hypothesis, using multiple object tracking (MOT) performance to measure visual attention. Participants performed MOT under single- and dual-task conditions. Dual-task conditions included engaging in a telephone conversation with an experimenter, narrative comprehension of an audiobook, shadowing a list of words read by an experimenter, and cognitively generating new words on the basis of a set of word game rules. Our results mirrored those obtained with driving simulators. Neither narrative comprehension nor shadowing impaired MOT performance, relative to the single-task baseline, indicating that neither listening nor speaking per se interfere with visual attention. However, both conversation and word generation did disrupt MOT performance, indicating that generating verbal content interferes with visual attention at a central bottleneck.

(4048) Redundancy Gain in Simple, Go/No-Go, and Choice RT Tasks: Evidence for an Effect on Response Execution. JEFF MILLER & XIN DAI, University of Otago—Responses are usually faster when they are signaled by two redundant stimuli than when they are signaled by a single stimulus, and this speedup is known as redundancy gain (RG). Three experiments provide evidence that RG results primarily from the speedup of motor processes. The first experiment shows equal RG in simple RT, go/no-go, and choice tasks, suggesting that RG affects a process common to all these tasks (i.e., stimulus detection or response execution). The second experiment shows that RG is independent of stimulus eccentricity, suggesting that it does not affect stimulus detection, and also shows that it increases with binunual, rather than unimanual, responses, suggesting an effect on response execution. The third experiment shows that the time from the onset of the lateralized readiness potential to the keypress response is shortened with redundant stimuli, also suggesting an effect on response execution.

(4049) Response Activation in Dual-Task Performance. HARTMUT LEUTHOLD, University of Glasgow—Most recently, it has been argued that Task 2 response activation has no access to the bottleneck stage but, rather, produces effects on Task 2 reaction time (RT2) indirectly, via cross talk onto Task 1 response-related processing (Schubert, Fischer, & Stelzel, 2008). To test this assumption, participants performed, in the present psychological refractory period (PRP) paradigm, a pitch discrimination task as Task 1 and a masked priming paradigm as Task 2. Task 2 allowed assessing positive and negative response activation influences (congruency effects) on RT. As in Schubert et al., Task 1 reaction time (RT1) indicated reliable congruency cross talk effects, whereas RT2 showed a standard PRP effect and stronger congruency effects when a longer stimulus onset asynchrony. Crucially, an analysis that examined Task 1 and Task 2 response activation effects on response speed as a function of RT1 revealed differential congruency effects for the two tasks. Together, the present results suggest that response activation both directly and indirectly influences response-related Task 2 processes.

(4050) Phoning It In: Considering the Role of Judgment in Distracted Driving. MITCHELL LUNDIN & KATHLEEN M. GALOTTI, Carleton College—This study examined the effects of hands-free cell phone conversation on performance on a simulated driving program. Participants engaged in a driving simulator in three conditions: while engaging in a mandatory phone conversation, an optional phone conversation, and no phone conversation. Performance on the simulator was measured by an internal scoring system that accrued points for various traffic violations, including speeding, failure to signal, running a red light, and so on. The results showed that the participants scored significantly better in the no-phone condition than in either phone condition and that there was no significant difference between the mandatory and the optional phone conditions. Only 19 of 35 participants chose to end or ignore a call. Although these findings support previous research that has suggested that cell phone conversations impair driving performance, they do not provide evidence that drivers are aware of the impairment enough to make a judgment call to end a conversation before performance is affected.

(4051) Semantic Processing, But Not Semantic Inhibition, Produces the Enhanced Attentional Blink for Emotional First Targets. KAREN M. ARNELL, KATIE WALTERS, LAUREN SANDERS, & CHRIS RUDYK, Brock University—Previously, our lab observed that the magnitude of the attentional blink (AB) was increased when the first of two targets (T1 and T2) was a sexual/taboo word, relative to an emotionally neutral word (Mathewson, Arnell, & Mansfield, 2008). In those experiments, the T1 task required a font decision unrelated to the meaning of the word. In the present experiments we show that the enhanced AB observed with sexual/taboo T1s was not due to Stroop-like interference from the word meaning, since the enhanced AB was also observed when participants simply had to report the identity of T1. We also show that although the increased AB with sexual/taboo T1s does not necessitate a T1 task requiring semantic processing, either the T1 task or the T2 task must require semantic search of the RSVP stream. When both T1 and T2 required orthographic search, there was no increase in AB magnitude with sexual/taboo T1s.

-Letter/Word Processing-

(4052) Visual Word Recognition of Monosyllabic Monomorphic French Words: New Evidence From Lexical Decision, Naming, and Progressive Demasking. LUDOVIC FERRAND, PATRICK BONIN, ALAIN MEOT, & MARIA AUGUSTINOVA, LAPSICO, CNRS, Université Blaise Pascal, BORIS NEW, CNRS and Université Paris Descartes, & CHRISTOPHE PAILLIER, INSEEM and Service Hospitalier Frédéric Joliot—We report lexical decision, word naming, and word identification (progressive demasking) performance on 1,494 monosyllabic monomorphic French words. Simultaneous and hierarchical regression analyses were conducted with response time as the dependent variable in order to investigate the unique predictive variance of classical independent variables, such as phonological onsets, lexical variables (e.g., feedforward and feedback consistency, objective and subjective frequency, age of acquisition, orthographic neighborhood, and number of letters), and semantic variables (e.g., imageability and number of meanings). We included new independent variables, such as cumulative frequency, frequency trajectory, number of phonological neighbors, morphological size family, morphological entropy, word category, and contextual dispersion. The influence of most variables was obtained in the three tasks, with differential effects depending on the task. We compare our results with those reported for American English by Balota, Cortese,

(4053) Sensory Experience Ratings: A New Word Recognition Variable. BARBARA J. JUHASZ & SARAH TAYLOR, Wesleyan University, & MARGARET M. GULLICK, Dartmouth College—This study examined whether lexical representations were tied to the sensory experience within which words were learned. Participants were asked to rate their level of sensory experience, defined as a specific sensation from one of the senses, with certain words. Correlations between these sensory experience ratings (SERs) and other lexical variables were examined. The results demonstrated a significant positive correlation with word imageability and a significant negative correlation with age of acquisition. SER was not significantly correlated with word frequency. In a lexical decision task, words with a high SER were responded to significantly more quickly than words with a low SER, indicating speeded word recognition. Simulations using the English Lexicon Project (Balota et al., 2007) also demonstrated an advantage for high-SER words in lexical decision, but not in word-naming, tasks. These findings suggest that SER may be an independent variable indexing quality of semantic representations.

(4054) Word and Pseudoword Superiority Effects in Early/Native Welsh–English Bilinguals. GIORDANA GROSSI, SUNY, New Paltz, GUILLAUME THIERRY & ENLLI THOMAS, Bangor University, & JOSEPH DIPIETRO, SUNY, New Paltz (sponsored by William Prinzmetal)—Word and pseudowords' superiority effects have been interpreted as indices of familiarity with the words and the orthography of a language, respectively. Grossi, Murphy, and Boggon (in press) have shown that these effects are present in late learners of a language. Here, we explored their presence in a different population of bilinguals and a different language. Twenty-five native/early Welsh–English bilinguals performed a forced choice letter identification task with Welsh words and pseudowords, English words and pseudowords, and nonwords. The participants showed pseudoword superiority effects for both languages but a significant word superiority effect only for Welsh. A control group of monolingual English speakers showed superiority effects only for English. These results show that word and pseudoword superiority effects reliably measure familiarity with the orthography of a language across a variety of alphabetic futures. Future research will more specifically explore whether visual word recognition processes are shaped differently following different learning experiences.

(4055) Sentence Content Processing Prevels Over Constituent Word Processing. MICHIKO ASANO & KAZUHIKO YOKOSAWA, University of Tokyo (sponsored by Kazuhioko Yokosawa)—This study investigated the relationship between word and sentence content processing in the early stage of sentence reading. The influence of sentence context on the recognition of contextually anomalous words in Japanese text was examined. A target word (a contextually anomalous word or its contextually consistent counterpart) in a short text was briefly presented, followed by a recognition task. The recognition list consisted of four words: contextually anomalous/consistent target words and anomalous/consistent new words. The results showed that the anomalous words were less frequently recognized than the correct counterparts; the participants were more likely to select the contextually consistent word. The context effect was generated even when only the information of content in a sentence was provided to the participants. These results show that processing of sentence context prevails over those of constituent word and that the semantic information of content words plays a primary role in the early stage of sentence reading.

(4056) Warwick Oral Reading Differences Project. JAMES S. ADELMAN, University of Warwick, MAURA SABATOS-DiVITO, University of North Carolina, Chapel Hill, & GORDON D. BROWN, University of Warwick—Neuropsychological and development differences in reading have long informed visual word recognition theories. For instance, identification of whole-word readers (i.e., phonological dyslexics, Chinese-style readers) and part-word readers (i.e., surface dyslexics, Phoenician-style readers) has constrained visual word recognition theories. The influence of variability in normal readers' cognitive abilities on visual word recognition is yet to be explored. Differences in visual and attentional processes, long- and short-term memory, verbal and nonverbal cognitive ability, and auditory and phonological processing could influence lexical processing, which should constrain such theories. We describe the Warwick Oral Reading Differences project, which seeks to relate these factors to the strength of lexical effects on the response times typically observed in normal adult naming experiments (i.e., word frequency, length, neighborhood size, regularity, and consistency) to further constrain the interpretation of these effects and, thus, model development. Findings from the project are presented.

(4057) A Connectionist Implementation of the Incremental Articulation Model. ALAN H. KAWAMOTO & QIANG LIU, University of California, Santa Cruz, & CHRISTOPHER T. KELLO, University of California, Merced (sponsored by Christopher T. Kellog)—We present a connectionist implementation of the incremental articulation account of speech production and reading aloud based on a simple recurrent network. This network takes a phonological representation as the input and generates articulatory gestures corresponding to a sequence of segments as the output. The model assumes a parallel stochastic phonological-encoding process and a minimal criterion to initiate articulation based on the segment. We discuss how this model can account for both length and serial position effects, effects that some researchers have argued can be accounted for only by models that assume serial phonological encoding. In addition, an account of initial segment duration effects and the complex onset advantage effect that models assuming a minimal criterion corresponding to the segment cannot account for will be discussed. We argue that acoustic effects arising from articulatory differences of consonants differing in their manner of articulation affect the interpretation of acoustic latency results.

(4058) Bilingual Reading of Compound Words. IN YEONG KO, MIN WANG, & SAY YOUNG KIM, University of Maryland, College Park—The present study investigated whether bilingual readers activate constituents of compound words in one language while processing compound words in the other language via decomposition. Two experiments using a lexical decision paradigm were conducted with adult Korean–English bilingual readers. In Experiment 1, the lexical decision of real English compound words was more accurate when the translated compounds (the combination of the translation equivalents of the constituents) in Korean (the nontarget language) were real words than when they were nonwords. In Experiment 2, when the frequency of the head constituent of compound words in the target language was manipulated, the effect of the lexical status of the translated compounds was greater on the compounds with high-frequency head constituents than on the compounds with low-frequency head constituents in the target language. Together, these results provided evidence for decomposition and cross-language activation in the bilingual reading of compound words.

(4059) Discrimination Without Awareness: Extracting Different Kinds of Information From Visually Masked Words. ANASTASIA A. GORBUNOVA & KENNETH J. FORSTER, University of Arizona (sponsored by Kenneth J. Forster)—Two experiments are presented exploring the idea proposed by Marcel (1983) that information about the semantic properties of a stimulus persists beyond the backward mask despite any awareness of the stimulus. In each experiment, participants were asked to perform three types of forced choice discrimination, based on the information gathered from a word that was masked both backward and forward: (1) semantic discrimination, in which the participants had to choose between a word associated in meaning with the masked stimulus and an unrelated alternative; (2) an identity task in which the participants selected a word identical to the masked one; and (3) e-detection, where the participants responded “yes” if the masked word contained the letter “e” or “no” if it did not. Experiment 1 presented masked words for 50 msec, and Experiment 2
for 40 msec. Different interpretations of the findings and possible mechanisms by which these three tasks can be performed are discussed.

- Language Comprehension -

(4060) Priming Language Pushes People Into Bilingual or Monolingual Mode. ALEXANDRA L. DUNN & JEANE FOX TREE, University of California, Santa Cruz (sponsored by Jean E. Fox Tree)—Can bilingual speakers be primed to think in one language or another? Participants were recruited to participate in an experiment presumed to be English only, as are most studies in our department. Spanish–English bilingual speakers and English monolingual speakers completed a lexical decision task (LDT) administered by an experimenter who did not appear to speak Spanish. Subsequently, half the bilinguals engaged in a task involving speaking Spanish (bilinguals in bilingual mode). The other bilinguals completed the same task in English (bilinguals in monolingual mode), as did the monolingual English speakers. All then completed a second LDT. In contrast to other studies, the LDTs contained no cognates and no words with Latinate roots. The bilinguals in bilingual mode showed a smaller practice effect from the first to the second LDT than did the bilinguals in monolingual mode. Bilinguals in monolingual mode performed similarly to monolingual English speakers. Differences between rejecting nonwords and accepting words are discussed.

(4061) Effects of Familiarity on Metaphor Comprehension. ALISON P. WHIT-EFORD & RONALD T. KELLOGG, St. Louis University—Bowdle and Gentner’s (2005) career of metaphor hypothesis (CoM) proposes that novel metaphors are understood as comparison statements but that, with repeated exposure to a metaphoric construct, comprehension shifts from compari-son to categorization. Critics counter that it is not familiarity but the often-confounded aptness (goodness) that determines the mode of processing. The present study paired high- and low-familiar metaphors matched on aptness either with a prime that drew on the literal sense of the metaphor vehicle or with an irrelevant prime. If CoM is correct, low-familiar metaphors will be processed as comparison statements and should benefit from the presence of a literally related prime, whereas high-familiar metaphors (processed as categorization statements) should not. Experiment 1 revealed the predicted main effect of familiarity, even with aptness controlled. The interaction of prime type and familiarity was, however, only suggestive. Experiment 2 examined the CoM predicted interaction again with enhanced power.

(4062) Semantic Overlap and the Time Course of Metaphor Processing: ERP Evidence. LAWN G. BLASKO & VICTORIA A. KAZMERSKI, Pennsyl-vania State University, Erie, & BANCHIAMLACK DESSALEGN, Johns Hopkins University—The understanding of metaphor requires a semantic leap between vehicle and topic. In the present study, participants read high and low semantic overlap metaphors and rated their meaning-fulness on a three-point scale. They then judged whether a following tar-get word was related. The participants also completed a working memory span task. Event-related brain potentials (ERPs) were recorded continu-ously. ERPs have very high temporal resolution, which allowed us to map the precise time course of processing, and source localization allowed us to examine models of the brain regions involved. The results showed that metaphors with high semantic overlap were more likely to be judged meaningful and were better primes to the related targets. ERP differences between literal sentences and metaphors were clear starting in the earliest bins. Differences based on semantic overlap were seen in the late positivity 700 msec after the onset of the last word of the metaphor.

(4063) Effects of Syntactic Complexity, Load and Span on Cleft Comprehen-sion. CHRISTY M. SEIDEL & JANET L. MCDONALD, Louisiana State University—Object clefts (It is the doctor that the dentist contacts) are harder to comprehend than subject clefts (It is the doctor that contacts the dentist). We investigated the role of working memory on processing clefts in three ways: (1) processing demands of the sentences via type of clause (subject, object) and number of clauses (one, two), (2) external load (none, visual, auditory), and (3) individual differences in working memory span (high, low). Comprehension was most strongly impacted by cleft type/number, followed by working memory span, and finally by external load. Object clefts were more impacted by memory span than were subject clefts. Of the loads, auditory proved to be the most detrimental, but only on the structures where the correct answer was two clauses back—that is, those with the highest working memory demands (e.g., It is the doctor that the patient visits that contacts the dentist. Who contacts?).

(4064) Eye Movements and the Processing of Morphosyntax in the Visual World: Evaluating a Linking Hypothesis. BRIAN RIORDAN & MI-CHAEI N. JONES, Indiana University, Bloomington—Does the tight time-locking of the processing of linguistic information and eye move-ments (Tanenhaus et al., 2000) hold for morphosyntactic processing (cf. Dahan et al., 2000)? We explored whether a strong linking hypothesis relating linguistic processing and eye movements can account for the processing of grammatical number morphology in English. Gaze was tracked as participants listened to existential and interrogative sentences and viewed pictures of objects that were either singular or plural. In one condition, disambiguating number information occurred at the copula (is/are). In another, number information was present on both the copula and the determiner (a/some). The participants failed to reliably use either source of information: No differences were observed in speed to fixate the target on same trials (number morphology matched both referents) versus different trials (cf. Lew-Williams & Fernald, 2007). These results do not support a strong linking hypothesis in the case of grammatical number processing in English.

(4065) The Effect of Irony on Quantifier Focus and Pronoun Resolution. RUTH FILIK & LINDA M. MOXERY, University of Glasgow—We inves-tigated the online processing of written irony—specifically, how irony interacts with the focusing properties of quantifiers. Quantifiers divide sets into two subsets. For example, in a sentence such as Many fans at-tended the match, many leads to focus on the set of fans who did attend, making subsequent anaphoric reference to this set felicitous, as in They cheered loudly. In contrast, substituting not many for many leads to focus on the set of fans who did not attend, thereby licensing They watched it on TV instead. The present experiments demonstrated that these focusing patterns can be reversed, for both positive and negative quantifiers, when they are used in an ironic context. This finding was evident in both lan-guage production (sentence completions) and language comprehension (eyetracking while reading). The results will be discussed in terms of the presupposition denial account of quantifier focus and contemporary theories of irony comprehension.

(4066) The Time Course of Simulation Is Constrained by the Grammar of the Verb. CAROL J. MADDEN, Erasmus University Rotterdam, & DAVID J. THERRIAUT, University of Florida—This study investigated the influ-ence of verb aspect on sentence representations. The experiments measured word-by-word reading, as well as sensibility judgments on sentences in which a target object word had been replaced by a picture of that object. In the first experiment, the target object was pictured either in-use or not in-use (open or closed laptop). In the second experiment, objects were pic-tured at a middle or completed stage (burning or extinguished candle). The results suggest that simulations are used to integrate target objects into the unfolding sentence context, regardless of the aspect of the verb, and that the subsequent time course of these simulations is constrained by the aspect of the preceding verb. Control experiments ensured that the effects were a result of contextual manipulations, rather than surface features of the pictures themselves. The findings are interpreted within the framework of perceptual simulations during language comprehension.

- Language Production -

(4067) The Influence of Clustering Coefficient on Spoken Word Production. KIT YING CHAN & MICHAEL S. VITEVITCH, University of
Scope of Planning As an Alternative to Hierarchical Feature Pass-
ing in Language Production. MAUREEN GILLESPIE & NEAL J. PEARLMUTTER, Northeastern University—The sources of subject–verb agreement errors in spoken language production were examined using preambles such as The book with the torn page(s) by the red pen(s), which participants completed as full sentences. Both prepositional phrases modified the head noun, and the semantic integration (Solomon & Pearlmutter, 2004) of the head noun and local nouns was varied by switching the order of the prepositional phrases. Head–local mismatch error rates showed an interaction between integration and linear distance to the head noun. Integration affected error rates more for the local noun nearest the head, suggesting that integration affects timing of planning and that scope of planning influences error production: Intervening local nouns planned closer to the head noun are more likely to interfere. Local noun hierarchical distance to the verb (Franck et al., 2002) cannot account for these results; an additional study will examine the independent influence of hierarchical distance during agreement production.

Morpheme Frequency and the Shape of the Phonological Word. ARIEL M. GOLDBERG, Johns Hopkins University and Tufts Univer-
sity, & BRENDA RAPP, Johns Hopkins University—It is a cross-
linguistic fact that phonological and phonetic processes are more active within the stems of a compound than across the compound boundary. This has been accounted for by positing that the phonological word is the basic unit of phonological processing (Levitt et al., 1999; Wheelton & Lahiri, 1997). Traditional theories have posited that phonological word boundaries are determined on the basis of morphological and phonologi-
cal structure alone (Nespor & Vogel, 1986). We investigate the possi-
ability that the phonological word is influenced in part by the frequency of its constituent morphemes. We present a number of studies designed to examine whether the relative frequency of the stems in a compound influences the degree to which phonological/phonetic processes that index the phonological word take place across the compound boundary. Processes examined include degemination, nasal place assimilation, and vowel-to-vowel coarticulation.

Relational and Lexical Repetition Effects in a Language Production Task. BLAINE MULLINS & PETER DIXON, University of Alberta—The waning of priming effects across intervening trials has been used to distinguish models of lexical and syntactic priming in language produc-
tion. In our research, we found evidence for long-lived lexical priming but short-lived relational priming. Subjects orally described schematic scenes with sentences such as The bear is darker than the dog. In each sentence, the target object (cross) was compared with one of two possible reference objects (e.g., disc). When there was a choice of how to describe a scene, the subjects tended to repeat lexical items produced on previous trials, even when there were one or two unrelated intervening trials. However, when there were no intervening trials, the subjects were more likely to repeat the noun (disc) than the adjective (darker). The res-
ults can be explained by assuming that the construction of the relational representation is primed by the immediately preceding trial.

How Readers Experience Characters' Decisions. MATTHEW E. JA-
COVINA & RICHARD J. GERRIG, Stony Brook University—When people read narratives, they have ample opportunities to evaluate the decisions that characters make. Our studies examined how the quality of characters’ decisions interacted with story outcomes to structure readers’ experiences. Participants read brief stories in which characters made popular or unpopular decisions (with respect to normative expectations). By the end of each story, the readers learned the outcomes of those deci-
sions—positive or negative. Decisions and outcomes either matched or mismatched. Sometimes, for example, unpopular decisions (e.g., Laura chose to party rather than to study) led to positive outcomes (Laura’s midterm proved to be quite easy). The participants took longer to read
outcome sentences when there was a mismatch. However, the participants' retrospective judgments (e.g., Did Laura make a good decision going to the party?) were largely determined by the stories' outcomes (rather than by a priori decision popularity). The results illustrate the time course of readers' engagement with characters' decisions.

**Interaction between the lexical item and the conceptual process.**

**Reading time and memory measures demonstrated an continuity.** After reading, the participants recalled the stories and verified the terms before and after were equally likely to signal a temporal shift or word shifts (i.e., lexical items) and the shifts themselves ral shifts involving event reordering have not distinguished between the terms that they require both the temporal index updating and the mental reor- dering of events (Ohtsuka & Brewer, 1992). Studies examining tempo- ral shifts involving event reordering have not distinguished between the words used to signal shifts (i.e., lexical items) and the shifts themselves (i.e., conceptual processes). In this work, participants read stories in which the terms before and after were equally likely to signal a temporal shift or continuity. After reading, the participants recalled the stories and verified story event order. Reading time and memory measures demonstrated an interaction between the lexical item and the conceptual process.

**Who Draws Inferences and Notices Contradictions in Scientific Texts While Reading?** JASON L. BRAASCH, JENNIFER WILEY, & THOMAS D. GRIFFIN, University of Illinois, Chicago—We used a paradigm contrast to test whether readers spontaneously compute logical inferences while reading scientific texts. The results of previous experiments indicated that such inferences could be computed when all the necessary information was available and immediately preceded a conclusion, rendering it highly accessible. The same effect was not seen when critical information was distanced from the conclusion, making it less accessible (Wiley & Myers, 2003). The present study follows up this finding by examining the relation of individual differences in working memory capacity (WMC) to inference generation in expository text. The results support the role of WMC in the maintenance of the critical pieces of information in order to compute scientific inferences and notice contradictions. The role of prior knowledge is also discussed.

**Repetition Effects Across Unrelated Narratives: The Influence of Characters' Social Interaction.** CELIA M. KLIN & APRIL M. DRUMM, Binghamton University—One way to study readers' memory representation is through reading; only information included in memory from the first reading can influence the second reading. Despite claims that repetition effects are episodic when people are reading for compre- hension, Klin, Rakano, and Weingartner (2007) found context-independent repetition effects when a phrase was repeated across two otherwise unrelat- ed passages. In the present experiments, we found that subtle aspects of the social interaction between characters must match for repetition effects to be found: When a character left a written note in Story A and another character left the same note in Story B, repetition effects were found. How- ever, if the message in Story B was described, instead, as part of a phone conversation, no repetition effects were found. Not only was a match in the mode of communication important (spoken vs. written), but so was the presence or absence of social interaction (voicemail vs. conversation).

**Understanding Situations in Text and Picture Stories.** JOSEPH P. MAGLIANO & KRISTOPHER KOPP, Northern Illinois University, & GABRIEL A. RADVANSKY, SABINE A. KRAWIETZ, & ANDREA K. TAMPLIN, University of Notre Dame—Narratives are experienced in a variety of modalities, including texts, pictures, and film. Presumably, the same cognitive systems operate across these various modalities. In this study, people comprehended either picture or text versions of the same simple stories and did an event segmentation task in which they indicated whether a sentence or a picture depicted a change in the situation of the narrative. A content analysis of the stories was conducted to identify the situational structures of the stories. Analyses of the event segmentation data indicated that the participants largely perceived the same situational structures for the picture and the text versions. However, counterintui- tively, changes in the spatial–temporal framework had a greater impact on event segmentation for the text than for the picture versions. It may be that the picture stories encourage readers to perceive a continuity of action that reduces the impact of shifts in time and space.
whereby performance under spaced conditions exceeds the level predicted by statistical independence. We report the results of a meta-analysis that reveals superadditivity to be ubiquitous and, consequently, implies that such models are inadequate theories of distributed practice. The flaw in such theories lies in the assumption that mnemonic benefits arise from the increasing independence, rather than dependence, of study opportunities. Theories that implicate interactivity between study or practice events, such as those that presume a study phase retrieval mechanism, are more viable approaches to understanding the advantages of distributed practice.

(4083)  
Framing Effects in Children’s Directed Forgetting. ALP ASLAN & KARL-HEINZ BÄUML, Regensburg University—We examined framing effects in children’s directed forgetting. Children and adults were cued to forget a previously learned list of items before studying a second list. The forget cue either was motivated by telling subjects that the first list was presented by mistake (the whoops condition) or was not motivated at all (the no-explanation condition). Independently of framing, young adults and fourth graders showed the standard pattern of directed forgetting—that is, impaired recall of precue items and improved recall of postcue items. In contrast, both kindergartners and first graders showed recall impairment of precue items in the whoops condition, but not in the no-explanation condition. Moreover, both groups of children failed to show recall improvement of postcue items in either condition. The results demonstrate that young children can intentionally forget previously encoded information. Unlike in adults and older children, however, the forgetting is not accompanied by recall improvement for subsequently encoded information.

(4084)  
Directed Forgetting: The Role of Amount and Strength of Postcue Encoding. BERNHARD PASTÖTTER & KARL-HEINZ BÄUML, Regensburg University—In list-method-directed forgetting, participants are cued to intentionally forget a previously studied list (List 1) before encoding a subsequently presented list (List 2). As compared with the remember condition, the participants in the forget condition typically show impaired recall of List 1 items and improved recall of List 2 items, referred to as forgetting and enhancement. Prior work has shown that postpone encoding is necessary to observe List 1 forgetting. We report the results of two experiments in which we examined the role of amount and strength of List 2 encoding on directed forgetting performance. The results indicate that the amount, but not the strength, of List 2 items affects directed forgetting. Indeed, the more List 2 items had been learned, the more List 1 items were intentionally forgotten. In addition, the effects of serial position and output order were analyzed, separately for List 1 and List 2 items. The results impose restrictions on current accounts of directed forgetting.

(4085)  
List-Method-Directed Forgetting Affects Recognition After All. LILI SAHAKYAN & EMILY R. WALDUM, University of North Carolina, Greensboro, & AARON S. BENJAMIN, University of Illinois, Urbana-Champaign—Instructing people to forget previously learned information leads to impaired memory for that information—known as the directed forgetting effect (Bjork, LaBerge, & Legrand, 1968). In the list-method variant of directed forgetting, such memory impairments have been found in free recall but were typically absent in recognition tests. In two list-method-directed forgetting experiments, we used a yes/no recognition test to assess memory. We varied the length of the study lists (short vs. long), the study materials (words vs. nonwords), and the type of distractors during the test (similar vs. dissimilar). Conditions that relied on specific recovery of details from study influenced the discriminability of precue items. This was true both for stimulus manipulations, such as nonwords, and for test manipulations, such as similarity of distractors. The length of the study list had no influence on the discriminability of precue items, but it affected the discriminability of postcue items.

• SOURCE MEMORY •

(4086)  
Memory for Spatial Location of Arousal and Nonarousal Images. JASON L. HICKS, NOELLE L. BROWN, & BENJAMIN A. MARTIN, Louisiana State University—We investigated the effect of stimulus-evoked arousal on memory for the screen location of the stimuli. Pure blocks of arousing or nonarousing images were encoded for an expected location short-term memory (STM) test. On each STM trial, one of the four images was tested in its original location or in a different studied location. An unexpected, delayed three-alternative forced choice long-term memory (LTM) test of location memory was presented for all the images. In general, arousing images produced better STM and better LTM memory than nonarousing images. We also found an interaction, so that location LTM for nonarousing images was better for previously tested items over nontested items, but location LTM for previously tested arousing images was no better than that for their nontested mates. These results are considered in the context of previous work for location STM and LTM of arousing versus nonarousing images (e.g., Mather et al., 2006; Mather & Nesmith, 2007).

(4087)  
Two Kinds of Response Bias in Reality Monitoring. JOHN A. REEDER, Simmons College (sponsored by Linda A. Henkel)—There is growing evidence that source monitoring involves the evaluation of continuously distributed information in memory, as described by signal detection theory. An important implication is that performance may be influenced by subjective biases to identify memories with one source or another. In a reality-monitoring task, participants attempted to discriminate among previously seen, previously imagined, and new items. The instructions misleadingly suggested that most items were old or that most were new, or that most of the old items were either seen or imagined. The old/new manipulation only affected recognition, shifting bias parameters in the predicted direction. The seen/imaged manipulation affected both recognition and reality monitoring. Telling participants that most old items had been imagined made them more likely to respond “imagined,” instead of “seen,” but also more likely to respond “old” overall. These results support recent multidimensional models of source monitoring, which provide for separate recognition and source biases.

(4088)  
Auditory Distraction Impairs Source Memory: Evidence From Output Editing. JOHN E. MARSH & HELEN M. HODGETTS, Cardiff University, C. PHILIP BEAMAN, Reading University, & DYLAN M. JONES, Cardiff University (sponsored by William Macken)—Two experiments compared oral recall of visually presented lists of words, drawn from a semantic category, that were accompanied by to-be-ignored auditory words either from the same category (related condition) or from a different category (unrelated condition). Experiment 1 used a standard free recall procedure and showed that significantly fewer correct items and significantly more intrusions (recall of words presented as to-be-ignored items) were produced in the related condition. Experiment 2 used an externalized free-recall procedure (Kahana et al., 2005) whereby participants were instructed to say any words that came to mind during recall and to signal immediately if they knew that they had produced an intrusion. Here, the participants in the related condition recalled a significantly greater number of intrusions without identifying them as such and were more likely to erroneously identify correct responses as intrusions. The results suggest that the semantic similarity between to-be-remembered and irrelevant items impairs source memory, as is evident by the disruption it produces to output editing.

(4089)  
Noncriterial Recollection Affects Feelings of Knowing. GENE A. BREWER, ARLO G. CLARK-FOOS, RICHARD L. MARSH, & JOSEPH T. MEEKS, University of Georgia, & PAUL W. FOOS, University of North Carolina, Charlotte—When people attempt to recall information from memory, their decisions about searching can be driven by both the sought-after information and related but temporarily irrelevant details. The later information has been labeled noncriterial recollection, and the focus of this study was to demonstrate that such details can affect metacognitive beliefs and further memorial search. In two experiments involving color versus line drawings, the labels were spoken by different-gendered speakers at learning. We then asked the participants, in the absence of memory for the gender, for a feeling-of-knowing
judgment concerning recognition of the gender if it were re-represented. These metacognitive judgments were higher when they later were able to discriminate the format (color vs. line) of the picture, and they were also higher when they later claimed to recollect the format of the picture. Thus, later recollection of a temporarily irrelevant detail (format) affected the earlier metacognitive judgment (about gender), thereby demonstrating the influence of noncriterial recollection on memorial processes.

The Testing Effect Does Not Uniformly Affect Source Memory. GENE A. BREWER, ARLO G. CLARK-FOOS, & RICHARD L. MARSH, University of Georgia, JASON L. HICKS, Louisiana State University, & JOSEPH T. MEEKS, University of Georgia—The testing effect is a phenomenon in which a free recall test on material tends to improve memory for related material. Recently, this testing effect has ostensibly been extended to improving context (or source) memory. However, the latter claim about improvement may be localized to temporal characteristics associated with the items during free recall testing in a two-list learning paradigm. In two experiments, we replicated this effect but also showed that a second source dimension is not affected by the testing effect. More specifically, we manipulated the gender of the speaker in each of the two lists. When testing on which list an item had appeared, we found a testing effect, but not when we tested on gender. In addition, we showed that changing a person’s focus during the original free recall testing eliminates the testing effect entirely.

Working Memory Capacity and the Ability to Avoid Source Memory Errors. SEAN LANE, EMILY ELLIOTT, CRISTINE ROUSSEL, JILL SHELTON, STEPHANIE GROFT, & TANYA KARAM, Louisiana State University—It has been argued that differences in working memory capacity (WMC) are associated with differences in the ability to search for and reactivate information from secondary memory (Unsworth & Engle, 2007). To test this hypothesis, we examined whether WMC is associated with the ability to accurately ascertain the source of long-term memories. Each subject completed three working memory tasks that were used to compute a composite measure of WMC. In a separate task, the subjects saw and imaged pictures. Forty-eight hours later, the subjects were instructed to recall only the pictures that they had studied and to exclude the images and, subsequently, took a source recognition test. The high-WMC subjects recalled more pictures and fewer images than did the low-WMC subjects. The high-WMC subjects were also more accurate on the source recognition test, even when recalled items were excluded. We discuss the theoretical and practical implications of our findings.

Determinants of Working Memory Span: The Effect of Consecutive Cognitive Tasks. M. KARL HEALEY & LYNN HASHER, University of Toronto, ROSE T. ZACKS, Michigan State University, & ELENA DANIOVA, University of Toronto—Working memory span, as measured by complex span tasks, is often assumed to provide a reliable measure of an individual’s working memory capacity. We tested the possibility that working memory span is influenced by other tasks completed within the same experimental session. A series of experiments followed a basic paradigm. Participants first completed a primary task either with or without simultaneously ignoring irrelevant distracting information. Next, the participants completed either a verbal or a spatial working memory span task. Across experiments, the participants’ verbal span scores were dramatically lower if the previous task required them to ignore irrelevant information, regardless of whether that information was itself verbal or spatial. In contrast, spatial span scores were unaffected by the demands of the previous task. These results have methodological implications for the administration of span tasks and theoretical implications for the concept of working memory “capacity.”

Working Memory Capacity and Attentional Capture. TIM LORAT & SOWON HAHN, University of Oklahoma—In the present study, we investigated the role of working memory capacity (WMC) on automatic attentional capture of stimuli that are related to WM contents. High- and low-WMC individuals viewed a display including eight circles, while maintaining a certain color visually or verbally. The task of the participants was to determine the orientation of a triangular shape in one of the circles. The rest of the circles contained a diamond-shaped distractor. One of the diamond-shaped distractors was colored the same as the one in WM (related distractor) or was different (unrelated distractor). Low-WMC individuals showed interference from both related and unrelated distractors. However, high-WMC individuals showed more interference by related distractors than by unrelated distractors. Based on the basis of the present results, we suggest that attentional capture by WM contents is not automatic but depends on available WMC.
Working Memory and Language: A Latent Variable Longitudinal Study. PASCALE M. J. ENGEL & SUSAN E. GATHERCOLE, University of York (sponsored by Philip Thomas Quinlan)—The relationship between working memory, phonological awareness, and developing language skills was explored longitudinally in children growing up in a multilingual society. A sample of 121 children from Luxembourg were followed from kindergarten to first grade, and completed multiple assessments of working memory, phonological awareness, native and foreign vocabulary knowledge, language comprehension, and reading. Relations between the measures were best characterized by a model consisting of two related but separable constructs—corresponding to verbal short-term memory and the central executive—that were distinct from phonological awareness. Assessments of verbal short-term memory in kindergarten significantly predicted vocabulary knowledge and comprehension in native and foreign languages 1 year later: Central executive and verbal short-term memory measures in kindergarten were significantly associated with reading in first grade, and phonological awareness did not predict any of the language constructs.

The Cognitive Consequences of Positive Mood: Working Memory Improvement in an Older Adult Population. STEPHANIE M. CARPENTER, Massachusetts General Hospital and University of Oregon, ELLEN PETERS, Decision Research and University of Oregon, ALICE M. ISEN, Cornell University, & DANIEL VÄSTFJÄLL, Decision Research and University of Göteborg (sponsored by Alice M. Isen)—Older adult subjects (N = 46; 63–85 years of age) participated in an experiment assessing the influence of mood on cognitive performance and decision making. Positive-mood subjects received a gift of candy, whereas neutral-mood subjects did not receive any gift. All completed a computer-based card sorting task in which they learned to choose winning outcomes and avoid losing outcomes. In the background of the computer task, positive-mood subjects saw smiling suns, and neutral-mood subjects saw control circles. The subjects also completed tasks measuring cognitive performance (e.g., working memory [WM], speed of processing, matrix reasoning, and vocabulary). The results indicated that positive mood was related to choosing better and that this effect was mediated by an increase in WM in the positive-mood condition. A follow-up study, conducted 3 months later, with a subset (n = 19) of the subjects from the original sample, supported our finding that positive mood improves WM, because in the absence of a positive-mood induction, WM significantly decreased.

Recognition Memory

Ironic Effects of Censorship in Memory. MATTHEW R. KELLEY, BRITTANY A. GOLDMAN, & JERRICA R. CERDA, Lake Forest College—Two experiments explored the generation effect in the applied context of lyrical censorship. College-aged participants listened to and shadowed an original song that contained a mixture of partially or completely censored nouns. Shadowing involved repeating every heard word and attempting to generate every censored word in the song. Following either one or two presentations of the song, the participants completed a recognition test consisting of heard, censored, and distractor nouns. The results revealed an ironic effect of censorship: Censored items that were generated during the shadowing task were remembered significantly better (~20%) than heard items. Moreover, the participants were able to generate significantly more censored items when they were partially censored and when they heard the song more than once. The results and implications are discussed.

Concurrent Heuristic Use in Recognition Memory: The Impact of Confidence Judgments. JEREMY K. MILLER, Willamette University, & MARIANNE E. LLOYD & ERICA KNOWLES, Seton Hall University—Two experiments are presented that investigated concurrent use of the distinctiveness and fluency heuristics (Gallo, 2008). Participants studied either words or word/picture pairs. During the recognition test, the fluency of half of the test items was increased (e.g., Jacoby & Whitehouse, 1989), and the participants responded using a 4-point confidence scale. In Experiment 1, similar priming effects were obtained for both high- and low-confidence judgments, suggesting that participants do not use the fluency heuristic to a greater degree under high-confidence uncertainty. In addition, false alarm rates were lower after picture study, suggesting use of the distinctiveness heuristic. In Experiment 2, the participants were permitted to change their recognition responses (e.g., Van Zandt & Molonado-Molina, 2004). Again, the participants employed the fluency heuristic. However, there was no evidence that the participants also employed the distinctiveness heuristic. The results are discussed in relation to recent models of fluency (Huber et al., in press).
tiveness and stereotypicality, and were given a recognition test. Priming memory errors. Participants were primed with a category label, were typically Black) are associated with both positive (sports) and negative prototypical category member. Afrocentric facial features (i.e., stereotypical) in involving category priming, we tested whether face recognition errors counts contend that this phenomenon is due to the familiarity of the orthographic features of unidentified probes, and the notion that recollection is involved has been rejected. The present study reexamined the possibility that recollection may play a role in recognition without identification. In two experiments, above-chance source memory was found on a list discrimination task and a voice discrimination task for unidentified test probes. Moreover, source accuracy for identified and unidentified targets did not differ significantly. These findings have implications both for theories concerning recognition without identification in particular and for those concerning recognition memory in general.

The Biasing Effects of Category Priming and Facial Features on Face Memory. HEATHER M. KLEIDER, LESLIE KNUCKY, & ASHLEY MYERS, Georgia State University—In three experiments involving category priming, we tested whether face recognition errors are driven by the degree to which a target’s facial features represent a prototypical category member. Afrocentric facial features (i.e., stereotypically Black) are associated with both positive (sports) and negative (crime) professions, leading to biased jury outcomes for the latter. In the present study, we tested whether these associations would produce face memory errors. Participants were primed with a category label, were shown a series of faces (either Black or White males) varying in attractiveness and stereotypicality, and were given a recognition test. Priming either “murder” (Experiment 1) or “basketball player” (Experiment 3) resulted in more false alarms for stereotypical than for atypical Black faces, whereas priming “doctor” (Experiment 2) had no impact. The halo effect resulted for the White faces. Together, these findings suggest that certain facial features have strong category associations and, when activated, promote stereotype-based recollection errors.

List Composition Effects on Recognition Memory Performance and Metacognitive Judgments. DAVIDE BRUNO, University of Massachusetts, Amherst, PHILIP A. HIGHAM, University of Southampton, & TIMOTHY J. PERFECT, University of Plymouth—A variant of the remember-know procedure is introduced in which participants are allowed to select one of a set of response options for both old and new judgments in a recognition memory task. This procedure is used to establish which mechanisms underlie acceptance and rejection of lures. Research is presented in which compatibility of lures with the encoding context was manipulated by changing the composition of the study list. In Experiment 1, for example, the proportion of high-frequency words across different study lists was progressively reduced in order to show that the false alarm portion of the word frequency mirror effect can be reversed when only low-frequency words are presented in the study list. The use of our new procedure also revealed that the application of the presuppositional response strategy (Strack & Bless, 1994) may play an important role in producing false positives in conditions of low memorability of the study list.

Constraining Retrieval in Recognition Memory: Effects of Perceptible Stimulus Characteristics. JUSTIN KANTNER & D. STEPHEN LINDSAY, University of Victoria—Some prominent theories of recognition memory hold that recognition judgments are based on the degree of match between test probes and all previously encountered exemplars. Jacoby and his colleagues, by contrast, argued that recognition judgments are supported in part by a process of “constrained retrieval” whereby individuals search memory for items from a particular contextual source. Experiments conducted in our laboratory have not yielded consistent evidence for such a process in recognition tasks. We report new experiments exploring whether objective perceptual characteristics of to-be-remembered stimuli facilitate the use of constrained retrieval in recognition judgments.

Distributed Practice in Real-World Classroom Vocabulary Learning. HALEY S. SOBEL, McGill University, & IRINA V. KAPLER & NICHOLAS J. CEPEDA, York University (sponsored by Nicholas J. Cepeda)—Distributed practice refers to a memory advantage that occurs when study sessions are spaced across time, instead of massed into a single study session. Spaced learning is not often explicitly utilized in actual classrooms, perhaps due to a paucity of research in applied settings and with school-aged children. The present study expands previous findings into fifth-grade real-world classrooms. We taught 46 students unfamiliar English words in three conditions: massed, spaced by 5 h, and spaced by 1 week. Retention was tested 5 weeks after completion of the second study session. One-week spacing produced superior long-term retention, as compared with the massed and the same-day conditions, which did not differ. To our knowledge, this is the first study to examine such a long within-day spacing gap. This finding demonstrates that distributed practice can be generalized to vocabulary learning in applied settings and middle-school-aged children.

Epistemological Beliefs, Academic Performance, and Perceived Effectiveness of Various Teaching Methods Among College Students. ROBERT A. KACHELSKI & RODGER NARLOCH, College of St. Benedict and St. John’s University—The purpose of this study was to determine how college students’ epistemological beliefs (beliefs about knowledge and learning) are related to their academic performance and the types of teaching methods and classroom activities they perceive as effective. Epistemological beliefs were assessed using the Epistemic Beliefs Inventory (Schraw, Bendixen, & Dunkle, 2002), which yields scores on five dimensions: omniscient authority, certain knowledge, quick learning, simple knowledge, and innate ability. Significant negative correlations were found between students’ GPAs and their scores on the quick learning and simple knowledge dimensions. Students’ ratings of the effectiveness of lecture as a teaching method were positively correlated with their scores on the omniscient authority dimension and were negatively correlated with their scores on the quick learning dimension. Additional analyses are presented, including the relationship between epistemological beliefs and identity formation among college students.

Using Text Messages to Support Complex Learning Tasks. KEITH R. BUIJAK & RICHARD CATRAMBONE, Georgia Institute of Technology—This study investigated the use of mobile phones to support mathematics learning. Support was provided to participants during a learning activity, which included a tutorial only, a printed list of facts and equations, or a series of text messages sent to their mobile phone, with some messages requiring a response. Pre-/posttest performance differences among conditions were not significant, due to ceiling effects. The qualitative results, however, bode well for using mobile phones to support learners in complex tasks. Building on the work of Storze, Briggs, and Smith (2002), the participants rated the complex “journey” of text messages as “easy to use” and claimed that it “helped in learning the material.” Implications for socioeconomically disadvantaged communities are significant, given the adoption rates of mobile phones in these communities and the lack of other learning technologies, such as computers and reliable Internet access.

The Neural Correlates of Visual and Verbal Cognitive Styles. DAVID J. M. KRAEMER, LAUREN ROSENBERG, & SHARON L. THOMPSON-SCHILL, University of Pennsylvania—Cognitive styles, thought to reflect an individual’s preferred mode of processing information, are believed to affect the way individuals learn, recollect, and reason. However, little direct evidence currently exists to link cognitive styles to specific neural systems. In the present study, visual and verbal cognitive styles were measured both by objectively quantifiable tests of cognitive abilities and by self-report measures of processing style preference. During fMRI scanning, participants took part in a novel task...
(4112) Testing the Desirable Difficulty Account of Retrieval Practice Effects. MARY A. PYC & KATHERINE A. RAWSON, Kent State University—To test the desirable difficulty account (Bjork, 1994) of retrieval practice effects, we created practice conditions in which retrieval was successful but differentially difficult and then examined effects on final test performance. Assuming that retrieval is more difficult after a long versus short interstimulus interval (ISI), final test performance is predicted to be greater for items recalled after longer versus shorter ISIs during practice. Assuming that items are less difficult to retrieve as the number of correct recalls during practice increases, the desirable difficulty account predicts less gain in final test performance from each next correct recall during practice. Examination of first-keypress latencies for correct recalls during practice confirmed that both assumptions above hold. Most important, as is predicted by the desirable difficulty account, final test performance was greater in the long-ISI condition, and each next correct recall during practice showed diminishing returns for final test performance.

- Reasoning/Problem Solving -

(4113) Innovation and Imagination in Adults With Attention-Deficit/ Hyperactivity Disorder. HOLLY A. WHITE, University of Memphis, & PRITI SHAH, University of Michigan—Attention-deficit/hyperactivity disorder (ADHD) in adults is characterized by inattentiveness and poor inhibitory control, but the flip side of these deficits may be an enhanced ability to “think outside the box.” Our previous research suggests that adults with ADHD are divergent thinkers with a preference for the idea generation and brainstorming phase of creative problem solving. Hypothetically, unstructured and unconstrained cognition may enable individuals with ADHD to generate ideas that are more original but less practical. The present study explored this possibility, using a cell phone design task. As was expected, adults with ADHD produced ideas that were more original (less frequent), innovative, and rated as more creative, whereas adults without ADHD generated ideas that were rated higher on practicality, utility, and ease of implementation using current technology. The results are discussed in terms of chaotic cognition in ADHD and implications for real-world creative problem solving.

(4114) A Computational Account of the Development of Structured Thought. LEONIDAS A. DOUMAS, University of Hawaii, Manoa, ROBERT G. MORRISON, Northwestern University, & LINDSEY E. RICHLAND, University of California, Irvine—Numerous studies have demonstrated that children’s ability to reason relationally depends on their development of structured knowledge representations and their ability to successfully process that information in working memory (e.g., Gentner & Rattermann, 1991; Richland et al., 2006). Previously, we demonstrated that these two factors can interact to explain complex patterns in children’s analogical reasoning (Morrison et al., 2008). Here, we provide an explanation of how children can actually learn the structured representations necessary for analogy from unstructured examples. This theory is implemented in DORA (Doumas et al., 2008), a computational model that provides an account of (1) how children can learn these structured representations, (2) how they use these representations to reason relationally, and (3) how both of these processes are sensitive to developmentally appropriate limitations in executive control in working memory. To demonstrate the flexibility of this approach in understanding the development of analogical reasoning, we simulate several classic studies.

(4115) Generating Explanations. ERIC G. TAYLOR, DAVID LANDY, BRIAN H. ROSS, & JOHN E. HUMMEL, University of Illinois, Urbana-Champaign (sponsored by Brian H. Ross)—Explanations often involve computing a cause of an event, which might be part of some larger scenario. The explanation may then highlight the role of the cause in the larger scenario. To test this idea, participants read short paragraphs about novel situations and then explained some assertions about those scenarios. Two groups of participants explained two different subsets of assertions. The participants’ explanations for a final test assertion differed between the groups. Each group identified a particular cause (the connected cause) in many of their explanations, and these causes were typically invoked in explaining the test event. It is unlikely that the connected cause was simply more available than others, because the participants systematically chose the nonconnected cause when asked to pick which of the two was more likely to be true of a different situation. We discuss implications for models of causal reasoning and future studies of explanation.

(4116) Human Performance on Capacitated Vehicle Routing Problems: Can Humans Compete With Computation Algorithms? THOMAS C. ORMEROD, RICHARD W. EGGLESE, & GENOVEFA KEFALIDOU, Lancaster University (sponsored by Thomas C. Ormerod)— Pilot data for traveling salesman problems (TSPs) indicate that naive human solutions can compete with powerful computational algorithms. An experiment with two conditions (no-verbalization and verbalization groups) was conducted on capacitated vehicle routing problems (VRPs). Forty-eight participants had to find the shortest route under a weight constraint in four problems. The results suggest that there are two main groups of strategists (clusterers and calculators). In one problem, verbalizers performed better and more slowly than did the nonverbalizers. In the other three problems, they gave worse solutions than did the nonverbalizers. Clusterers performed better than the calculators. A significant effect of problem was found. Verbalization appears to impair solutions in two problems, as compared with nonverbalization. The results suggest that humans give good solutions to difficult problems (VRPs) in relatively quick time (this agrees with relative literature). Furthermore, people who use visual grouping can give better solutions in a shorter time.

(4117) Performance Pressure and the Role of Retrieval Interference. ANDREW MATTARELLA-MICKE, University of Chicago, MAREIKE WIETH, Albion College, & SIAN L. BEILOCK, University of Chicago—Previous studies have shown that performance pressure can cripple math problem solving—except on well-practiced problems retrieved from long-term memory (Beilock et al., 2004). We show that this exception does not always hold. In Experiment 1, 92 participants completed a set of highly learned single-digit addition problems in a low-pressure or high-pressure testing situation. These addition problems were preceded by either multiplication or division problems. Performance on single-digit addition (a highly retrieved operation) was hurt by pressure, but only when preceded by multiplication—a pressure × operation interaction [F(1,88) = 6.23, p < .05]. Due to the overlap between addition and multiplication operations (Campbell & Timm, 2000), multiplication produces retrieval interference for the addition problems that division does not. Pressure exacerbates this effect, causing performance loss even in basic addition. Experiment 2 followed up on this phenomenon by demonstrating that small changes to problem content yield major differences in retrieval interference and, therefore, sensitivity to performance pressure.

(4118) Similarity-Based Interference in Analogical Reasoning: An Eye-tracking Investigation. GUIDO F. SCHAUER, ROBIN L. GRUVER, & MATTHEW R. WEIDEN, UCLA, PETER C. GORDON, University of North Carolina, Chapel Hill, & KEITH J. HOLYOAK, UCLA—We measured fixation and saccade patterns as college students solved a set of four-term pictorial analogy problems. The analogical answer had to be selected from among four options, which either did or did not include...
BILINGUALISM

The Role of Bilingualism in Retrieval Control: Specificity and Selectivity, LIN LUO, York University, BREGTJE SETON, University of Groningen, ELLEN BIALYSTOK, York University, & FERGUS I. M. CRAIJK, Rotman Research Institute—This study examined the effects of bilingualism on two aspects of controlled processing at memory retrieval: specificity and selectivity. Specificity refers to one’s ability to accurately access specific memory details, and selectivity refers to one’s ability to select relevant memory cues and ignore distracting information at retrieval. Forty-eight young adults (24 monolinguals and 24 bilinguals) participated in a memory task and were instructed to memorize two lists of common objects. At retrieval, specificity was manipulated by requiring the participants to retrieve specific contextual details, and selectivity was manipulated by showing test items on distracting backgrounds. Monolinguals and bilinguals performed equivalently in accuracy, but group interacted with retrieval conditions in response speed. Specifically, monolinguals and bilinguals did not differ as a function of specificity, but bilinguals were more resistant to the effects of lures and distracting backgrounds. These results show bilingual advantages in selectivity in the context of distraction.

Resolution of Conflict in Sentence Processing by Bilinguals: Evidence from ERP, SYLVAIN MORENO & ELLEN BIALYSTOK, York University, ZOFIA WODNIECKA, Jagiellonian University, & CLAUDE ALAIN, Rotman Research Institute (sponsored by Ellen Bialystok)—Bilingual children have been shown to perform better than monolinguals in a grammaticality judgment task that requires a high degree of cognitive control. The present study used ERPs to extend these results to adults performing two sentence judgment tasks varying in their need for cognitive control. The N400 and P600 effects were modulated by both bilingualism and task instructions. In the acceptability task using standard instructions to assess language proficiency with little demand on cognitive control, monolinguals obtained higher accuracy than did bilinguals, and there were no differences in ERP waveforms. In the grammaticality task, which included the need for cognitive control to focus on grammar in the context of misleading meaning, accuracy was equivalent in the two groups, but bilingualism influenced P600 time course processing and the P600 neural network. We interpret these findings in terms of the effect of bilingualism on cognitive control and its impact on linguistic processing.

Code Switching in Bilinguals: An Electrophysiological and Behavioral Study of Lexical and Discourse Triggering, MARJIT J. WITTEMAN & JANET G. VAN HELL, Radboud University Nijmegen—Code switching, using two languages within one utterance, is a hallmark of bilingual language processing. We report two ERP and behavioral experiments that examined triggering mechanisms of code switching. Experiment 1 tested the lexical triggering hypothesis, which claims that cognates trigger a switch to the other language. In an ERP study and a behavioral study (the latter using self-paced reading), Dutch–English bilinguals read code-switched sentences preceded by a cognate trigger word or a control word. In Experiment 2, we extended the basic triggering mechanism to see whether language-related information in the context prior to language switching modulates code switching (discourse triggering). In an ERP study and a behavioral study, Dutch–English bilinguals read code-switched sentences that were preceded by a sentence containing sociocontextual information about a British/American or a Dutch situation. Preliminary results of the ERP and behavioral studies indicate that lexical and discourse triggers indeed modulate the perception of code switches.

Masked Cross-Modal Translation Priming in Different Script Bilinguals, NORIKO HOSHINO & PHILLIP J. HOLCOMB, Tufts University, & JONATHAN GRAINGER, LPC, CNRS, and Aix-Marseille University—There is resonance among the lexical codes across two languages when even only one language is required for processing. In the present study, we examined the time course of cross-modal interactions during bilingual word recognition, using a masked priming paradigm with event-related potentials. Japanese–English bilinguals performed auditory and visual lexical decision tasks in the L2, English. Auditory or visual English targets were preceded by a visually presented related (translation equivalent) or unrelated prime in the L1, Japanese. The results showed that the amplitudes of the N250 and N400 components were modulated when both the prime and the target were visually presented. In contrast, when the L1 visual prime was followed by the auditory L2 target, cross-language priming was reflected only in the N400 component. Implications for models of bilingual word recognition, particularly for the way in which the lexical codes of different script languages interact, will be discussed.

Shared Verbosepatial and Visuospatial Representations for Bilinguals’ Primary Language, KIM-PHUONG L. VU, California State University, Long Beach, ROBERT W. PROCTOR, Purdue University, & KATSUMI MINAKATA & THUAN K. NGO, California State University, Long Beach—Notebaert et al. (2007) showed that, with bilingual Dutch and French participants, incompatible visuospatial mappings influenced performance on an intermixed spatial Simon task only when the stimuli were in the first language of the participants. The sharing of visuospatial and visuospatial associations observed for the first language could have been due to all the participants being native Dutch speakers who learned French later in school. Our study tested bilingual participants who learned Spanish as their first language but grew up in the United States, where English became their primary language. Although the bilingual participants were slower at responding with incompatibly mapped Spanish words than were monolingual English controls, the incompatible mapping intruded on performance of the Simon task when the words were printed in English, but not when printed in Spanish. Thus, the common representation of visuospatial and visuospatial information occurs through experience with a language and not by first exposure to a language.

Lexical Representation Influences Language–Cognition Interactions in Bilinguals, HENRIKE K. BLUMENFELD, San Diego State University, & VIORICA MARIAN, Northwestern University—Letter fluency (e.g., “name words that start with the letter A”) and category fluency (e.g., “name words that are animals”) assess cognitive function relative to language knowledge. In bilinguals, such language–cognition interactions may change with linguistic experience. The present study focused on the language–cognition interface by examining letter and category fluency in bilinguals. As was expected, in their native language (English), monolinguals and bilinguals (N = 60) named more category than letter tokens. In their second language (Spanish), bilinguals named an equal number of category and letter tokens. To identify the role of lexical representation strength in language differences, responses were split into cognates and noncognates. For cognates, both groups made more category than letter responses. For noncognates, bilinguals made more letter than category responses preceded by a cognate trigger word or a control word. These findings suggest that differences between bilinguals’ two languages in language–cognition interactions are due to lexical representation strength, with cognitive retrieval mechanisms compensating for weak representations.
(5001) The Influence of Parafoveal Word n-1 Visibility on Word n+1 Recognition During Reading. CHIN-AN WANG, National Yang-Ming University, & ALBRECHT INHOFF, BRADLEY SEYMOUR, & MATTHEW SOLOMON, Binghamton University—Eye movements were recorded while participants read one-line sentences. Each sentence contained a critical three-word sequence with a pretarget (three-letter), target, and posttarget word. The parafoveal preview of the pre- and post-target words was manipulated so that it was either fully visible or masked until the eyes moved to the right of the blank space preceding the corresponding word. Eye movements during posttarget reading indicated that the size of the preview benefit was modulated by the prior preview of the pretarget word. The effect of a pretarget word preview on the usefulness of a posttarget preview is difficult to reconcile with the assumption that attention is confined to one word at a time and progresses to the next word only after a word has been fully recognized.

(5002) Effects of Central Fixation Target Offset on Peripheral Letter Recognition Performance. LYNN HUESTEYEGGE & IRING KOCH, RWTH Aachen—Temporal gaps between the offset of a central fixation target and the onset of an eccentric target typically lead to reduced saccade latencies (Saslow, 1967). However, it is unknown whether temporal gaps also modulate recognition performance. In Experiment 1, subjects were asked both to execute saccades to briefly presented peripheral target letters and to report letter identity. Crucially, the central fixation target either remained visible throughout the trial (overlap) or disappeared 200 msec before letter onset (gap). In Experiments 2 and 3, subjects were either instructed to identify the target letters only or to perform goal-directed saccades only. The results demonstrated that letter recognition performance was enhanced in gap conditions, irrespective of concurrent oculomotor demands. These findings strengthen the claims of the premotor theory of attention (Rizzolatti et al., 1987), which postulates a close coupling between the preparation of goal-directed saccades and shifts of visual attention.

(5003) Language Interferes With Attentional Control of Smooth Pursuit Eye Movements. XIERONG L IU & GERRY T. M. ALTMAN, University of York—We investigated whether verbs whose meanings implied directionality would affect smooth pursuit eye movements. Participants tracked a dot moving smoothly in one of two directions, upward or downward. Verbs denoting upward or downward motion (e.g., “rise” and “sink”) were presented auditorily during the task. Eye velocity was systematically modified by an interaction between the directionality implied by the language (up or down) and the location of the eyes relative to the pursuit target (ahead or behind). We propose that eye velocity was sensitive to the conflicts created when the language directed attention in one direction but the pursuit target required attention in the other (hence, the interaction with the location of the eye relative to the target). These results demonstrate that low-level oculomotor control can be influenced by higher cognitive functioning, such as language comprehension, even when the content of the cognitive function is irrelevant to the oculomotor task.

(5004) Eye Movements During Categorical and Metric Visuospatial Relation Judgments. KATIE L. MEADMORE & ITIEL E. DROR, University of Southampton, ROMOLA S. BUCKS, University of Western Australia, & SIMON P. LIVERSEDGE, University of Southampton (sponsored by Simon P. Liversedge)—The goal of the present research was to investigate whether eye movements would reflect different underlying cognitive processes associated with categorical and metric visuospatial judgments. Ten participants made three discrete judgments regarding the position of a dot in relation to a bar: an above/below judgment (categorical task), a near/far judgment (old metric task), and a distance estimate (new metric task). The eye movement data were similar for the categorical and old metric tasks (usually argued to engage different processes), but different for the new metric task. The data suggest that the categorical and old metric tasks require fast, reflexive (probably pattern recognition) processes, whereas precise distance computation, which is comparatively cognitively demanding, is required for the new metric task. We conclude that categorical and metric judgments employ qualitatively distinct visuospatial cognitive processes only when metric judgments require precise distance measurements (new metric), not when distances can be categorized (old metric).

(5005) Impact of Visual Mental Action Verbs on Eye Movements in a Size-Discrimination Task. JOEL D. DICKINSON & ANNIE ROY-CHARLAND, Laurentian University—The presence of considerable numbers of visual action verbs implies that they represent an important aspect of cognition and behavior. Many words that represent mental actions do not have obvious behavioral outputs (e.g., “see” and “perceive”). Behavioral outputs of these words have been examined in order to more fully understand the actions associated with them (e.g., the impact of embedding different mental action verbs within instructions to response tasks). We examined response time, criteria, sensitivity, and accuracy differences. Effects of instruction were significant for response times, but not for criterion, sensitivity, or accuracy. The present research further explored what happens during the extra time it takes to perform certain mental action verbs. Participants completed a size discrimination task under four different instructions. We hypothesized that they made extra “comparisons,” but with no improvement on performance. The number of comparisons made during the task was evaluated using eyetracking equipment.

(5006) An Anti-Hick’s Effect for Saccades, but Not for Reaches, in a Visually Guided Saccade and Reach Task. BONNIE M. LAWRENCE & ANDREW GARDELLA, Case Western Reserve University—Hick’s law states that reaction time (RT) increases as the number of response alternatives increases. Previously we showed, at least under certain conditions, that saccades are characterized by an anti-Hick’s effect—that is, a decrease in RTs with an increase in response alternatives (Lawrence et al., 2008). In the present study, we examined whether the reach system is characterized by this anti-Hick’s effect. We found, in a visually guided saccade and reaching task, that saccade RTs decreased with an increase in response alternatives, consistent with the anti-Hick’s effect, but reach RTs increased with an increase in response alternatives, consistent with the Hick’s effect. These results place an important constraint on the anti-Hick’s effect, suggesting that it is a characteristic of the saccade system but not of the reach system, possibly occurring at the level of the superior colliculus.

(5007) Audiovisual Interactions: The Impact of Visual Information on Music Cognition. MARILYN G. BOLTZ, Haverford College—Previous studies have demonstrated that musical soundtracks can influence the cognitive processing of film information. The purpose of the present research was to investigate the reverse relationship and whether visual information influences the perception and memory of music. In Experiment 1, listeners were presented with a set of affectively ambiguous tunes paired with visual displays varying in their affect (positive, negative) and format (video, montage or, as a control condition, with no visual information at all. Immediately after each, participants were asked to evaluate different acoustical characteristics of the melody. The results showed that both the affect and format of visual information differentially influence the way a melody is perceived, and more so for the temporal (vs. pitch) dimensions of music. Experiment 2 further revealed that the affect of visual displays can distort melody recognition in a mood-congruent fashion. These findings are discussed in terms of their theoretical implications for audiovisual processing.
Auditory, Visual, and Audiovisual Apparent Motion at Different Locations in Space. THOMAS Z. STRYBEL & ANDREA S. ROTTERMANN, California State University, Long Beach—Previously, Strybel and Vatakis (2004) showed differences in audiovisual motion integration between central (0°) and peripheral (8° right) locations. In the present investigation, we compared audiovisual motion integration at 0° and ±12°, to the left and right of fixation. Auditory and visual types of apparent motion were presented first unimodally and then bimodally. In bimodal conditions, visual and auditory moving targets were presented with cross-modal distractors moving either in the same or in opposite directions. For unimodal conditions, the percentage of correct direction reports was affected by midpoint in the auditory modality only; accuracy was lower in the left visual field as compared with the central and right fields. For bimodal conditions, moving visual distractors captured auditory motion direction at all midpoints, although they did not affect perception of motion per se. Moving auditory distractors did not affect visual motion direction judgments but did affect the percentage of visual motion reports.

Effects of Visuospatial Cues on Temporal Order Identification of Sound Sequences. KAZUHIKO YOKOSAWA & NAOKO SATO, University of Tokyo, & TAKAYUKI KA WASHIMA, Teikyo-Heisei University—We conducted experiments with temporal sound order identification using sequences comprising four distinct sounds. The set of four sounds were repeatedly presented and varied in both the location of the source of each sound and whether or not the sounds were presented with synchronized flashes. Individual sounds emanated from either one single spatial location, four fixed locations, or four floating locations variously associated. When the flashes were always presented at the same location as the sounds, the presence of flashes improved identification only in the fixed location condition. When there was spatial discrepancy between the sounds and the flashes, the visual enhancing effect significantly decreased. These results indicate that location information provides an extra visuospatial cue about sound order if location is correlated with sound identity.

The Influence of Perceptual Characteristics on Auditory Redundancy Gains. HANNES SCHRÖTER, University of Tübingen, LUISA S. FREI, University of Glasgow, ROLF ULRICH, University of Tübingen, & JEFF MILLER, University of Ottawa (sponsored by Hartmut Leuthold)—A recent study (Fischer & Miller, 2008) provided evidence of a larger redundant-signals effect (RSE) for responses to onsets than to offsets of visual stimuli. This result suggests that perceptual characteristics can influence the RSE. The present study assessed redundancy gains for responses to onsets and offsets of auditory stimuli. In contrast to responses to visual stimuli, a larger redundancy gain was observed for responses to auditory offsets than to auditory onsets, providing further evidence of an influence of perceptual characteristics on the RSE. Furthermore, the results suggest that visual and auditory redundancy gains are differentially affected by stimulus on- and offsets.

Cross-Modal Enhancement of Auditory Sensitivity: The Ventriloquist Effect Produces Spatial Release From Masking. YOAV ARIEH & JACK A. LATONA, Montclair State University—Spatial release from masking (SRM) refers to the improvement in detection of auditory targets when they are spatially separated from a masking noise, relative to the case in which they are co-located. We used a variant of the ventriloquist paradigm to show that a similar improvement, albeit smaller in magnitude, can be obtained by using visual cues to displace the target relative to the masker. Listeners detected targets that were either co-located with continuous masking noise (masked condition) or separated by 32°, while a visual cue flashed on the same side as the target or on the opposite side of the target. In the masked condition, we found a significant improvement in sensitivity (d′) but no change in criterion (β) when the visual cue was flashed on the opposite side of the targets. We conclude that the visual cues displaced the apparent location of the target away from the masking noise, thereby creating cross-modal SRM.

Vection Depends on Body Orientation: Role of Vestibular Inputs. ATSUKI HIGASHIYAMA, Ritsumeikan University—This study investigated how body orientation affects proprioceptively and visually perceived movements. The 36 participants observed for 30 sec a random-dot-pattern disk rotating in the frontal plane with the body upright or prone, and after this observation, they judged the perceived velocity of the disk and of self-movement induced by the disk—that is,vection. The results showed that vection was slower with the body upright than with the body prone. This may be explained by suppression of vection by vestibular inputs that are most effective with the head upright (see, e.g., Young, 1996). In addition, the perceived velocity of a disk rotating at 15°–60°/sec was not affected by body orientation, but a disk rotating at 45°–180°/sec appeared to move more slowly with the body upright than with the body prone. This suggests that participants judged slow velocity with respect to the visual surround and fast velocity with respect to the body perceived in motion.

Feature Integration Across Taction, Audition, Vision, and Action Planning: Evidence for Intermodal Event Files. SHARON ZMIG-ROD & BERNHARD HOMMEL, Leiden Institute for Brain and Cognition (sponsored by Bernhard Hommel)—Understanding how the human brain integrates features of perceived events calls for the examination of binding processes within and across different modalities and domains. Recent studies of feature-repetition effects have demonstrated interactions between features in visual and in auditory perception, and between perception and action. These findings suggest that co-occurring features are spontaneously bound into temporary event files, which commonly also include the accompanying action. The present study tested whether intermodal integration produces comparable effects, by combining visual, auditory, and vibrotactile features with manual actions. The same types of interactions occurred as in unimodal studies, but the size of the interactions varied with the particular modality combination; this suggests that the salience of features and the temporal overlap between feature-code activations play mediating roles.

Effects of Sensorimotor Integration on Auditory Memory for Music. RACHEL M. BROWN & CAROLINE PALMER, McGill University—Sensorimotor integration tasks such as speaking and performing music create a coupling of movement with auditory feedback; we tested how this coupling affects subsequent auditory memory. Pianists practiced melodies in four learning conditions: auditory-only (listening only), motor-only (performing without auditory feedback), coupled auditory—motor (listening and performing), and uncoupled auditory—motor (performing while hearing a computer-generated recording). Pianists heard computer-generated recordings of the melodies at test and completed auditory and motor imagery tests. High auditory-imagery scorers had better memory for melodies from the motor-only condition, and high motor-imagery scorers had better memory for melodies from the auditory-only condition. Both groups of high scorers had worse memory for music from the uncoupled auditory–motor condition, presumably because of a change in the coupling of auditory and motor information from learning to test. Both the coupling of musical action and sound during learning and individual imagery abilities influenced memory for music.

Effects of Auditory and Motor Feedback on Musical Synchronization. JANEEN D. LOEHR & CAROLINE PALMER, McGill University (sponsored by Caroline Palmer)—Synchronization of actions with auditory events may be enhanced by auditory feedback or by movement-related (kinematic) feedback. We address whether musicians’ temporal synchronization abilities are affected by the presence of auditory feedback and movement-related feedback. Seventeen pianists performed melodies with a metronome. Auditory and motor forms of feedback were manipulated within melodies, so that every other tone was produced with auditory and motor feedback present (normal conditions), movement only (auditory feedback removed), auditory feedback only (computer-produced tones), or neither (empty interval). Temporal...
synchronization was affected mostly by auditory feedback, but also by movement feedback. Finger motion trajectories showed the reverse pattern. Movement feedback altered the trajectories of upcoming tones, but auditory feedback had little impact. Thus, auditory and motor feedback both influence temporal synchronization performance; auditory feedback has greater impact on timing accuracy than does motor feedback, and motor feedback changes the motion with which upcoming tones are produced.

**Embodyed Cognition**

(5016) When You and I Share Perspectives: Pronouns Modulate Perspective-Taking During Narrative Comprehension. TAD T. BRUNYEE, U.S. Army NSRDEC and Tufts University; TALI DITMAN, Massachusetts General Hospital and Tufts University; CAROLINE R. MAHONEY, U.S. Army NSRDEC and Tufts University; JASON S. AUGUSTYN, U.S. Army NSRDEC; & HOLLY A. TAYLOR, Tufts University—Readers perform mental simulations of the objects and events described in narratives. One common assumption is that readers mentally embody an actor's perspective; alternatively, readers might mentally simulate events from an external "onlooker" perspective. Two experiments examined the role of pronouns in modulating a reader's adopted perspective of simple event sentences. Experiment 1 demonstrated that readers are likely to embody an actor's perspective when the pronoun "you" or "I" is used, but they take an external perspective when "he" is used. Experiment 2, however, found that a short discourse context preceding the event sentence led readers to adopt an external perspective with the pronoun "I." These experiments demonstrated that pronoun variation and discourse context mediate the degree of embodiment experienced during narrative comprehension: In all cases, readers mentally simulate objects and events, but they only embody an actor's perspective when directly addressed as the subject of a sentence.

(5017) Can the Body–Object Interaction Effect Be Observed in Tasks Requiring Verbal Responses? PAUL D. SIAKALUK, MICHELE WELLISBY, & WILLIAM J. OWEN, University of Northern British Columbia, & PENNY N. PEXMAN, University of Calgary—Body–object interaction (BOI) is a variable that measures people's perceptions of the ease with which a human body can physically interact with a word's referent. In previous studies, we observed facilitatory BOI effects in lexical decision, phonological lexical decision, and semantic categorization (SC) tasks. An important commonality between these tasks is that they all require buttonpress responses. As such, BOI effects may be due to priming of manual responses, rather than activation of stored motor information. To address this question, we observed facilitatory BOI effects in naming and verbal SC (is the word easily imageable?). These results support the inference that stored motor information is indeed an important component of lexical conceptual knowledge.

(5018) Manipulating Words in the Brain: Neuroimaging and Behavioral Studies on Object Word Processing. SHIRLEY-ANN RUESCHEMEYER, DAAN VAN ROOIJ, & HAROLD BEKKERING, Radboud University Nijmegen—Recent research has indicated that language processing relies on brain areas dedicated to perception and action. For example, processing words denoting manipulable objects activates a fronto-parietal network involved in actual tool use. We investigated in two experiments (one fMRI and one behavioral) whether a distinction can be made between words denoting different types of manipulable objects: (1) objects that can be picked up to move (e.g., manipulable objects [MO]: bookend, clock), and (2) objects that must be picked up to use (e.g., functionally manipulable objects [FM]: cup, pen). The results of the neuroimaging experiment indicated that FM words elicit greater levels of activation in the fronto-parietal motor areas than do MO words. The results of the behavioral experiment indicated that only processing of FM words is affected by simultaneous execution of an arbitrary motor task. The results provide a refinement to embodied theories of language processing.

(5019) The Influence of Motor Resonance on Language Comprehension. MARK A. CASTEEL, Pennsylvania State University—Recent research has suggested that many aspects of cognition are grounded in the perceptual experiences of the individual, an approach termed embodied cognition. Although research has shown that reading comprehension often produces a mental simulation of the described actions, less is known about how (and whether) motor activation influences reading comprehension. The present research therefore examined whether the intention to perform an action associated with an object facilitates comprehension of a passage involving a similar motor response. Participants were given common objects with stereotypical motor patterns and prepared to act out those typical responses. Participants then read a passage about another object that required either similar or competing motor behaviors and then acted out the original behavior. Reading times to the passages (and particularly the verbs) were measured to see whether motor resonance facilitated language comprehension. The results will help to delineate the influence of motor resonance on language comprehension.

(5020) Language, Gesture, Action! A Test of the Gesture As Simulated Action Framework. AUTUMN B. HOSTETTER, University of Wisconsin, Madison, and Kalamazoo College, & MARTHA W. ALIBALLI, University of Wisconsin, Madison (sponsored by Arthur M. Glenberg)—The “gesture as simulated action” (GSA) framework (Hostetter & Alibali, 2008) holds that representational gestures arise when actions are simulated as part of thinking and speaking. Accordingly, speakers should gesture more when describing images that they have specific physical experience with than when describing images that are less closely tied to actions. Study 1 supported this hypothesis by showing that speakers produced more representational gestures when describing patterns they had physically made rather than only viewed. Study 2 ruled out the possibility that speakers gesture more whenever they have been primed to move. Taken together, these studies support the central claim of the GSA framework by suggesting that speakers gesture when they express thoughts that involve simulations of actions.

(5021) Does Power Shift One's Attention on a Vertical Dimension? An ERP Study. KIKI ZANOLIE, SASKIA VAN DANTZIG, & INGE BOOT, Erasmus University Rotterdam, JASPER WIJNEN, University of Amsterdam, & JAN W. VAN STRIEN & DIANE PECHER, Erasmus University Rotterdam (sponsored by Jan W. Van Strien)—People often use the spatial dimension up–down metaphorically when speaking and thinking of power. Studies have shown that thinking of power automatically activates the “power is up” metaphor. This raises the question of whether power stimuli can induce a shift of attention to the upper or lower visual field. To address this question, ERPs were recorded during a dual task. Participants made power judgments to words denoting powerful or powerless people (e.g., “king” or “servant”) presented centrally. Following each judgment, a target letter was presented in the upper or lower visual field. Preliminary findings from 12 participants showed an enhanced N1 amplitude when the spatial position of the target was congruent with the metaphorical direction of the preceding word (powerful–up, powerless–down). This result suggests that power stimuli induce a spatial shift of attention corresponding to their implied direction, providing further evidence that metaphors play a role in grounding abstract concepts in sensorimotor processing.

(5022) Affect and Horizontal Position. BRYAN D. POOLE, & WILLIAM E. LANGSTON, Middle Tennessee State University—Previous research has shown that metaphors linking affect and vertical positioning influence judgments, but no research has examined the relationship between affect and horizontal positioning. Two studies were designed to test the hypothesis that metaphors linking affect and horizontal positioning may also influence evaluations. In Study 1, participants verbally evaluated...
100 words as being positively or negatively valenced. After each evaluation, a number (4 or 6) appeared on the top or bottom of a screen, and participants responded by pressing the corresponding number. Another group of participants completed the same task, except that the number (2 or 8, this time) appeared on the screen’s left or right side. In Study 2, participants viewed a series of four similarly valenced words and responded to a number (2 or 8) appearing on the screen’s left or right side. These studies reinforced the findings from previous research but indicated no relationship between affect and horizontal positioning.

- ACTION -

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Bimanual Coordination Between Individuals Investigating Task Sharing in a Reaching Task. CHRISTINA JÄGER, ANTJE HOLLÄNDER, & WOLFGANG PRINZ, Max Planck Institute for Human Cognitive and Brain Sciences (sponsored by Wolfgang Prinz)—When people are acting together in close proximity, their tasks and/or movements might influence each other in the overall performance. Recent findings have shown that each participant takes the aspects of a co-acting partner’s task into account as well. This co-representation leads to an impairment of the participant’s own actions, even when different aspects of the tasks are performed. The present study investigated the impact of shared representations on movement preparation. Subjects shared a symbolically cued bimanual reaching task with varying movement amplitudes. Both partial (individual) and shared (joint) conditions were conducted. Reaction times were used as a measure of interference in comparisons of the initiated congruent and incongruent movements. The results provide evidence that knowing which current action is required to be performed by the other agent has an impact on one’s own action planning processes.

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Modulation of Action Selection by Action Effect Anticipation. YUN KYOUNG SHIN & ROBERT W. PROCTOR, Purdue University (sponsored by Kim-Phuong L. Vu)—The ideomotor hypothesis proposes that actions are cognitively represented by their environmental effects. Kunde (2001) further provided evidence that actions are triggered by endogenous activation of the anticipatory image of the action effect. When there is dimensional overlap between a response and the following action effect, the anticipatory process is facilitated by priming the action in a way similar to that of stimulus–response compatibility. The present study replicated Kunde’s results in a simpler version of the manual task and evaluated his model with various behavioral data. In the experiments, subjects responded to either of two stimuli with one of two keypresses, which produced visual action effects. Subjects were faster to respond when the visual effects were compatible with the action and also when the effects were presented immediately after the actions. The size of the stimulus–response compatibility effect was modulated as well by the action effect’s feature.

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Do Response Biases Created by Task Instructions Override Preexisting Response Biases? JAMES D. MILES & ROBERT W. PROCTOR, Purdue University (sponsored by David F. Pick)—Recent research has suggested that the so-called implementation intention strategy for task performance can automatize behavior through task instruction. Whereas most instructions provide a general goal strategy, implementation intention instructions emphasize the link between a specific stimulus and response by means of an “IF . . . THEN” statement. This strategy putatively links an anticipated stimulus and its goal-relevant response and creates a new response bias to the stimulus, overriding any previous biases. Participants performed an auditory Simon task, in which tone pitch was relevant and tone location irrelevant, preceded by either general task instructions or implementation intention instructions. If the implementation intention strategy “rewrites” automatic response biases, the Simon effect (faster responding when stimulus and response locations correspond than when they do not) should be reduced. The results showed that although an implementation intention strategy may improve performance in a characteristically automatic way, it does not override preexisting biases.

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Social Context Modulation of Goal-Directed Action in Autism. EDITA POLJAC, HEIN VAN SCHIE, & HAROLD BEKKERING, Radboud University Nijmegen (sponsored by Dorothee J. Chwilla)—To account for social disabilities in autism, a “broken mirror” theory has been proposed, stating that social disabilities in autism originate from dysfunctions of the mirror neuron system. This study examined the context dependency of the imitation effect (see, e.g., Heyes et al., 2005) in autism. The participants (9 individuals with autism and 9 healthy, IQ-matched controls) were asked to execute a grip (power or precision) cued by the color (green/purple) of a stimulus presented on a screen. The stimulus was a hand making either a power or a precision grip. Each participant executed the colored-hand task following an imitation and a joint action context. The results showed clear context dependency of the imitation effect in autism, indicating that social sensitivity in autism can affect goal-directed behavior. This study illustrates the need for more detailed examination of the “broken mirror” account in autism.

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Analyzing Task Sharing in a Social Dual-Task Context. ROMAN LIEPELT & WOLFGANG PRINZ, Max Planck Institute for Human Cognitive and Brain Sciences—The ability to coordinate actions with other individuals in order to reach common goals (task sharing) is crucial for success both as individuals and in social interactions. Previous studies have shown a spatial compatibility effect in a joint go/no-go task similar to the effect usually observed in a two-choice response time (RT) task (Sebanz, Knoblich, & Prinz, 2003). However, little is known about the cognitive mechanisms underlying task sharing. We present recent evidence from a behavioral study that aimed to test the hypothesis that people share a common action representation when performing a dual task in a social context. We developed a task-sharing version of the psychological refractory period paradigm. We found evidence for a slowing effect on second RTs with decreasing stimulus onset asynchrony when two persons shared two choice-action tasks. The present findings are discussed with regard to current bottleneck theories (Meyer & Kieras, 1997; Pashler & Johnston, 1998) and provide evidence that individuals acting in a social dual-task context form shared action representations.

5028

Impact of Social Setting on Action Planning. ANTJE HOLLÄNDER & WOLFGANG PRINZ, Max Planck Institute for Human Cognitive and Brain Sciences—The common-coding approach claims that perceived events and planned actions share the same representational domain. There is growing evidence that these representations may be shared between oneself and others. The mechanisms of shared representations can be investigated with the task-sharing paradigm, in which two individuals take care of certain aspects of a common task. There is evidence that although no interpersonal coordination is required, the task aspect of the other agent is taken into account as well. The present study investigated the underlying neural mechanisms of co-representation in task sharing. Therefore, the lateralized response potential was used as a measure of relative activation of the participant’s motor cortices. The findings provide evidence that similar neural mechanisms are involved in monitoring one’s own actions and the actions of others.

5029

Intentionality Matters: Boundary Conditions of Task Sharing. SILKE ATMACA, ANTJE HOLLÄNDER, & WOLFGANG PRINZ, Max Planck Institute for Human Cognitive and Brain Sciences—Humans perform most of their actions in a social context. The present study examined the nature of a co-actor in a turn-taking task, in order to determine what environmental conditions elicit or hamper task sharing. Using the flanker paradigm (Eriksen & Eriksen, 1974), pairs of participants performed a go/no-go task in response to target letters arbitrarily linked to two response keys, with each participant being responsible for one key (joint condition). The results of this joint condition differed from those of participants performing the same go/no-go task in isolation (individual condition). Furthermore, we tested whether the co-actor’s actions needed to be intentional for task sharing to occur. We compared a condition in which participants took turns, with a co-actor performing...
intentional actions, with a passive movement condition in which the co-
actor’s finger was pulled down by an automatic key, controlled by the
computer.

(5030) Verb Aspect and the Activation of Agent and Patient Roles in Situ-
ation Models. TODD R. FERRETTI, Wilfrid Laurier University—This
research examined the activation of thematic roles following events de-
scribed as ongoing with imperfective aspect (e.g., was viewing) or as
completed with perfective (served) or perfect aspect (had served). The
subjects generated story completions to fragments that described events
with agent and patient nouns denoted by personal names (e.g., Darrel
was serving Carla . . .) and that were followed by either a causal connective
(so, because) or no connective. The activation of agent and patient
roles was indexed by noting which participant in the event was mentioned
next in the continuations. The results demonstrated that people were less
likely to mention either participant when the events were described as
completed rather than ongoing, and that the influence of verb aspect on
next-mention biases was negligible relative to the causal connectives.
This research contributes to our understanding of how verb aspect influ-
ences the availability of event participants in situation models.

• INHIBITORY PROCESSING: •

(5031) Effects of Face Inversion on Attentional Capture in the Flanker Par-
digm. BETTINA OLK & ANDREA M. GARAY VADO, Jacobs Uni-
versity Bremen—According to the perceptual-load theory of attention,
distractors will be successfully ignored if perceptual load is high. Lavie,
Ro, and Russell (2003) showed that face distractors are an exception, be-
cause they attract attention even under high load. Considering that face
processing is affected by the orientation of the stimuli, we investigated
whether inverting faces would influence attentional capture. Participants
performed a central search task—for instance, they searched for a per-
son’s or an object’s name among nonwords and performed judgments
regarding the name—under high- and low-load conditions. Upright
faces, inverted faces, or objects were presented as irrelevant flankers in
the periphery. Reaction time measurements showed that upright faces
resulted in congruency effects even under high load, and thus always
attracted attention, replicating Lavie et al. (2003). In contrast, inverted
faces were ignored. The findings suggest a link between the mechanisms
of face processing and their attention-capturing power.

(5032) Active Inhibition of Precued Distractor Location. HSUAN-FU
CHAO, Chung Yuan Christian University—It has been demonstrated
that observers can actively inhibit precued distractor words in a Stroop
color-naming task. The present study aimed to investigate whether or not
spatial locations can be actively inhibited as well. In Experiment 1, an
exogenous cue was used to cue the distractor location. Participants were
instructed to respond selectively to the location of the target. Responses
were facilitated when the distractor location was cued. Experiments 2 and 3 replicated Experiment 1 with an endogenous precue. Experiment 4
further demonstrated that the benefit of the distractor location precue
could be observed with a target identification task. These results indicate
that people could achieve attentional control over the precued distractor
location by actively inhibiting it.

(5033) Intertrial Inhibition of Focused Attention in Oddball Search. JUN
I. KAWAHARA, AIST, & ALEJANDRO LLERAS, University of Il-
ninois, Urbana-Champaign—When observers search for a color odd-
bull (e.g., a red diamond among green diamonds), oddball-absent trials
(for which no response is required) affect performance on the following
oddball-present trial (the distractor-previewing effect, or DPE). Specifi-
cally, the distractor color in the oddball-absent trial (e.g., green) delays
responses to a target of that color in the subsequent trial (e.g., a green
target among red distractors), even if observers report a target attribute
unrelated to color. We investigated whether the DPE has an automatic
and preattentive locus or reflects active inhibition of focused attention.

We found that (1) the DPE disappeared when attention was diverted in the
distractor-preview DPE display, and (2) the DPE reversed in a subitizing
task (intertrial facilitation), even though identical displays produced a
DPE in an oddball identification task. These results suggest that the DPE
reflects inhibition in the attentional system, as determined by the current
goals of the observer.

(5034) Lexical Decision Task With Transposed-Letter Nonwords. WILLIAM
STURGILL & SANDRA N. CLARK, Rockhurst University—Analysis
of error patterns from a masked lexical decision task (LDT) using two
types of transposed letter target supported, via inhibition processes, the
assertion that the LDT is strategic. All transposed letter targets featured
internal, adjacent letter transpositions that formed a target that either did
not violate phonological rules, rendering a pronounceable nonword, or
formed a nonword that violated bigram location. Word targets were used
also. Three prime types (related word, unrelated word, or a string of Xs)
were crossed with the three target types. Significant and strong main
effects of target type were found for response times and errors. Subjects
were most likely to produce an error by rejecting pronounceable non-
word targets, suggesting a limited reservoir of inhibition resources that
were largely depleted when inhibiting the expectancy set formed from
the unrelated prime. For related primes, a large priming effect for word
targets was mirrored by significant inhibition in rejecting pronounceable
nonword targets.

(5035) The Generalizability of Inhibitory Deficits in Individuals Who
Ruminate. ANSON J. WHITMER & MARIE T. BANICH, University of
Colorado, Boulder—Research has shown that individuals who tend to
ruminate about dysphoric moods have difficulties with inhibitory
processes in working memory (Joormann, 2006; Whitmer & Banich,
2007). The two goals of the present study were to determine (1) whether
these inhibitory deficits also generalize to long-term memory (LTM) and
(2) whether inhibitory deficits in LTM are associated with other limi-
tative tendencies besides depressive rumination, such as anger rumina-
tion and/or a more general form of rumination. To test inhibitory processes
in LTM, we used a retrieval-induced forgetting paradigm. In this paradigm,
the retrieval of memories causes the inhibition of related memories. A
tendency to depressively ruminate was associated with less inhibition,
suggesting that ruminators’ inhibitory deficits also affect retrieval of in-
formation from LTM. Additionally, tendencies to angrily ruminate and to
ruminate more generally were also associated with impaired inhibition,
suggesting that inhibitory deficits are not specific to individuals with
tendencies to depressively ruminate.

(5036) East–West Differences in Inhibition. XUEZHAO LAN & PRITI
SHAH, University of Michigan, Ann Arbor, AYSECAN BODUROGLU,
Bogazici University, & XUEMIN ZHANG, Beijing Normal Univer-
sity—A number of recent studies have found that Asian preschoolers
outperform Westerners on inhibition tasks. At the same time, however,
it has been hypothesized that East Asians’ holistic cognitive style may
lead to impairments in response inhibition and sequential processing,
relative to Westerners’ cognitive style (Kopecky, Kitayama, & Meyer,
2006; Oyserman & Lee, 2007). Thus, the present study investigated the
influence of culture on response inhibition, interference resolution, and
task switching in East Asian and Western adults. The results from two
experiments revealed that American students consistently outperformed
their East Asian counterparts on task switching and response inhibition.
There were no cultural differences on interference resolution, suggest-
ing that the cultural differences in inhibitory function are specific to
response inhibition and task switching. This study demonstrated that the
East Asian advantage in inhibition in early childhood does not persist
to adulthood.

(5037) Negative Priming in Six-Choice Tasks With Spatially Incompatible
Mappings. LENORE E. READ & ROBERT W. PROCTOR, Purdue
University (sponsored by Robert W. Proctor)—For choice-reaction
tasks with spatially incompatible mappings, an ongoing issue concerns
whether the corresponding response must be inhibited before execution of
the assigned response. Read and Proctor (2004) tested the inhibition
hypothesis for four-choice spatial tasks using a negative priming para-
digm. The results showed evidence of inhibition (slower responses when the
corresponding response on the preceding trial became the required response on the current trial, as compared with when it did not), but only when the mapping did not follow a simple rule. The present study extended this research to six-choice tasks with more complex mappings. We hypothesized that this negative priming effect would decrease with higher mapping complexity, because the balance of mental resources
would be allocated to the transformational rules. The negative priming
effect was absent for the more difficult of the two mappings examined, consistent with the hypothesis that transformation rules take precedence as mappings become increasingly complex.

(5038)
The Role of Inhibitory Control in Creative Problem Solving. BENJAMIN C. STORM, University of Illinois, Chicago, & GENNA M. ANGELLO, ELIZABETH LIGON BJORK, & ROBERT A. BJORK, UCLA—Inhibition plays a critical role in human memory. Information becomes irrelevant and outdated, and without some means of setting aside such information, accessing new and relevant information would become increasingly difficult. This is especially true in the context of retrieval, where the ability to retrieve a target item in memory is impeded by the accessibility of other, nontarget items that are associated with the same retrieval cue. Inhibition is believed to decrease the accessibility of nontarget items, thereby facilitating access to the target item. We present evidence that this type of inhibitory control also plays a role in creative problem solving. In order to make novel and creative associations, competing and irrelevant associations must be inhibited. Employing the Remote Associates Test, we showed that attempting to make a novel association between three cue words can cause the forgetting of other associations related to those cue words.

(5039)
Relating Inhibition Ability to Recovered Memory Reports. LINSEY RAYMAEKERS, Maastricht University, MICHAEL C. ANDERSON, University of St Andrews; HARALD MERKELBACH, Maastricht University, & ELKE GERAERTS, University of St Andrews and Maastricht University (sponsored by Elke Geraerts)—Are people able to recover long forgotten memories of a traumatic event such as childhood sexual abuse (CSA)? Whereas some argue that recovered memories are genuine memories relived in the present, others have argued that recovered memories are false memories due to suggestibility. We hypothesized that recovered memories would be characterized by false memories, and that there would be a positive relationship between inhibitory control and the ability to inhibit false memory associations.

• AUTOMATIC PROCESSING •

(5040)
SNARC-Like Congruency Based on Number Magnitude and Response Duration. ANDREAA KIESEL, University of Würzburg, & ESTHER VIERCK, Mount Sinai School of Medicine (sponsored by Andrea Kiesel)—Recent findings have demonstrated that number magnitude affects the perception of display time (Xuan, Zhang, He, & Chen, 2007). Participants make fewer errors when display time (e.g., short) and magnitude (e.g., small) matched, suggesting an influence of magnitude on time perception. The present experiment aimed to extend these findings by investigating whether number magnitude and time are also connected at the response level. Participants judged the parity of single digits by pressing a response key for either a short or a long duration. Responses were faster when small numbers required short keypresses and large numbers required long keypresses. In addition, overall keypress duration was affected by number magnitude. Our results suggest a connection between number magnitude and time at the levels of response initiation and execution, thus supporting theories outlining a common magnitude system, comprising time, space, and magnitude.

(5041)
The Role of Semantic Content of Spoken Words and the Effect on Serial Recall. JESSICA K. LJUNGBERG, Luleå University of Technology, & ROBERT W. HUGHES, WILLIAM J. MACKEN, & DYLAN M. JONES, Cardiff University (sponsored by Dylan M. Jones)—In an auditory alarm design, we examined whether the semanticity of spoken words (negatively valenced vs. neutral words, nonwords vs. words, or action vs. nonaction words) and their intonation style (“urgent” vs. “calm”) modulate the extent to which words capture attention from a visually presented serial recall task (objective measure), as well as whether these behavioral effects map onto subjective ratings of “perceived urgency” and “attention grabbingness” (subjective measures). Relative to quiet or repeated tone, the infrequent presentation of a spoken word captured attention, as indexed by an impairment of serial recall, but there were no effects of semanticity or intonation. However, action words were rated as more urgent and attention-grabbing than neutral words, which were rated as more urgent and attention-grabbing than nonwords. “Urgent” words were also rated higher in urgency and attention grabbingness than “calm” words, regardless of valence. In conclusion, we argue for a disassociation between subjective and objective measurements.

(5042)
Truly Subliminal Primes Do Not Cause Priming Effects. RICHARD D. MOREY, University of Groningen—In the past 20 years, many researchers have presented evidence that priming effects can be demonstrated even when prime stimulus detection or categorization is at chance. We argue that this evidence has been based on flawed methodology. We mitigate methodological problems by using an extension of the mass-at-chance (MAC; Morey, Rouder, & Speckman, 2008) model. The MAC model is related to item response models, but is tailored for use in psychophysical paradigms in which at-chance performance is possible. Using the MAC model to determine when participants are at chance performance, we found no evidence for subliminal priming in common priming paradigms.

(5043)
A Simon Effect With Appearance and Disappearance of Visual and Auditory Accessory Stimuli. AKIO NISHIMURA, Tohoku University, & KAZUHIKO YOKOSAWA, University of Tokyo—We investigated the effect of appearance/disappearance of visual and auditory accessory stimuli on spatially congruent responses. Participants’ task was to press a right or left key in response to the color of a visual target presented at the center of the display. Visual (Experiment 1) or auditory (Experiment 2) task-irrelevant accessory stimuli appeared or disappeared on the right or the left side. In Experiment 1, responses were faster when the onset or offset of the visual accessory stimulus was spatially congruent with the response. In Experiment 2, responses were again faster when the onset of the auditory accessory stimulus and the response were spatially congruent, whereas responses were slightly slower when the offset of the auditory accessory stimulus and the response were on the same side when they were on the opposite sides. These findings indicate that transient change information is crucial for the visual Simon effect, whereas sustained stimulation is also important for the auditory Simon effect.

(5044)
Memory for Location and Identifying Information Following Introductions. STEVEN P. MEWALDT, KRISTEN L. STOVER, JESSICA L. MOORE, & TENISA L. KOONE, Marshall University—A total of 48 college students (tested in groups of 12) were seated in chairs arranged in a square and given fictitious background information that they used to introduce themselves. The subjects were asked to remember the introductions. In addition, half were asked to remember where each person was sitting. The students were then moved to another location
and seated in a different arrangement. They were asked to recall all of the information presented during the introductions, including the location where each person had been sitting, and to match the information with the correct person. In immediate recall, location was remembered approximately 84% of the time, regardless of the subject’s intention to learn. Names were recalled one-third of the time, and a fact about each individual, two-thirds of the time. In delayed recall (1 week later), the pattern was similar, with an approximately 10% drop in recall for each type of information. Implications for intentional and automatic processing are discussed.

(5045) No Simon Effect Without Redirection of Attention to the Response Location. SIMONA BUETTI & DIRK KERZEL, University of Geneva—In the Simon effect, responses to the color of a stimulus are faster when the location of an irrelevant stimulus corresponds to the response location. It has been hypothesized that orienting of attention toward the irrelevant stimulus contributes to the effect. We recorded eye movements, and participants performed a Simon task with pointing and keypress responses. Initially, no oculomotor constraints were imposed, and a Simon effect was present for both manual responses. Next, overt shifts of attention were manipulated. The subjects had to either make a saccade toward the stimulus or maintain their gaze fixed in the screen center. Whereas a Simon effect was always observed for pointing responses, it disappeared altogether for keypress responses. The analysis of gaze position at the end of the response suggested that for a Simon effect to occur, it is mandatory to redirect attention from the stimulus toward the correct response location in incongruent trials.

(5046) An Investigation of Global and Local Expectancy Using Event-Related Potentials. AMINDA J. O’HARE & CODY WOLCOTT, University of Kansas, & JOSEPH DIEN, University of Louisville (sponsored by Joseph Dien)—It has been noted in past event-related potential (ERP) studies that the P300 component following violations of sequences appears more frontal than the classic P300 seen in oddball paradigms (Jentzsch & Sommer, 2001; Kotchoubey et al., 1997; Squires et al., 1976). We predicted that rather than reflecting a scalp topography shift in the P300, the component seen in the sequence tasks is separate from the P300. Participants (n = 21) completed a visual oddball task and a visual sequence task, with colored circles as stimuli, while ERPs were recorded from a high-density, 128-channel system. In the sequence task, red and green circles appeared equally. The component in response to sequence violations appeared more frontally than the P300 in the oddball task. The difference in these two components seems to reflect the difference between violations of global expectancy in the oddball task and violations of local expectancy in the sequence task.

• LETTER/WORD PROCESSING •

(5047) Distributional Analyses of Priming and Frequency in Lexical Decision: The Role of Individual Differences. MELVIN J. YAP, National University of Singapore, & CHI-SHING TSE & DAVID A. BALOTA, Washington University (sponsored by Janet Duchek)—Frequency and semantic priming effects are among the most robust effects in visual word recognition. These two variables are generally assumed to produce interactive effects in lexical decision performance, with larger priming effects for low-frequency targets. The results from the present study suggest that this assumption is not always valid. In four lexical decision experiments across two universities, we used distributional analyses to examine the joint effects of semantic priming and frequency. The results indicated that the interaction between word frequency and semantic priming was strongly modulated by verbal proficiency. Specifically, additive effects of the two variables were observed in participants with higher reading ability, whereas interactive effects were observed in participants with lower reading ability. It is difficult to reconcile these findings with either an unembellished multiple-stage account or a single-mechanism model without positing a flexible lexical processing system that optimizes performance on the basis of processing efficiency and task demands.

(5048) Relatedness Proportion Effects in Semantic Priming Occur Even for Relatedness Proportions Below .25. PATRICK A. O’CONNOR, University at Albany, KEITH A. HUTCHISON, Montana State University, & JAMES H. NEELY, University at Albany—The relatedness proportion (RP) effect, the typical finding that semantic priming is greater as the proportion of related primes and targets increases from 20 to 80, has been attributed to an increased use of conscious strategies as RP increases. However, researchers often make the potentially invalid inference that priming is entirely automatic when RP = .20. To test this assumption, the present experiment tested RPs of .06 and .20 with prime–target stimulus onset asynchronies of 600 and 1,200 msec and moderately and strongly associated prime–target pairs. RP effects occurred even at these low RPs, suggesting that conscious strategies mediate priming even when RP = .20. The results are discussed in terms of current models of semantic priming.

(5049) Irregular Morphological Priming and Early Morpho-Orthographic Segmentation. DAVID CREPALDI, Royal Holloway, University of London, MAX COLTHEART & LYNDSEY NICKELS, Macquarie Centre for Cognitive Science, & KATHLEEN RASTLE, Royal Holloway, University of London (sponsored by Kathleen Rastle)—New evidence has emerged in recent years suggesting that the recognition of morphologically complex words starts with a rapid morphemic segmentation that is orthographically based (Rastle & Davis, 2008). This evidence appears inconsistent with evidence showing that masked priming of irregular inflections (e.g., stole–steal) does not differ from masked identity priming (Forster et al., 1987) or masked priming of regular inflections (e.g., walked–walk; Meunier et al., 2004). We carried out a masked priming experiment (SOA = 42 msec) with a lexical decision task comparing the facilitation triggered by (1) irregular inflected primes (e.g., dug–dug), (2) orthographically matched but morphologically unrelated primes (dog–dog), and (3) completely unrelated primes (pop–dog). The results showed that irregular inflections facilitate recognition of their stems significantly more than do orthographically matched primes. These data are at odds with the existence of a prelexical, orthographically based morphological stage, unless very early feedback from central, semantically and syntactically based stages of morphological processing is hypothesized.

(5050) Phonological Priming in Hindi and Urdu: A Preliminary Investigation. JYOTSNA VAID & CHAITRA RAO, Texas A&M University, HSIN-CHIN CHEN, National Chung Cheng University, Taiwan, & NARAYANAN SRINIVASAN, University of Allahabad—Hindi and Urdu share a core phonology, lexicon, and syntax but differ markedly in their scripts, with Hindi being relatively more transparent in spelling–sound correspondence than is Urdu. To test the processing implications of this difference, bисcriptal readers of Hindi and Urdu were administered a speeded naming task in which bisyllabic targets per language followed—at short or long SOAs—bisyllabic primes that either were unrelated to the targets or shared the same sound in the first syllable (e.g., mausam/mausqa). Primes were shown in English transliteration, whereas targets were shown in Hindi or Urdu. Regardless of prime relatedness, naming latencies were faster for Hindi than for Urdu targets. Moreover, for low-frequency targets, prime relatedness facilitated word naming of Urdu words, but only at the long SOA. The findings are discussed in terms of how script-related properties may affect routes to lexical access.

(5051) Neighborhood Effects Within a Priming Context. APRIL FUGETT, Marshall University, & UN-SO PARK-DIENER, GREG B. SIMPSON, THOMAS DUERMEIER, & GEORGE KELLAS, University of Kansas—In a semantic priming experiment, the effects of neighborhood characteristics of the prime were examined. Primes varied according to both orthographic and phonological neighborhood size. Orthographic neighborhood size of the prime did not affect target processing. Primes with many phonological neighbors, however, resulted in slower target
processing than did primes with few phonological neighbors, though this difference was restricted to unrelated trials. Semantic priming eliminated any effect of neighborhood size. The results are discussed in terms of global and unit-level activation and word recognition.

(5052)
Masked Priming From Orthographic Neighbors: An Event-Related Potential Investigation. STEPHANIE MASSOL, JONATHAN GRAINER, & STÉPHANE DUFUAU, LPC, CNRS, and Aix-Marseille University, & PHILIP J. HOLCOMB, Tufts University (sponsored by Philip J. Holcomb)—Orthographic priming was examined using the masked priming paradigm combined with event-related potential (ERP) recordings. In Experiment 1, low-frequency target words were primed either by the same word, a high-frequency orthographic neighbor, or an unrelated word. In Experiment 2, effects of high-frequency orthographic neighbor primes were compared with effects of nonword neighbor primes. High-frequency neighbor primes were found to generate a different priming effect in the ERP waveform, as compared with both repetition primes and nonword neighbor primes. This differential priming effect was mostly evident in the P325 (starting at around 300 msec post-target-onset) and N400 components. In these epochs, word neighbor primes produced greater negativities than did unrelated primes, whereas full-repetition primes and nonword neighbor primes produced less negativity than did unrelated primes. The results help locate the influence of high-frequency neighbor primes at the level of computations operating on word-form representations and the mapping of word forms onto meaning.

(5053)
Effects of Unrelated Distractor Frequency in the Visual-World Paradigm. SHIN-YI FANG & JAMES S. MAGNUSON, University of Connecticut (sponsored by Bruno Repp)—In one variant of the visual-world paradigm, subjects hear or see a word and select a corresponding picture. Although most studies in this paradigm examine competition among related items, we examined effects of unrelated distractors. Our subjects saw two unrelated pictures, and 500 msec later, a word appeared at the bottom of the screen. The task was to click the corresponding picture. We used high and low levels of target and distractor frequency. Unsurprisingly, high-frequency targets were selected faster when paired with high-frequency distractors. Surprisingly, there was a trend for low-frequency targets to be selected faster when paired with high-frequency orthographic neighbor primes. The results suggest that the observed deficits in aphasic naming do not require that grammatical category be a stipulated property of language representations. Rather, dissociations between nouns and verbs after damage can be understood as reflecting the learned organization of semantic knowledge in the brain.

(5054)
A Semantic Basis for Grammatical Category Deficits in Aphasia: A Distributed Connectionist Account. CHRISTINE E. WATSON & DAVID C. PLAUT, Carnegie Mellon University (sponsored by David C. Plaut)—The existence of noun- or verb-specific impairments in aphasia has often been used as evidence that grammatical category is an organizing principle of lexical knowledge. However, given the confound between grammatical category and meaning (e.g., typically objects are nouns and actions are verbs), apparent grammatical category deficits may result from damage to semantic information. We show that a distributed connectionist model of semantics can produce grammatical category-specific naming impairments, even in the absence of any explicit representation of grammatical categories, by means of a topographic bias favoring short connections and the differential participation of visual- or action-related knowledge in representing the meanings of nouns and verbs. The results suggest that the observed deficits in aphasic naming do not require that grammatical category be a stipulated property of language representations. Rather, dissociations between nouns and verbs after damage can be understood as reflecting the learned organization of semantic knowledge in the brain.

(5055)
Naming in the Native Language Predicts Foreign Language Proficiency. KATY BORODKIN & MIRIAM FAUST, Bar-Ilan University—Many individuals experience significant difficulties with foreign language (FL) learning. Previous research has suggested that native language (L1) phonological abilities play an important role in FL learning success. We hypothesized that L1 naming ability, which also involves a phonological component, can predict FL proficiency. This hypothesis was studied in 20 good and 25 poor FL learners using the experimental tip-of-the-tongue (TOT) paradigm. The experimental group did not differ from the control group on any of the variables—abstract reasoning (measured by Raven’s Matrices), handedness, reading test, and rapid naming (measured by the RAN test). The TOT experiment yielded the following results: Relative to good FL learners, poor FL learners had significantly fewer correct responses, more true and false TOT responses, and fewer spontaneous resolutions of TOT states. These findings highlight the role of L1 phonological skills, particularly L1 naming ability, in determining FL proficiency.

(5056)
Limits on Phonotactic Learning. JILL A. WARKER, GARY S. DELL, YE XU, & CYNTHIA FISHER, University of Illinois, Urbana-Champaign—Adults can rapidly learn new phonotactic constraints by producing or hearing syllables that follow those constraints. The experiments presented here tested the limits of phonotactic learning using speech errors as an implicit measure of learning. Experiment 1 tested a constraint in which consonant position depended on an extralinguistic factor, the speech rate. Participants were unable to learn this constraint. Experiments 2 and 3 investigated whether phonotactic learning occurs separately in production and perception, or whether phonotactic transfer occurs to production. Participants repeated alternating syllables in which particular consonants were restricted to particular syllable positions. Participants learned the constraints present in the sequences they produced, regardless of whether their partner produced syllables with the same or with opposing constraints. Together, these experiments suggest that the learning of new phonotactic constraints is limited by whether the constraining elements reside in the phonological system and by the modality in which the constraints are experienced.

(5057)
Impact of Working Memory Span on Perspective-Taking in Conversation. CALION B. LOCKRIDGE, Allegheny College, & SUSAN E. BRENNAN, Stony Brook University (sponsored by Susan E. Brennan)—To communicate successfully, speakers must sometimes resolve differences in perspectives with their partners or be able to create entirely new perspectives. How do individual differences in working memory span shape perspective-taking? Students were categorized as high-span or low-span using the operation span test. Then, high-span, low-span, and mixed-span (high–low or low–high) director/matcher pairs matched 18 cards five times in a referential communication task. Prior perspectives were individually varied, having learned the same, different, or no perspective for each card before the matching task. Entrainment on joint perspectives took longer for different than for same initial perspectives; those with no initial perspective took even longer. Pairs with low-span matchers made
Lexical Influences on Speech Articulation: Evidence From Speech Errors. MATTHEW GOLDRICK, H. ROSS BAKER, & MELISSA BAENSE, Northwestern University—A growing body of evidence contradicts the traditional view of speech errors as categorical sound substitutions. For example, [p]s in speech errors (e.g., back–pack) tend to have shorter voice onset times (VOTs) than do correctly produced [p]s. Goldrick and Blumstein (2006) proposed that these phonetic distortions reflect cascading activation. During errors, the target’s phonological representation remains partially active. Cascade from this activation produces a phonetic “trace” of the target’s articulatory properties in the error (e.g., partial activation of target /b/ shortens the VOT of [p] in errors). Since lexical frequency influences the activation of phonological representations (Dell, 1990), this account makes an additional prediction—that phonetic traces should be modulated by word frequency. We tested this prediction by manipulating the frequency of words in tongue twisters. Preliminary analysis of the VOTs suggests that, consistent with the presence of cascading activation, traces are larger for errors on low-versus high-frequency targets.

Priming of Grammatical Class Influences Homophone Substitution Errors. KATHERINE K. WHITE, Centre College, CULLEN B. McWHITE & HEATHER L. HAGLER, College of Charleston, & LISE ABRAMS, University of Florida—Although a word’s grammatical class plays an important role in spoken retrieval, the function of grammatical class in spelling is unknown. This experiment investigated the roles of grammatical class and priming in the production of written homophone substitution errors, which occur when a contextually inappropriate homophone substitutes with its partner (e.g., “size of relief”). Participants typed auditorily presented sentences that included a contextually appropriate homophone that shared its part of speech with its partner or had a different part of speech. Furthermore, each homophone was preceded by an unrelated word or a prime, where primes were orthographically related to the partner (e.g., criticize) and shared or differed from the partner’s part of speech. When homophones shared a part of speech, more errors occurred, and priming increased errors independent of the prime’s part of speech. When homophones did not share a part of speech, more priming occurred following primes that shared the part of speech with the partner.

Semantic Relatedness Among Objects Promotes the Activation of Multiple Phonological Codes During Object Naming. FRANK OPPERMANN, FRAUKE GORGES, & JÖRG D. JESCHENIAT, University of Leipzig, & HERBERT J. SCHRIEFERS, Radboud University Nijmegen (sponsored by Herbert J. Schriefers)—In two picture–word interference experiments, the authors demonstrated that a semantic–categorical relation between a target object and a context object (e.g., a target flute with the context object harp) promotes the phonological activation of the to-be-ignored context object (as indexed by interference from a distractor phonologically related to the context object; e.g., a heart). No such activation was observed if the objects were semantically unrelated. In contrast to recent picture–picture interference experiments, the results provide direct evidence that the amount of phonological activation that a context object receives is dependent on its semantic processing. At a more general level, this observation further supports the notion that the possibility to establish a coherent representation among multiple objects affects the information flow in the conceptual–lexical system during speech planning (cf. Oppermann et al., 2008).

Resolving Bilinguals’ Tip-of-the-Tongue States: Priming Phonology Within and Across Languages. GIOVANNA MORINI, University of Maryland, & LISE ABRAMS, University of Florida (sponsored by Lise Abrams)—Priming of Spanish–English bilinguals’ tip-of-the-tongue (TOT) resolution was investigated in two experiments. Bilinguals saw general-knowledge questions presented in English and attempted retrieval of the corresponding English target words. Following TOT responses, participants heard a list containing a phonologically related prime or an unrelated word. In Experiment 1, the primes were English words containing the target’s first syllable, whereas in Experiment 2 they were Spanish words whose English translations contained the target’s first syllable. Primes shared or did not share the target’s part of speech. Questions were presented again, and bilinguals attempted target retrieval. For English primes, bilinguals exhibited priming of TOT resolution by resolving more TOTs following primes than following unrelated words, but contrary to studies with monolinguals, priming occurred independent of the primes’ parts of speech. A similar pattern occurred for Spanish primes, in which bilinguals demonstrated mediated priming of TOT resolution across languages. These findings offer a new perspective into the processes by which bilinguals process words.

• DISCUSSOR PROCESSING •

I’m Always Sincere: What Is Salient in Sarcasm? GINA M. CAUCCI, ROGER J. KREUZ, & EUGENE H. BUDER, University of Memphis—What are some ways speakers cue sarcastic intent? It has been suggested that tone of voice (e.g., Bryant & Fox Tree, 2000), common ground, facial expression, and (recently) lexical factors (e.g., Utsumi, 2000) can be employed as cues. However, no studies have been conducted to date on how (or whether) these cues are used in naturally produced sarcastic speech. This project examined how speakers can cue their listeners to sarcastic meaning in natural conversational discourse. Participants were provided with tasks designed to elicit sarcastic speech. The sessions were recorded and coded for gestural (e.g., pointing), facial (e.g., smiling), and lexical (e.g., adjectives) cues. Analyses of the audio data revealed significant differences in number of adjectives, adjective/adverb collocations, and pauses. Surprisingly, distinctive bodily and facial cues did not accompany sarcastic utterances. This suggests that social and lexical factors are more important than acoustic or gestural factors.

An Event-Related-Potential Investigation of Pronoun Resolution. TALI DITMAN, Massachusetts General Hospital and Tufts University, PHILLIP J. HOLCOMB, Tufts University, & GINA R. KUPERBERG, Massachusetts General Hospital and Tufts University—The present study investigated the time course for the contributions of lexical features and pragmatic information to the resolution of pronominal anaphors. Event-related potentials were recorded while participants read two-sentence scenarios. The first sentence introduced an antecedent preceded by an indefinite article (“a salad plate”) or a definite article (“the salad plate”). The second sentence included a singular (“it”) or plural (“them”) pronoun to refer to the antecedent. Indefinite articles typically signal a general category of items (e.g., group of salad plates), whereas definite articles signal a specific entity (e.g., a specific salad plate). Thus, although singular pronouns always matched the antecedent in number, pragmatic match was determined by the article preceding the antecedent: Plural pronouns matched antecedents preceded by indefinite articles, and singular pronouns matched antecedents preceded by definite articles. Neural activity demonstrated that lexical features and pragmatic information are quickly used (within 400 msec following pronoun onset) to resolve pronouns.

The Influence of Adjectival Modifiers on the Processing of Anaphoric Dependencies: Evidence From Eye Movements. KRISTIN M. WEINGARTNER, Hofstra University, & LYN FRAZIER, University of Massachusetts, Amherst—In an eye movement experiment, we examined the influence of adjectival modifiers on the processing of anaphoric dependencies, in part to test a main prediction of the information load hypothesis (ILH; Almor, 1999). Assuming that adjectives increase the specificity of the anaphoric noun phrases they modify, then according to the ILH, their presence should lead to a processing penalty under some conditions: that is, when they neither add new information nor assist in identifying the
Pronouns minimize cognitive effort and unnecessary semantic activations. RNs also resulted in greater activation in the medial frontal gyrus, left and more working memory resources and more extensive semantic processing in the parietal lobe (IPL), and supramarginal gyrus, suggesting that RNs require more cognitive resources to be processed than Ns. We used fMRI to investigate the processing of repeated pronouns and referents in discourse. The results from the predictable N-update task show that higher working memory capacity is associated with a shallower slope in object switch cost in older, but not in younger, adults. The results from the unpredictable N-update task show an inverse relationship between working memory capacity and object switch cost when only two objects have to be maintained in working memory.

How Does Experiencing the Generation Advantage Lead to Improved Reading of New Information? JERI L. LITTLE, BENJAMÍN C. STORM, & ELIZABETH LIGON BJORK, UCLA—When, on a test, students experience the memorial benefit of having generated (vs. read) critical items in a passage, they then improve their processing of future to-be-read items—as indicated by the elimination of a generation advantage, but without a cost to the generated items—for a second passage containing both types of items (deWinstanley & Bjork, 2004). This improvement in processing may occur because, during the test, (1) the students realize their superior recall of generated items and (2) their previous use of surrounding contextual information to help generate those items in the original encoding task is now helping them to recall such items on the test. Students thus attend to such contextual information for both types of items on the second passage. We tested this possibility in two experiments by manipulating the amount of contextual information provided by a test following a first passage and obtained results supporting this hypothesis.

Pronouns and the Rules of Engagement. JESSICA LOVE & GAIL MCKOON, Ohio State University (sponsored by Gail McKoon)—In much current research on pronoun resolution, it is assumed that pronouns are always correctly resolved. However, Greene, McKoon, and Ratcliff (1992) found that readers do not always automatically and correctly identify pronouns, even when the referents are unambiguous. For example, in “Mary and John were doing the dishes. John handed knives to Mary and then he picked up a plate,” readers did not automatically identify John as the referent of “he.” In this paper, we revisit those findings. In recognition probe and priming experiments, we manipulated Greene et al.’s stories to discover the circumstances under which a pronoun’s referent is automatically understood. We lengthened the stories from 4 to 8 sentences, without mentioning the referent in the added sentences. This simple manipulation led to automatic and correct resolution. We trace the time course of the referent’s accessibility across sentences and examine the effects of pronoun resolution on later textual representations.

A Matter of Salience: An fMRI Study of Processing Linguistic Reference. JEREMY L. MAY, YEENA A. NAIR, & AMIT ALMOR, University of South Carolina (sponsored by Amit Almor)—Better understanding of the neural circuits that underlie referential processing in discourse can provide important insights about such processing that would be difficult to obtain otherwise. We used fMRI to investigate the processing of repeated name (RN) and pronoun references to previously mentioned salient and nonsalient referents. When the referent was salient, RNs led to greater activations than did pronouns in left middle and superior frontal gyr, inferior parietal lobe (IPL), and supramarginal gyrus, suggesting that RNs require more working memory resources and more extensive semantic processing. RNs also resulted in greater activation in the medial frontal gyrus, left and right cingulate, and right IPL when the referent was salient than when it was not, suggesting that RNs require more executive resources and semantic processing when the referent is salient. These findings indicate that pronouns minimize cognitive effort and unnecessary semantic activations when making repeated reference to salient referents.

Contribution of Strategy Use to Performance on Complex and Simple Span Tasks. HEATHER ROTH & JOHN DUNLOPSKY, Kent State University, & MICHAEL J. KANE, University of North Carolina, Greensboro—Although much research has demonstrated that complex and simple span tasks measure dissociable constructs, Unsworth and Engle (2006, 2007) claimed that both kinds of task measure the same construct when the numbers of items recalled from secondary memory are equated. In the present study, we compared the contribution of strategy use to performance on complex (operation and reading) and simple (letter and word) span tasks. Consistent with Unsworth and Engle’s studies, after equating for items in secondary memory, we found that task performance and task correlations with fluid intelligence were similar for complex and simple span tasks. Counterintuitively, however, rates of normatively effective strategy use were higher in complex than in simple span tasks, and individual differences in strategy use significantly predicted performance in complex, but not simple, span tasks.

Block Span: A New Automated Working Memory Span Task. J. ISAIAY HARBISON, MICHAEL R. DOUGHERTY, & MICHAEL F. BUNTING, University of Maryland, College Park—This presentation introduces a new visual–spatial-based working memory span task (block span) that is automated, easy to administer, and has the potential to be deployed over the Internet. The block span task requires participants to remember the spatial location and serial order of a series of one or more sequences of visually presented blocks appearing in a grid. The results from two studies indicated that individual differences in block span performance are correlated with performance on other measures of cognitive ability, including aspects of Stroop performance and performance on the automated operation-span (A0-span) task. Importantly, better distributional properties were apparent in the block span than in the A0-span task.

Working Memory Loads Do Not Disrupt Selective Attention in Visual Search When Arrays Contain an Attention-Capturing Singleton. HEATHER D. MOTSINGER & DALE DAGENBACH, Wake Forest University—When maintenance of a small number of items in memory (a working memory [WM] load) is interleaved with performance in inefficient visual search, nonspatial WM loads do not impair search efficiency, measured as the steepness of the slope of response times (RTs) across search sets of varying size. Although researchers sometimes observe longer search times under WM-load (as compared with search-alone) conditions, these RT costs are constant across search-set sizes (i.e., increases in the intercept of search), suggesting a type of dual-task or other non-search-related interference. We sought to determine whether these findings held when searches contained an attention-capturing color-singleton distractor. Previously, Lavie and de Fockert (2005) found that WM loads increased RTs only when searches contained a singleton, but they tested size-8 arrays only, whereas the present study varied search-set size (4, 8, and 12 items). For both singleton and nonsingleton searches, we found that WM loads increased the intercept of search but did not affect search slope.
University of New Mexico—sponsored by Eliot Hazeltine—To flexibly connect behavior, current goals and actions must be represented in the brain. It is widely assumed that response selection processes engage working memory (WM) to plan responses. However, this assumption is usually underspecified, and it has received little systematic study. In a series of experiments, we asked subjects to select responses (speeded) for a choice response time (RT) task while holding information in WM. The critical manipulations were the type of information held in WM and the output modality for the choice RT task. Specifically, subjects maintained sequences of tones or color–location bindings in WM while responding to visual words either vocally or manually. Memory capacity for tones was reduced when making vocal responses, but not when making manual responses. The opposite pattern of interference was observed when subjects held color–location bindings. These findings suggest that response selection processes activate information in WM, leading to modality-specific patterns of interference.

Training and Transfer Effects Using a Working Memory Complex Span Task. ALEXANDRA B. MORTON, INGRID R. OLSON, & JASON M. CHEIN, Temple University—sponsored by Nora S. Newcombe—A systematic working memory training regimen was designed to test the malleability of working memory span and to determine whether the benefits of training would transfer to other cognitive skills. The training paradigm involved verbal and spatial versions of an adaptive complex span task designed to promote improvements in control over executive attention. Prior to and following training, participants were assessed on a variety of cognitive skills, including measures of cognitive control, reading comprehension, and fluid intelligence. Those assigned to the training condition completed 20 working memory training sessions over a span of 4 weeks. The results indicated significantly greater improvements in spatial and verbal working memory spans for trained participants, as compared with control participants. In addition, working memory improvements transferred to both cognitive control and reading comprehension measures. We attribute these gains in cognitive functions to the domain-general benefits of our training paradigm.

The Central Executive Modulates the Effects of Cognitive Exhaustion on Insight. SEAN N. VELD & JANET M. GIBSON, Grinnell College—sponsored by Janet M. Gibson—This study investigated the possible moderating role of individual differences on insight problem solving. We examined correlations between scales measuring participants’ ability to achieve cognitive structure (AACS), the need for cognitive structure (NCS), the need for cognition (NFC), and perseverative errors on the Wisconsin Card Sorting Test, a measure of central executive functioning (CEF). More specifically, we attempted to experimentally induce AACS through a cognitive exhaustion task and NCS through time constraint while observing performance on insight problems. We hypothesized that high AACS (no cognitive exhaustion) coupled with low NCS (moderate time constraint) would facilitate the solution of insight problems more than would any other combination of AACS and NCS. Interestingly, we found that individuals with high CEF in the cognitive exhaustion condition solved the most insight problems, whereas high CEF in the no-cognitive-exhaustion condition solved the same number of problems as low-CEF groups.

Memory Enhancement Due to Survival Processing: The Roles of Danger and Usefulness. LISA R. VAN HAVERMAET, DEVON R. WITHERELL, & LEE H. WURM, Wayne State University—sponsored by Lee H. Wurm—Survival processing has been found to produce enhanced incidental memory, as demonstrated by Nairne et al. (2007) and subsequent replications. The survivability rating scenario seems to include aspects of both danger and usefulness, dimensions found to be important in word recognition (e.g., Wurm & Vakoch, 2000). In order to determine whether danger or usefulness is sufficient or whether both are needed to produce memory enhancement, our incidental learning experiment used two new modifications of the standard survivability instruction, designed to separate the effect of danger from that of usefulness. We also included three conditions from Nairne et al. (2007): survivability, pleasantness, and intentional. The survivability instruction produced better performance than either the pleasantness or the intentional instruction, replicating the memory enhancement effect. Survivability and danger instructions produced equivalent memory performance. The usefulness instruction produced marginally better memory than did the standard survivability instruction, and significantly better memory than all other instructions.

Becoming Sensitive to Generation As an Enhancer of Learning. COLIN CLARK, ELIZABETH LIGON BJORK, ALAN D. CASTEL, & NATE KORNELL, UCLA—sponsored by Elizabeth Ligon Bjork—As individuals monitor their own comprehension during learning, they can be insensitive to many conditions of learning—including generation—that enhance long-term retention and transfer. Recently, however, deWinstanley and Bjork (2004) demonstrated that when learners are allowed to experience the benefit of generation during a test of text passages containing both to-be-generated and to-be-read critical items, they appear to become sensitive to the benefit of generation, leading them to develop enhanced encoding strategies for future to-be-read items. In the present research, we explored whether this effect extends to the processing of other materials—specifically, cue–target pairs that differ in relatedness—and found that it does. We also investigated the effect of being asked to generate judgments of learning (JOLs), the effect of making JOLs on the generation effect, and whether, as indexed by JOLs, learners can be made sensitive to the memorial benefit of generating at the time of encoding.

Multiple-Choice Tests Improve Access to Marginal Knowledge. ANDREA N. ESLICK & ELIZABETH J. MARSH, Duke University, & ROBERT A. BJORK & ELIZABETH LIGON BJORK, UCLA—sponsored by Elizabeth J. Marsh—Marginal knowledge refers to knowledge that is not easily accessed on cued-recall tests, but is easily recognized. For example, an individual may struggle to answer the question, “What is the last name of the author of The Call of the Wild?” but will easily select “London” from a list of possible answers. Impressively, a short exposure to the correct answer improves access to marginal knowledge on delayed tests (Berger, Hall, & Bahrick, 1999). Given that tests can be powerful learning devices (Roediger & Karpicke, 2006), our question was whether a multiple-choice test (without feedback) would have a similar effect. The results show that a multiple-choice test (without feedback) improves access to marginal knowledge across several short delays (Experiment 1) and across longer delays as well (Experiment 2).

The More You Know, the More You Remember: Number-of-Features Effects in Free Recall. IAN S. HARGREAVES, PENNY M. PEXMAN, & JEREMY C. JOHNSON, University of Calgary—In a semantic feature listing task, participants list many features for some concepts (e.g., “cougar”) and fewer features for other concepts (e.g., “leopard”). This number-of-features (NoF) variable has been shown to influence word naming, lexical decision, and semantic categorization responses (Pexman et al., 2002, 2003), with facilitated responding for high-NoF words. In the present research, we investigated whether NoF effects can also be observed in a memory task. The results showed more accurate free recall performance for high-NoF words than for low-NoF words (Experiments 1 and 2). The NoF effect in recall was not explained by the fact that high-NoF words tend to have more distinctive features than do low-NoF words (Experiment 3). We suggest that the NoF effect in memory could be due to an encoding advantage for high-NoF words.

The Testing Effect: Intermediate Testing Reduces Forgetting for Topographical Knowledge. DIANE PECHEK, RENÉ ZEELENBERG, & HUIK K. TABBERS, Erasmus University Rotterdam—Long-term retention can be enhanced by intermediate testing, relative to additional study.
The most interesting finding is that the forgetting rate is lower in the test condition than in the additional-study condition. Previous studies of verbal materials in the present studies, we investigated instead whether the testing effect can also be found for geographical materials. Participants studied the map of Africa. Subsequently, half of the countries were presented in intermediate tests, and the other half were presented for additional study. We found slower forgetting with the intermediate tests, even when the final test was different from them. These findings clearly have implications for education.

(5081) How Testing Helps and Hurts Memory: The Role of Proactive and Retroactive Interference. KARL K. SZPUNAR, SEAN H. K. KANG, & KATHLEEN B. McDERMOTT, Washington University, & HENRY L. ROEDIGER III, Washington University—Recent interest in the benefits of retrieval practice on long-term retention—the testing effect—has spawned a considerable amount of research toward understanding the underlying nature of this ubiquitous memory phenomenon. In a series of experiments, we investigated, specifically, the role of testing in a multilist learning paradigm and its relation to proactive and retroactive interference. In general, testing appears to insulate against the buildup of proactive interference (during initial learning) but to facilitate the influence of retroactive interference (at the time of a final test). Although our findings highlight both positive and negative influences of testing, the positive seem to heavily outweigh the negative. As such, our findings have important implications for study strategies.

(5082) The Spacing Effect in Pure Lists: Now You See It, Now It’s Gone. PETER J. L. VERKOEIJEN, Erasmus University Rotterdam, & PETER F. DELANEY, University of North Carolina, Greensboro—A recent study (Delaney & Knowles, 2005) demonstrated, after a 1-min retention interval, a spacing effect in pure lists when a relational encoding strategy—in this case, a story mnemonic—was used during study, but not when arote rehearsal strategy was employed. In the present study, we took this one step further by examining the interaction in pure lists between the spacing effect and study strategy, after a retention interval of either 5 min or 7 days. After a 5-min retention interval, we obtained a spacing effect with a story mnemonic, but not with arote rehearsal strategy. By contrast, after a 7-day retention interval, a spacing effect was found with both the story mnemonic and the rote rehearsal strategy.

(5083) An Auditory Picture superiority Effect for Incidental Versus intentional Memory Task Instructions. ROBERT J. CRUTCHER & BRYAN TAYLOR, University of Dayton—The picture superiority effect (Pavio & Caspo, 1973) is the pattern that visual pictures of objects (e.g., a picture of a house) are remembered better than their corresponding verbal labels (e.g., the word “house”). This effect has been extended to the auditory domain in a series of experiments (Crutcher & Beer, 2006) that showed recorded sounds (e.g., of someone coughing) are recalled better than spoken verbal labels for those sounds (e.g., the word “coughing”). The present study sought to extend these findings by comparing memory for recorded sounds and spoken verbal labels under incidental versus intentional task conditions. Participants were randomly assigned to an incidental or intentional task condition and then heard a series of recorded sounds and spoken verbal labels. The recorded sounds were recalled better than the spoken verbal labels under both types of memory instructions, although the advantage for recorded sounds was greater for the incidental memory task condition.

(5084) Skipping Feedback Can Improve Retention. MATTHEW J. HAYS, NATE KORNELL, ISRAEL GONZALES, & ROBERT A. BJORK, UCLA—Feedback is typically viewed as often essential and always useful. The providing and processing of feedback takes time, however, a commodity learners often find in short supply. The question motivating our research was whether providing feedback can sometimes use up time and resources better spent on other activities. We asked participants to learn a list of English–Swahili word pairs in a fixed amount of time. On each trial, after an initial opportunity to study all the pairs, participants were provided a Swahili word and asked to type the English word (e.g., ndi—friend). After each retrieval attempt, participants—depending on the condition—always got feedback (feedback—friend), could opt to receive or skip feedback, or had feedback provided or skipped via a rule implemented by the computer. Skipping feedback, whether participant or computer induced, improved long-term retention of the to-be-learned pairs, presumably because it saved time for additional retrieval attempts.

(5085) Recognition of Item Details: Evidence for Differential Encoding in Directed Forgetting. AVERY A. RIZIO, MARK A. OAKES, & PENNY L. YEE, Hamilton College—Decreased recall of items to be forgotten (the directed forgetting, or DF, cost) is often explained by inhibition of the memory trace at retrieval rather than inadequate encoding. This model of forgetting is supported by the absence of a DF cost for recognition tests. However, recognition tests for DF costs have exclusively focused on the central information, or gist, of the memory. We believe the inclusion of item details on a recognition test will provide a more sensitive test of whether encoding contributes to the DF cost effect. In the present experiment, we manipulated the visual presentation of words on three dimensions: font, case, and size. A recognition test revealed that to-beforgotten words were more difficult to distinguish from presentationaltered foils than were to-be-remembered words. Rather than a one-dimensional model of forgetting that emphasizes retrieval inhibition, we propose a dual-process model that includes differential encoding.

(5086) Improved Melody Recognition: Feature Binding or Feature Accessibility? W. J. DOWLING, University of Texas, Dallas, & BARBARA TILLMANN, NSCC, CNRS, Université Claude Bernard Lyon 1—We previously found, in a music recognition task (Dowling, Tillmann, & Ayers, 2001), that false alarms to similar (same-contour) lines declined across 15 sec following presentation of a target phrase. We hypothesized that binding the features of musical phrases during encoding was responsible for this improvement—a process that took time and occurred while the listener continued following the music. An alternative hypothesis has been suggested: namely, that over a delay filled with music, the accessibility of contour as a melodic feature declines, whereas the accessibility of precise pitch intervals increases. We used classical minutes (as in our previous paradigm) to test this alternative hypothesis with lures that differed from the targets only in pitch contour, with all other features (rhythm, harmony, phrasing, articulation, and loudness) being kept constant. The alternative hypothesis predicts increased false alarms over time to different-contour lures. The experiment is in progress, and is discussed in terms of these hypotheses.

(5087) Familiarity in Associative Recognition: Influences of Modality and Time. COLLEEN M. PARKS, University of Nevada, Las Vegas, & ANDREW P. YONELINAS, University of California, Davis—Associative recognition is typically thought to rely primarily on recollection, with relatively little contribution from familiarity. However, recent receiver operating characteristic studies and studies of amnesia have indicated that familiarity can support associative recognition under some conditions. In the present study, we examined the contribution of familiarity to associative recognition for stimuli from the same or from different modalities (e.g., fractual—fractal vs. fractual—sound) that were presented either simultaneously or sequentially. Simultaneous presentation resulted in greater familiarity than did sequential presentation, but the difference between the simultaneous and sequential conditions was much greater for different-modality stimuli than for same-modality stimuli. The results indicate that familiarity does support associative recognition under a variety of conditions, but it does not readily support associative recognition of materials from different modalities if they are presented sequentially.

(5088) Exploring the Mental Representation Underlying Familiarity Assessment. STEPHEN C. DOPKINS & JESSE Q. SARGENT, George Washington University—Decreased recall of items to be forgotten (the directed forgetting, or DF, cost) is often explained by inhibition of the memory trace at retrieval rather than inadequate encoding. This model of forgetting is supported by the absence of a DF cost for recognition tests. However, recognition tests for DF costs have exclusively focused on the central information, or gist, of the memory. We believe the inclusion of item details on a recognition test will provide a more sensitive test of whether encoding contributes to the DF cost effect. In the present experiment, we manipulated the visual presentation of words on three dimensions: font, case, and size. A recognition test revealed that to-beforgotten words were more difficult to distinguish from presentationaltered foils than were to-be-remembered words. Rather than a one-dimensional model of forgetting that emphasizes retrieval inhibition, we propose a dual-process model that includes differential encoding.
AFluency Manipulation Affects Recollection but Not Familiarity for Associative Information. EYAL ROSEN & YONATAN GOSHEN-GOTTSTEIN, Tel-Aviv University—Dual-process theories argue that recognition memory is mediated by two retrieval processes, recollection and familiarity. Recollection retrieves contextual information, whereas familiarity entails the feeling that the target item was encountered at study. Although the idea is intuitive, we demonstrate in this study that recollection can be affected by a manipulation designed to affect familiarity. Specifically, participants were presented with word–font pairs at study. At test, two recognition tests were performed, one for single-item information (i.e., words only) and one for associative information (i.e., word–font pairs). In both tests, we manipulated the fluency of processing. In line with the literature, we found that in the single-item test, the fluency manipulation affected familiarity but not recollection. However, in the association test, the fluency manipulation affected recollection but not familiarity. We interpret our findings in terms of an encoding–recollection dependency.

Strength Effects in Recognition Memory: Testing the New Class of Matching Models. JEFFREY J. STARNES, COREY WHITE, & ROGER RATCLIFF, Ohio State University (sponsored by Roger Ratcliff)—Repeating studied items not only increases the hit rate but also decreases the false-alarm rate (FAR). Traditionally, the reduced FAR is thought to reflect a shift to a more conservative retrieval criterion. More recent models, such as REM (Shiffrin & Steyvers, 1997), have predicted reductions in the FAR without changes in the decision criterion. Rather, FAR declines as a result of differentiation, a process that matches the match of nonstudied items to the contents of memory. In our experiments, participants studied lists of words presented once along with words presented either twice or five times. One group completed tests with both repeated and nonrepeated targets, and another group completed separate tests containing only repeated or only nonrepeated targets. The results showed that repetition reduced the FAR only when repeated items appeared at test, suggesting that the FAR decreases as a result of changes in retrieval standards and not of a differentiation process.

Relating Recognition Without Identification and the Déjà Vu Phenomenon. ANTHONY J. RYALS, JASON S. NOMI, & ANNE M. CLEARY, Colorado State University—Many hypotheses of déjà vu regard it as a memory phenomenon, whereby a feeling of familiarity is triggered without recollecting the familiarity’s source (Brown, 2004). One such hypothesis holds that the configuration of elements within a scene can trigger a déjà vu experience if (1) the configuration resembles that of a prior scene in memory and (2) the prior scene that it resembles cannot be recalled. We investigated this “configuration hypothesis” using the “recognition without identification” paradigm. Participants studied pictures of nameable scenes (e.g., a bathroom or airport). The test list contained novel scenes, half of which resembled studied scenes in their configuration. In the absence of cue recall, participants’ familiarity ratings discriminated between test scenes that did and did not resemble studied scenes. Additional experiments revealed a direct relationship between familiarity ratings and reported déjà vu states, and revealed as well that disrupting the configurational relations among elements reduces the recognition-without-identification effect.
during retrieval. In previous work, we demonstrated that participants who exhibit higher temporal contiguity recall more items in standard delayed free recall tasks, whereas individual differences in semantic contiguity do not significantly correlate with recall performance. Here, we ran two free recall experiments in which we manipulated the number and temporal distribution of semantic associations in each list. When trying to remember lists containing semantically related words, participants exhibited a gradual shift from temporal to semantic cueing during the retrieval process. Furthermore, unlike standard free recall of lists with few semantic associates, a decrease in temporal contiguity correlated with increased memory performance. These results suggest extensions to the temporal context model that include a more dynamic retrieval process, whereby semantic versus temporal recall biases fluctuate over time.

(5096)
Depth-of-Processing Effect on Speed of Recollection in Word-Stem Cued Recall. SÉVERINE FAY, LAURENCE TACONNAT, BADIÀA BOUZZAOUI, DAVID CLARYS, & MICHEL ISINGRINI, CeRCA, CNRS, Université François-Rabelais Tours (sponsored by Michel Isingrini)—Using the episodic memory remember/know paradigm, the present experiment investigates response times (RTs) for remember and know responses in a word-stem cued recall task as a function of depth of processing at encoding. Sixteen participants attempted to recall lexically or semantically studied words. The results indicated that RTs to remember responses were faster than those to know responses. Depth of processing also influenced RTs: Remember responses were faster for semantically studied words than for lexically studied words, whereas this effect was not reliable for know responses. These results are inconsistent with dual-process models of memory, which predict that recollection is slower and more effortful than familiarity. Our data demonstrate that the difference in RTs to remember and know responses reflects the time taken to access the memory trace and to make old/new decisions on the basis of the type of information activated at test.

(5097)
Memory: What Is the Real Cause of Correct Retrieval? MARIE POIRIER, City University London, JAMES S. NAIRNE, Purdue University, & CAROLINE MORIN, University of Warwick—This work summarizes several experiments that pitted the predictions of the encoding–retrieval match view against the predictions derived from another proposal: memory as discrimination. In all of the reported experiments, the level of match between the cues present at encoding and those available at retrieval was manipulated while the diagnosticity of the cues was independently varied. A counterintuitive and surprising prediction was supported in every case: that an increase in the encoding–retrieval match can lead to a reduction in recall performance. Conversely, our results suggest that retrieval can be enhanced by reducing the encoding–retrieval match—provided that this reduction entails calling upon cues that better discriminate between the correct recall candidate and competitors. The results are discussed in terms of the implications for the encoding–retrieval match and transfer-appropriate processing views.

(5098)
The Effects of Effort After Meaning on Recall and Metacognition. FRANKLIN M. ZAROMB, Washington University, JEFFREY D. KARPCICKE, Purdue University, & HENRY L. ROEDIGER III, Washington University—One experiment examined free recall and metacognitive judgments of ambiguous sentences studied with and without corresponding cues to facilitate comprehension using Auble and Frank's (1978) paradigm. Sentences were either studied without cues, with cues meaningfully embedded, or with cues following a 10-sec-interval delay, after which point subjects made judgments of comprehension (JCOMPs) or learning (JOLs). Puzzling over the meaning of sentences for several seconds prior to receiving the cue enhanced recall relative to studying sentences without cues or with embedded cues. This memory benefit of effort after meaning was not reflected in the JCOMPs or JOLs. Rather, sentences considered relatively easy to understand with or without disambiguating cues received higher JOLs and contributed to poor overall calibration. Although effort after meaning enhanced recall, subjects were not aware of this mnemonic benefit during learning.

• SKILL ACQUISITION •

(5099)
Forgetting and Potentiation in Automaticity: What Happens to Computational Efficiency Gains After a Delay? NICOLAS J. WILKINS & KATHERINE A. RAWSON, Kent State University (sponsored by Katherine A. Rawson)—Most automaticity research has focused on explaining why the speed with which a task is performed improves with practice. Two general mechanisms that have been proposed to account for the speed-ups observed during practice are computational efficiency gains and a strategy shift from computation to retrieval. With few exceptions (e.g., Rickard, 2007), automaticity research has not systematically explored how delays between practice sessions influence performance speed. For items that shifted to retrieval during practice, Rickard found evidence for some forgetting after a delay, but also for potentiation (faster rate of learning after a delay than in the previous practice session). The present research sought to extend Rickard's findings to conditions in which speed-ups during practice were due to computational efficiency gains rather than to shifts to retrieval. We found evidence of forgetting after a delay, but no evidence for potentiation (the rate of computational efficiency gain was not greater).

(5100)
Mixed Practice Enhances Retention and Judgment-of-Learning Accuracy for Mathematical Skills. KATYA L. LiBLANC & DOMINIC A. SIMON, New Mexico State University—Consistent with verbal and motor domain results, Rohrer and Taylor (2007) found that trial-to-trial mixing of mathematical material during practice enhanced learning when compared with blocked practice. The present study extended these findings by testing the efficacy of mixed versus blocked practice on mathematical procedures for both test performance and judgments of learning (JOLs). Forty-four participants learned to compute the volumes of four solids and had to successfully solve two or eight practice problems presented in a mixed or blocked order. Testing occurred a week later. As predicted, for mixed practice, acquisition performance was inferior, and delayed test performance was superior to that of blocked practice. JOLs were also more accurate under mixed practice, suggesting that learners derived a more realistic appraisal of their learning. Interestingly, the number of correct solutions required in practice did not significantly impact test performance, underscoring the importance of quality rather than quantity of practice.

(5101)
Quantity of Practice Leads to Effector-Dependent Learning in the Serial Reaction Time Task. MARC V. RICHARD & BENJAMIN A. CLEGG, Colorado State University, WILLEM B. VERWEY, University of Twente, & CAROL A. SEGER, Colorado State University—Verwey and Clegg (2005) found effector-dependent learning in the serial reaction time (SRT) task following extended practice. This practice was spread across 2 days—thus, effector-dependent learning could have been tied to quantity of practice or consolidation occurring over time. The present experiment addressed this finding by using two groups, each of which performed four SRT sessions, either spaced within a single day or across consecutive days. The results replicated previous findings that a practiced hand executed a practiced sequence faster than an unpracticed hand. This advantage emerged only after multiple sessions, and occurred for both single- and multiple-day practice. This suggests quantity of practice is the critical factor for effector-dependent learning. Moreover, the multiple-day group showed no evidence of effector-dependent learning on their second session, indicating that the opportunity to consolidate learning was, by itself, insufficient to establish such a representation. Implications for mechanisms of effector-dependent learning are discussed.

(5102)
A New Strategy for Learning Highly Similar Concepts. BREND A. HANNON, University of Texas, San Antonio—In educational settings, students are often expected to learn pairs of concepts, such as fluid intelligence/crystallized intelligence. For many students these concepts are difficult to learn, because they have similar definitions that are easy
to confuse. The challenge of learning these similar, often confused concepts is further complicated by the fact that students are often examined about differences between the concepts. The present study tests the efficacy of a new strategy—called differential + associative processing—for learning highly similar concepts. The results revealed that differential + associative processing is as good as or even better than elaborative verbal rehearsal and that it spontaneous transfers to new contexts.

**(5103)**

**Effects of Training With Added Relevant Responses on RADAR Detection.** MICHAEL D. YOUNG & ALICE F. HÉALY, University of Colorado, Boulder, CLEOTILDE GONZALEZ & VARUN DUTT, Carnegie Mellon University, & LYLE E. BOURNE, JR., University of Colorado, Boulder—Two experiments simulating military RADAR detection addressed the procedural reinstatement principle: That is, performance at test improves when training conditions match test conditions. Training and testing were separated by 1 week. Subjects detected target vehicles occurring among distractor vehicles. There were four RADAR locations and four targets held in memory, which were controlled in Experiment 2 but not Experiment 1. In Experiment 2, subjects were fastest in the upper left corner and for the first of the four targets held in memory, suggesting visual and memory serial scanning. In both experiments, subjects were either required (difficult) or not (easy) to make an additional relevant response to a target, with difficulty separately manipulated in training and testing. Hit rates were lower during difficult than during easy training, but for difficult testing, hit rates were higher when training had been difficult than when it had been easy. These results support the procedural reinstatement principle.

**(5104)**

**Associative Bases of Cognitive Skill Formation.** SERGE V. ONYPER, St. Lawrence University, & JOHN CERELLA & WILLIAM J. HOYER, Syracuse University—The associative basis of skill formation was investigated by presenting a fixed set of artificial-arithmetic problems repeatedly. Participants either learned the stimulus–response pairings as arbitrary paired associates (PA condition) or were taught how to compute the response from the stimulus (SK condition). Participants were trained until answers to all problems were reliably retrieved. Sorting PA responses into “certain” and “uncertain” exposed the source of PA superiority. “Certain” PA responses nearly matched SK retrievals in latency, whereas “uncertain” PA responses were slower. Learning rates for the PA and SK conditions did not differ for fast responses. Thus, PA superiority was due to the occurrence of slow retrievals that did not occur in SK, probably because SK participants computed rather than retrieved when uncertain. Binary-valued acquisition vectors were extracted for each item for each participant (0 = nonretrieval, 1 = retrieval) and fitted to logistic step functions to further clarify the relation between PA and SK.

**(5105)**

**Exploring the Contributions of Declarative and Procedural Training to Performance.** KEITH R. LOHSE & ALICE F. HÉALY, University of Colorado, Boulder—According to the procedural reinstatement principle, procedural training leads to strong retention but limited transfer. By extension, declarative training should lead to poor retention but robust transfer. To test this principle, subjects were trained in one of three conditions (declarative, procedural, or mixed) and were subsequently tested in either the same or in another condition. In the declarative condition, subjects typed the letters of the alphabet backward by threes. In the procedural condition, they typed the same keys following a display that used squares to represent the keyboard, with one square lit at a time. The mixed condition was like the procedural condition, except that the squares included letters. Procedural training was more durable than declarative training. At test in the mixed condition, accuracy was somewhat facilitated by declarative training, whereas response times were facilitated by procedural training. These results provide some initial support for the extension of the procedural reinstatement principle.

**(5106)**

**Statistical Learning of Probabilistic Nonadjacent Dependencies.** ESTHER VAN DEN BOS & MORTEN H. CHRISTIANSEN, Cornell University—Previous studies have indicated that dependencies between nonadjacent elements can be acquired by statistical learning when each element predicts only one other element (deterministic dependencies). The present study investigated statistical learning of probabilistic nonadjacent dependencies, in which each element predicts several other elements with a certain probability, as is more common in natural language. Three artificial language learning experiments compared statistical learning of deterministic and probabilistic nonadjacent dependencies. In Experiment 1, participants listened to sequences of three nonwords containing either deterministic or probabilistic dependencies between the first and last nonwords. Participants exposed to deterministic dependencies subsequently distinguished correct sequences from sequences that violated the nonadjacent dependencies; those exposed to probabilistic dependencies did not. However, when phonological (Experiment 2) and visual cues (Experiment 3) were added, participants learned both kinds of dependencies, suggesting that probabilistic nonadjacent dependencies can be acquired by statistical learning when additional cues highlight the dependencies.

**(5107)**

**The Underadditive-Factor Method.** SANDER. LOS, Vrije Universiteit Amsterdam—In this work, I discuss the prospects of an underadditive-factor method (UFM) that allows the identification of mental processes in a hybrid serial/parallel architecture (Los & Schut, 2008). The UFM draws a distinction between computational processes and a preparatory (or priming) process that influences the processing rate of one of the computational processes. The computational processes are ordered serially, whereas the preparatory process develops in parallel with the computational processes that precede the target process of preparation. This architecture supports an inferential schema that allows the identification and temporal ordering of computational processes. Experimental data validate the assumptions of the UFM and illustrate its application.

- **CATEGORIES AND CONCEPTS**

**(5108)**

**Effects of Linguistic and Nonlinguistic Category Knowledge on Object Processing.** KEVIN J. HOLMES, LAURA L. NAMY, & PHILLIP WOLFF, Emory University—People are faster at discriminating between objects from different linguistic categories than between objects from the same linguistic category, and this effect is lateralized to the right visual field (RVF). This RVF processing bias has been interpreted as evidence that object perception recruits linguistic knowledge localized to the left hemisphere (LH). An alternative explanation is that the effect stems from hemispheric differences in the processing of object categories. Using a training paradigm, we familiarized participants with novel objects arbitrarily grouped into categories learned either with or without labels. On a subsequent visual search task, participants in both training conditions exhibited the RVF effect, whereas participants without training did not. Differences in the time course of the between-category RVF advantage across conditions point to possible processing differences between linguistic and nonlinguistic categories. The findings suggest that category knowledge can affect LH object processing, but that such knowledge need not be linguistic.

**(5109)**

**Search in Semantic Space: Evaluating Models of Category Fluency.** THOMAS HILLS, University of Basel, & MICHAEL N. JONES & PETER M. TODD, Indiana University, Bloomington (sponsored by Linda Smith)—Category fluency (e.g., “name all the animals you can in 1 min”) is a task commonly used to better understand organization in semantic memory (Mandler, 1970). However, development of process models of the search involved in unconstrained category fluency has proved challenging because of a lack of semantic representation for the large variety of objects that subjects produce. We collected transition time data from 140 subjects who performed a fluency task on six categories, producing thousands of unique instances. Using a statistical co-occurrence model as our structural semantic representation (Jones & Mewhort, 2007) we compared various process models of memory search in their fit to the human item-by-item latency data. Pairwise transition
models are outperformed by models that dynamically change over the course of the trial, with subjects appearing to shift from exploitative to exploratory search strategies, indicating a process model sensitive to the structure of semantic memory (cf. Bousfield, 1953).

(5110) The Impact of Extensive Training and Large Categories on Performance in the Dot-Pattern Classification Paradigm. GOU CROIX, Carleton University, GYSLIN GIGUIER, Université du Québec à Montréal, & DENIS COURSEAU & SERGE LARACHELLE, Université de Montréal—Our experiment investigated participants’ performance in the dot-pattern classification paradigm using extensive training and large categories. Participants learned to classify dot-pattern categories containing 3, 9, 81, or 243 medium-level distortions each. They received 2,916 trials of training on 4 consecutive days. Transfer phases were conducted 1 and 8 days later. Category prototypes as well as new low-, medium-, and high-level distortions were presented. Classification accuracy was above 95% across transfer conditions for low- and medium-level distortions and dropped to 82% for high-level distortions. The 1-week delay between testing sessions did not significantly reduce classification accuracy. Response times were similar for prototypes and low- and medium-level distortions, but were faster for high-level distortions when participants trained with large categories, especially after 8 days. These results suggest that prototype enhancement effects fade with extensive practice.

(5111) Concrete to Abstract Representations When Learning a Hierarchy of Categories. JADE GIRARD & SERGE LARACHELLE, Université de Montréal—An experiment was run with the goal of determining which level of a category hierarchy is learned first. A feature overlap factor favored either high-level categories in the high-first condition or low-level categories in the low-first condition. A standard category verification task was administered six times during the learning process. Then, an explicit knowledge test was administered in order to take a closer look at the category representations of participants. Performance was better for low-level categories in both conditions, suggesting that the overlap factor did not determine the first level of abstraction. A closer look at the length and composition of the representations revealed that participants formed high-level representations with the attributes and values defining low-level categories. These results suggest a concrete-to-abstract process in learning hierarchically structured categories.

(5112) Learning, Generalization, and Retention of Haptic Categories. PHAMDD NGUYEN, FERGUSSON, KANAV FERGUSON, SUTHARANKA V PANCHANATHAN, & DONALD HOMA, Arizona State University—How haptic concepts are learned, retained, and generalized to the same or to the visual modality was explored. Objects were three-dimensional bioforms from three categories, with each category represented by a prototype; distortions transformed along two paths that eventually merged into the other prototypes. Subjects viewed or handled the objects on four learning trials in a systematic or a random order, followed by a transfer test given immediately or 1 week later in the same (HH, VV) or the alternate (HV, HV) modality. Learning was enhanced by systematic training, with better performance in the visual than in the haptic modality on both recognition and classification. Haptic concepts were represented by systematic training, with better performance in the visual than in the haptic modality. The 1-week delay between testing sessions did not significantly reduce classification accuracy. Response times were similar for prototypes and low- and medium-level distortions, but were faster for high-level distortions when participants trained with large categories, especially after 8 days. These results suggest that prototype enhancement effects fade with extensive practice.

(5113) Incorporating Causal and Similarity-Based Information in Feature Inference. RACHEL G. STEPHENS, DANIEL J. NAVARRO, & JOHN C. DUNN, University of Adelaide (sponsored by John C. Dunn)—Category-based feature generalizations are affected by similarity relationships between objects and by knowledge of causal relationships between features. However, it is unclear whether people simultaneously consider both relationships. Some recent experiments have suggested that people use only one or the other type of information and that causal knowledge may draw attention away from similarity information. However, other studies have suggested that people do incorporate both relationships. To help resolve these contradictory results, two potentially important differences between the past experimental designs are addressed: (1) whether natural or artificial categories are used and (2) whether the property generalizations under consideration are made within or between basic-level categories. We anticipated that a “combined model” that considers both similarity and causal relationships would best fit participants’ property generalizations when (1) natural categories were used and (2) generalizations were made between categories.

- COGNITION AND EDUCATION -

(5114) Comparing Multiple-Choice and Open-Ended Questions in Memory-Based Reading Comprehension Assessment. YASUHIRO OZURU, University of Illinois, Chicago, STEPHEN BRINER, DePaul University, CHRISTOPHER A. KURBY, Washington University, & DANIELLE S. McNAMARA, University of Memphis—This study examined whether multiple-choice and open-ended versions of the same reading comprehension questions assess different types of learning. Forty-two students read a short psychology passage in order to explain seven preselected sentences of the passage. After reading, participants answered nine open-ended questions and then nine multiple-choice versions of the same comprehension questions on the basis of memory of the passage. Performance on open-ended questions correlated with quality of the explanations for key sentences, not but with topic-relevant knowledge, whereas performance on multiple-choice questions correlated with topic-relevant knowledge, but not with quality of explanations. The study suggests that open-ended question performance is more influenced by depth of processing, whereas multiple-choice question performance is more influenced by preexisting knowledge. The results of this study are discussed in relation to transfer-appropriate processing (Morris, Bransford, & Franks, 1977).

(5115) Student Application of Technology in Learning. JOANNE M. WALSH & SUZANNE BOUSQUET, Kean University—The increasing speed of the availability and dissemination of information has spearheaded the inclusion of technology in pedagogical environments. In an effort to engage and interest students, interactive integrated technological products and applications are being introduced and used in a wide variety of curricula and courses. Although research has been conducted on the purchases, uses, and implementation of technology by higher education institutions, this study examined the issue from the student’s perspective. Today’s students are more likely than the previous generations to utilize advanced features of handheld devices and Web-based services. They naturally look to incorporate these tools into their learning experience. Qualitative and quantitative results are presented in terms of students’ preferences, applications, and usage patterns of technologies that extend the classroom.

(5116) GoCognitive.net—A New Online Center for Teaching Materials. STEFFEN WERNER, University of Idaho—A large number of teaching resources for instruction in cognitive psychology, cognitive neuroscience, and related fields already exist through a myriad of scattered Web pages. These sites are usually designed for an isolated subset of phenomena and are often lacking in pedagogy and integration with other sources. The goal of the GoCognitive Web project (www.gocognitive.net) is the creation of an online center for teaching-related materials in cognitive psychology and cognitive neuroscience that provides teaching resources and also enables experts and novice users to create and add meaningful content. This Web 2.0 approach of content generation is the model for many successful commercial Web sites. Current funding through the Idaho State Board of Education will allow the creation of an initial set of interactive demonstrations, video archives, and other resources linked through a unified framework for the search and navigation of teaching materials. A set of available demonstrations will be presented during the meeting.
(5117) Using Feedback to Correct Mistakes Made on a Multiple-Choice Test. JEFFREY P. LOZITO & ELIZABETH J. MARSH, Duke University, & ELIZABETH LIGON BJORK & ROBERT A. BJORK, UCLA—What is the most effective way for students to correct errors made on multiple-choice (MC) tests? To address this question, participants first answered a series of general knowledge MC questions, receiving no feedback, answer feedback, or partial feedback (i.e., being told only “correct” or “incorrect”). Of particular interest was whether partial feedback would lead to error correction on two final tests, given that partial feedback does not help participants correct errors made on a cue-card test (Pashler et al., 2005). We argue that, unlike with cued recall, learning whether one’s MC selection is correct or incorrect should allow participants to narrow down the possible answers and mark specific competitors as false. Thus, partial feedback should be effective at correcting errors on MC questions.

(5118) Task Reward Structure and Semester Timing Affect GRE Performance. LISA R. GRIMM, ARTHUR B. MARKMAN, & W. TODD MADDOX, University of Texas, Austin—Research has documented GRE test performance decrements for women resulting from the activation of negative task-relevant stereotypes. We suggest that these negative stereotypes produce a situational prevention focus (i.e., sensitivity to losses) that mismatches the gains structure typically used in tasks. We demonstrate that female test-takers perform better on GRE math problems when the reward structure of the test matches their focus (i.e., uses a losses structure), and in fact perform just as well as male test-takers when the test reward structure matches their situational focus (i.e., a gains structure with a promotion focus). Furthermore, we suggest that at the beginning of the semester students are generally promotion focused, whereas at the end of the semester they are generally prevention focused (e.g., worried about not passing classes). We found a three-way interaction of time in semester, gender, and reward structure.

(5119) Exploring the Emotional Carryover Effect in Memory. STEPHEN R. SCHMIDT, Middle Tennessee State University—Anderson, Wais, and Gabrieli (2006) reported that recognition memory for neutral pictures was better when the pictures were followed by emotionally arousing pictures than when they were followed by nonarousing pictures. The researchers concluded that amygdala activation by the arousing stimuli led to enhanced consolidation of recent events. However, numerous studies have demonstrated impaired memory for stimuli preceding and following emotional stimuli. We present several studies that followed the Anderson et al. procedure. Participants rated their emotional response to words in a series of trials. Each trial contained three words: a neutral word, followed by a moderator, followed by another neutral word. Moderator words were taboo, negative emotional, or clothing words. After the rating task, participants performed a recognition test. Taboo words were recognized better than emotional words, which in turn were recognized better than clothing words. However, moderator words had no effect on the likelihood of recognizing the surrounding neutral words.

(5120) Effectiveness of Holistic Mental Model Confrontation in Driving Conceptual Change. SONIYA GADGIL, University of Pittsburgh (sponsored by Timothy J. Nokes)—Students’ flawed mental models of a complex concept can often be corrected during learning by reading a refutation text. Reading successive contradictions from a text provides students an opportunity to revise their individual false beliefs. Strategies such as self-explaining can assist students in building a correct mental model from cumulative revisions of individual false beliefs. In the present experiment, we investigated whether there is a more efficient way to achieve this conceptual change. Students were first shown a high-level diagram aligned with their own flawed mental model, and then asked to contrast it with a diagram aligned with the correct model. This holistic confrontation method was compared with self-explaining the correct diagram. The results showed that although both groups gained significantly from pretest to posttest, the comparison group performed slightly better on conceptual and inference questions. This suggests that holistic mental-model confrontation provides an effective sense-making pathway to conceptual change.

• ANIMAL COGNITION •

(5121) Gestalt Processing Differences in Primates, Children, Adults, and Autistic Children. JULIE J. NEIWORTH, KATIE WHILOCK, JULIA GREENBERG, KRISTEN MILLER, & SHAUN SAWTELL, Carleton College, & JASON WEAVER, University of Minnesota, Twin Cities—Normally developing adults, 3- to 5-year-old children, adult cotton-top tamarins, and autistic children ranging from 5 to 12 years of age were all tested with an odd-item task in which gestalt grouping principles allowed the odd item to “pop out” as compared with items with single feature changes. Differences were found between all four groups, with gestalt processing showing an advantage in recognizing the odd item in 3- to 5-year-old children and adults.

(5122) Pigeons’ Numerosity Discrimination of Target Items Among Distractors. JACKY EMMERTON, Purdue University—Animals’ numerical abilities are often tested by having them respond to relative differences in the total number of items in one stimulus compared with another. This study investigated pigeons’ ability to discriminate numerosities of color-cued target elements in visual arrays when these targets were intermixed with distractor items of a different color. Baseline discrimination with no distractors showed that birds’ performance depended on relative numerosity differences, but not on the target color. They rapidly learned to discriminate relative differences in target numerosities when distractors in a nontarget color were introduced and total number of items in each array was held constant. Discrimination developed more slowly when colors served as either targets or distractors on different trials, so that birds had to attend to an initial cue that defined the target color on that trial. Factors affecting this performance are discussed.

(5123) Same/Different Training With a Small Stimulus Set Produces Both Relational and Item-Specific Learning. CAITLIN ELMORE, ANTHONY A. WRIGHT, & JACQUELINE J. RIVERA, University of Texas Health Science Center, Houston, & JEFFREY S. KATZ, Auburn University (sponsored by Anthony A. Wright)—Pigeons trained in a same/different task with a set of three pictures learned the task in basically different ways. Manipulations of the pairs of training items, color and shape manipulations, and transfers to novel items suggested that two pigeons learned the task by domain-restricted relational learning, whereas a third pigeon learned the task by item-specific learning.

(5124) Competition Between Stimulus- and Category-Specific Attributes in Pigeons’ Categorization of Natural Images. FABIAN A. SOTO & EDWARD A. WASSERMAN, University of Iowa (sponsored by Edward A. Wasserman)—We present a model of natural stimulus categorization and test one of its most important assumptions: namely, that different stimulus attributes compete for control of categorization performance. Pigeons were trained to sort photographs of natural objects according to two rules. In the pseudocategorization task, each photograph was randomly assigned to one of two response keys. In the true categorization task, all members of the same natural category were assigned to the same response key. In a second training phase, the pigeons were presented with two new true categorization tasks involving some of the same stimuli previously presented in Phase 1. A test with novel exemplars from each category showed significantly less transfer of discriminative performance in the condition trained first with a pseudocategorization task, suggesting that exemplar memorization fostered by this task blocked learning of a true open-ended category during the second training phase.