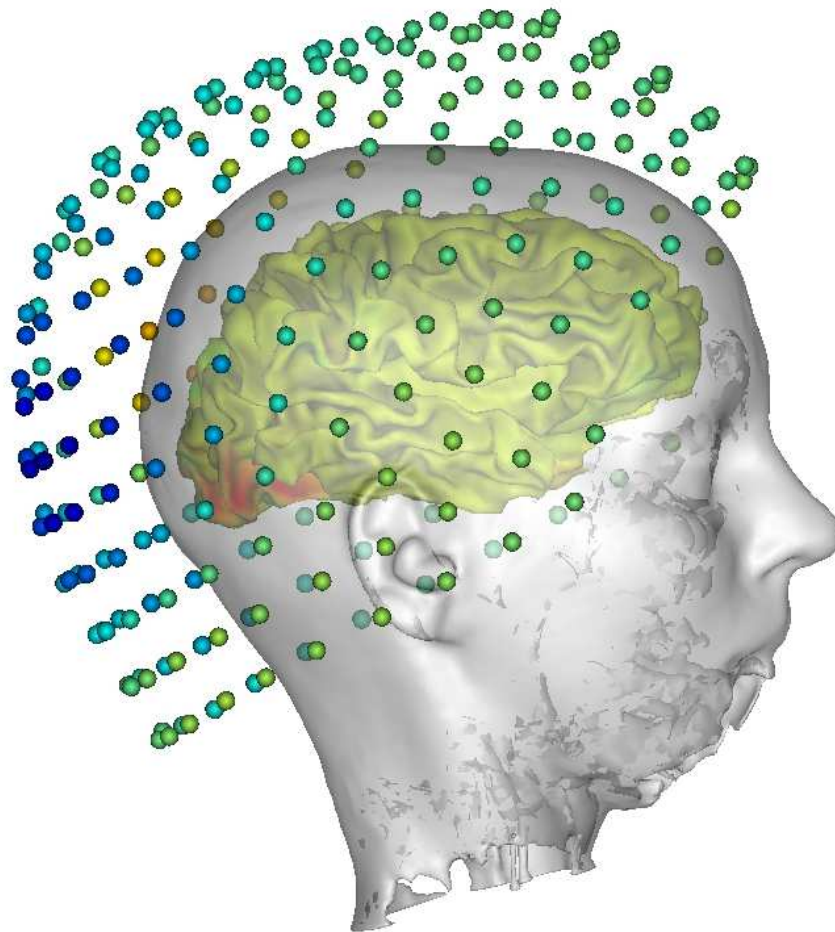


Twelfth Annual Meeting of the Cognitive Science Association for Interdisciplinary Learning

August 10–14, 2006
Hood River Hotel
Hood River, Oregon



Conference Organizers:

Pierre Jolicœur
Bill Prinzmetal
Michael Sullivan

PROGRAM

Thursday August 10 Evening

4:30 Appetizers

4:35 Opening Remarks. Don't be a doofus, by Bill Prinzmetal

4:45-5:25

— POSTERS —

4:45-4:55

Richard Lapointe-Goupil, Josée Bluteau, Claudette Fortin, & Sébastien Tremblay; *École de Psychologie, Université Laval*

Dual-tasking: Effects of interference, facilitation, and shift in decision criteria

5:00-5:10

François Vachon, Sonia Packwood, & Sébastien Tremblay; *École de Psychologie, Université Laval, Canada*

Effects of masking in the attentional blink: A direct comparison between vision and audition

5:15-5:25

Brad Wyble, Howard Bowman, & Patrick Craston; *Computing Laboratory, University of Kent, Canterbury, UK*

In search of sparing: Spatial cueing can be triggered contingently by discrimination of visual form

— TALKS —

5:30-6:10

D. Stephen Lindsay & Justin Kantner; *Department of Psychology, University of Victoria*

Recognition memory test performance with versus without trial-by-trial feedback

6:10-6:50

Jane E. Raymond; *The School of Psychology at the University of Wales, Bangor*

Attentional modulation of emotional responses

6:50-7:30

Kimron Shapiro; *The School of Psychology at the University of Wales, Bangor*

The role of distributed neural processing networks in attention

7:30 Adjourn

Friday August 11 Morning

8:00 Morning Refreshments

— TALKS —

8:30-9:10

Geoffrey F. Woodman & Leanne Boucher; *Department of Psychology, Vanderbilt University*

Eye movements reveal individual differences in strategic interactions between visual working memory and perceptual attention during visual search

9:10-9:50

Robert B. Welch, Merrit Hoover, & Jennifer Sweeton; *NASA Ames Research Center, University of California, Santa Cruz, and Stanford University*

Delayed visual feedback is not “fatal” to prism adaptation

9:50-10:30

George Sperling & Jian Ding; *University of California, Irvine*

How the two eyes combine information: A neurally-plausible mathematical theory and some supporting evidence

10:30 Break till 4:30

Friday August 11 Evening

4:30 Appetizers

4:45-5:25

— POSTERS —

4:45-4:55

Annamarie Bauer Murphy & Michael P. Sullivan; *Portland State University, Oregon Health and Science University, & Portland VA Medical Center*

A dual-task study of phoneme selection in the picture-word interference task: Is competition strategically minimized?

5:00-5:10

Ellen C. Klosternann, Ari Kane, & Arthur P. Shimamura; *Department of Psychology, University of California, Berkeley*

Parietal activation during the successful retrieval of abstract and concrete auditory information

5:15-5:25

Kay Livesay & Phillip Duggins; *Linfield College*

Modeling semantics in high dimensional space

— TALKS —

5:30-6:10

Catherine M. Arrington; *Department of Psychology, Lehigh University*

Choices, choices: Factors influencing task choice in the voluntary task switching paradigm

6:10-6:50

Padmanabhan Sudevan, John Holmes, Megan Golla, Autumn Hensel, & Jennifer Roskopf; *Department of Psychology, University of Wisconsin, Stevens Point*

Effects of priming operations with non-repeating primes

6:50-7:30

Matthew S. Cain & Arthur P. Shimamura; *Department of Psychology, University of California, Berkeley*

Asymmetric task switching effects in the anterior cingulate cortex

7:30-8:10

Susan M. Ravizza, & Cameron S. Carter; *Department of Psychology, Imaging Research Center, University of California, Davis*

Task switching is not a unitary phenomenon: Behavioral and neuroimaging evidence

8:10 Adjourn

Saturday August 12 Morning

8:00 Morning Refreshments — TALKS —

8:30-9:10

Ayelet N. Landau, Michael Esterman, Lynn C. Robertson, Shlomo Bentin, & Bill Prinzmetal; *University of California, Berkeley, and Hebrew University, Jerusalem*
Electrophysiological correlates of voluntary and involuntary attention to faces

9:10-9:50

Steven Yantis, Adam Greenberg, & Daryl Wilson; *Department of Psychology, The Johns Hopkins University*
Domain-independent mechanisms of cognitive control

9:50-10:30

Alexander Stevens & Arun Garg; *Oregon Health & Science University*
What the blind tell us about the mind's eye: Frontal eye fields in the congenitally blind

10:30 Break till 4:30

Saturday August 12 Evening

4:30 Appetizers

4:45-5:25

— POSTERS —

4:45-4:55

Angela Lafratta & Sergio C. Masin; *University of Padua, Italy*

Study of the ability to use information integration rules

5:00-5:10

Carrie Cuttler & Peter Graf; *Department of Psychology, University of British Columbia*

Compulsive checking, prospective memory and distractibility

5:15-5:25

Suzanne Mitchell, Vanessa Wilson, Stacy Legg, & Alexander Stevens; *Oregon Health & Science University*

Modeling risk-taking: Separating the representation of risk from the acceptable risk threshold

— TALKS —

5:30-6:10

David G. Elmes & Kathryn Van Veen; *Department of Psychology, Washington and Lee University*

Enhancing memory in the elderly via false positive feedback

6:10-6:50

Marci A. Flanery & Amy L. Shelton; *Department of Psychological and Brain Sciences, Johns Hopkins University and Department of Neuroscience, Johns Hopkins University*

Examining the relationship between memory strength and ROC analyses

6:50-7:30

Peter Graf; *Department of Psychology, University of British Columbia*

A task-momentum hypothesis of performance on prospective memory tests

7:30

Adjourn

Sunday August 13 Morning

8:00 Morning Refreshments — TALKS —

8:30-9:10

Barbara Luka; *Psychology Program, Bard College*

Long lasting structural priming in language comprehension

9:10-9:50

Meghan Sumner & Arthur Samuel; *Department of Psychology Stony Brook University*

Overcoming perceptual bias in the processing of non-native speech

9:50-10:30

Cyma Van Petten & Pedro Macizo; *University of Arizona and University of Granada*

Semantic access to embedded words in spoken word recognition

10:30 Break till 4:30

Sunday August 13 Evening

4:45-5:25

— POSTERS —

4:45-4:55

Pierre Jolicœur, Nicolas Robitaille, and Kevin Sauvé; *Université de Montréal, Canada; Centre de Recherche en Neuropsychologie et Cognition*

Neural loci and timecourse of encoding and maintenance in visual short-term memory: Evidence from magnetoencephalography

5:00-5:10

Andrew McCollough & Edward Vogel; *Department of Psychology, University of Oregon*

Electrophysiological measures of working memory process

5:15-5:25

Miranda Scolari, Andrew Kohnen, Brian Barton, & Edward Awh; *Department of Psychology, University of Oregon*

Spatial attention, preview, and popout: Can diminished crowding effects be explained by reductions in critical spacing?

— TALKS —

5:30-6:10

Trafton Drew & Edward K. Vogel; *Department of Psychology, University of Oregon*

An electrophysiological measure of multiple object tracking

6:10-6:50

Eric Soetens & Natacha Deroost; *University of Brussels (VUB), Belgium*

Endogenous attention is needed for perceptual sequence learning

6:50-7:30

Richard A. Block; *Montana State University*

Intending to remember information: The effectiveness and speed of attentional allocation

7:30

Adjourn

7:40

— BANQUET —

Monday August 14 Morning

8:00 Morning Refreshments — TALKS —

8:30-9:10

Ed Awh, Brian Barton, & Ed Vogel; *Department of Psychology, University of Oregon*
Visual working memory represents a fixed number of items regardless of complexity

9:10-9:50

Sian L. Beilock; *The University of Chicago*
Expertise and its embodiment

9:50-10:30

Jonathan Smallwood & Jonathan Schooler; *Department of Psychology, University of British Columbia*
The restless mind: Mind wandering as the decoupling of executive process

10:30 Closing remarks

10:31 Adjourn for the year

ABSTRACTS

Alphabetical by first author

Catherine M. Arrington

Department of Psychology, Lehigh University

Choices, choices: Factors influencing task choice in the voluntary task switching paradigm

The voluntary task switching (VTS) paradigm (Arrington & Logan, 2004) introduced a twist to research using task switching to study executive control: choice. Unlike standard task switching paradigms where tasks are determined by the experimenter, in VTS subjects choose which task to perform on every trial, typically under instructions to perform tasks equally often and in a random order. I have previously argued that this procedure places more control with the subject, making it better suited for studying executive control. However, this claim does not rule out the possibility of external influences on task choice. I will report results from a series of experiments examining a range of factors potentially influencing choice, including: time to prepare for the upcoming trial, stimulus availability, relationships among tasks, and the nature of the tasks themselves. The results support a combination of both internal and external factors influencing task choice in multitask environments.

Ed Awh, Brian Barton, & Ed Vogel

Department of Psychology, University of Oregon

Visual working memory represents a fixed number of items regardless of complexity

There has been controversy regarding the basic determinants of capacity in visual working memory. Luck and Vogel (1997) found that about four items could be maintained, independent of the number of features that defined each item. They concluded that capacity in VWM is defined in terms of the number of objects rather than the number of features. However, others have found marked reductions in capacity as object complexity increases (e.g., Alvarez & Cavanaugh, 2004), leading to the suggestion that the total amount of information within each object will constrain the number of items that can be represented. We examined whether the apparent capacity reductions for complex objects were due to increased similarity between items in these categories. In line with this hypothesis, similarity (operationalized by RT in a one-item change detection task), strongly predicted change detection performance across a wide range of object complexity ($r = .95$). Moreover, when sample/test similarity was low, the estimated capacity for even the most complex objects was equivalent to that of the simplest objects ($r = .84$). These data demonstrate that when very complex objects are displayed observers do not represent a smaller number of items in VWM. Instead, they maintain basic information about the same number of items as in a simple color memory task. Thus, although changes between similar items are harder to detect, a fixed number of items are represented in working memory, regardless of object complexity.

Annamarie Bauer Murphy & Michael P. Sullivan

Portland State University, Oregon Health and Science University, & Portland VA Medical Center

A dual-task study of phoneme selection in the picture-word interference task: Is competition strategically minimized?

Recent studies of lexical encoding have begun to explore whether selection at the lemma (lexical-semantic) and lexeme (word form) levels involves a central response selection mechanism. Using a psychological refractory period (PRP) paradigm, Ferreira and Pashler (2002) obtained evidence that selection at the lemma and lexeme levels requires a central response selection mechanism, whereas selection at the phoneme level does not. In the present study, we attempted to obtain converging evidence regarding whether phoneme selection operates independently of a central response selection mechanism. We employed a PRP paradigm and asked participants to first perform a picture-word interference task (T1) to induce competition for phoneme selection. Participants named pictured objects while listening to phonologically related (e.g., coat-comb) or unrelated (log-comb) words. Following either a 50 or 1000 ms SOA, which varied randomly within-subjects, participants then performed a speeded tone discrimination task (T2). According to PRP logic, if a central response selection mechanism is shared between T1 and T2, any slowing of naming latencies in T1 should be reflected in the T2 response latencies. For T1, the results revealed an overall inhibitory priming effect that did not interact with SOA. For T2, an overadditive SOA by prime interaction was obtained, which showed a significant inhibition effect (related minus unrelated) at the 50 ms SOA, but not at the 1000 ms SOA. These results contrast with those of Ferreira and Pashler, and suggest that phoneme selection may normally occur automatically, but can also involve strategic selection.

Sian L. Beilock

The University of Chicago

Expertise and its embodiment

Traditional views of cognitive psychology characterize the mind as an abstract information processor largely divorced from the body and the environment. However, more recent theories of embodied cognition suggest that our ability to represent the objects and events we encounter is subserved by the sensorimotor systems that govern acting on these objects and in the events in question. Although embodied viewpoints have received a significant amount of attention in domains such as language comprehension, little work has examined how such multi-modal representations arise or the types of experiences that support them. In this talk I will present a number of studies that explore how individuals with various levels of motor and visual expertise in sports ranging from ice hockey to football represent everyday and sport-specific objects and actions they read about — even when there is no intention to act. It turns out that not only does cognition drive sensorimotor performance, but sensorimotor experience influences cognition as well.

Richard A. Block
Montana State University

Intending to remember information: The effectiveness and speed of attentional allocation

Is intending to remember information effective or necessary for remembering? How quickly can attentional resources be allocated to enhance remembering? Evidence comes from studies in which previously unfamiliar human face or nonface (ape, bird) stimuli were presented, followed by recognition-memory testing. New findings concerning attention and memory processes are revealed by these studies. Although there are differences between intentional and incidental encoding of face and nonface stimuli, face-encoding processes are not very special or unique. Component processes involved in face encoding are more automatic than are those involved in nonface encoding; however, intentional processes affect both face and nonface encoding. For some kinds of stimuli, the mobilization of attentional resources to encode information for future remembering is effective within 500 ms. Recent cognitive neuroscience research converges on these findings. I review evidence on several issues concerning memory and attention, including the rapid mobilization of attention and its effects on remembering.

Matthew S. Cain & Arthur P. Shimamura
Department of Psychology, University of California, Berkeley

Asymmetric task switching effects in the anterior cingulate cortex

In many experiments trials of different types are intermixed, but some trial types disrupt performance on subsequent trials more than others. To study these effects, participants performed a modified Eriksen flanker task in which a central arrow was flanked by congruent arrows (pointing in the same direction) or by incongruent arrows (pointing in the opposite direction). Two types of tasks were intermixed: participants were asked to respond (1) in the direction indicated by the center arrow when the arrows were blue (pro trials) or (2) in the opposite direction when the arrows were yellow (anti trials). Consistent with previous research, pro trials were significantly faster than anti trials and congruent trials were significantly faster than incongruent trials. We also found a significant asymmetric interaction of trial type and the type of the previous trial. Pro trials showed significant switching costs: Pro trials immediately preceded by anti trials were 33 ms slower than pro trials preceded by pro trials, but anti trials showed only a non-significant 3 ms switching cost. Switching between congruent and incongruent trial types produced no such asymmetry. In an fMRI replication we observed significant anterior cingulate cortex (ACC) activation for both congruent versus incongruent and pro versus anti contrasts. There was also significant ACC activation in switched pro trials compared with repeated pro trials, but no comparable switching activation for anti trials. This correspondence between ACC recruitment and lengthened reaction time demonstrates that the mental slate is not always easily wiped clean between tasks.

Carrie Cuttler & Peter Graf
Department of Psychology, University of British Columbia

Compulsive checking, prospective memory and distractibility

Compulsive checkers become concerned that they failed to perform an important task (eg. lock their front door) and they feel compelled to check to ensure that the task was indeed completed. Our research suggests that these compulsions are a reaction to an impaired prospective memory — the ability to remember to perform future-oriented tasks (eg. locking the front door when you leave). In this study, we explore whether checkers' prospective memory impairment is mediated by distractibility. One hundred and twenty six students completed the Cognitive Failures Questionnaire as well as two questionnaires that measured the perceived frequency of experiencing a variety of everyday-life prospective memory failures. Subjects also completed a laboratory-based prospective memory task which required requesting the return of a personal belonging at the end of a testing session. The tendency to check was positively correlated with failing to complete the prospective memory task and with the self-rated frequency of everyday-life prospective memory failures. Checking was also correlated with distractibility. However, distractibility was not a significant mediator of the relationships between checking and prospective memory.

Trafton Drew & Edward K. Vogel
Department of Psychology, University of Oregon

An electrophysiological measure of multiple object tracking

Numerous studies have shown that we are capable of tracking 4 or 5 moving objects simultaneously. In this study we examined an electrophysiological measure in humans that appears to reflect the tracking of multiple objects “online” during a trial. Subjects were shown a bilateral display of multiple moving objects and were asked to track a subset of objects in a single hemifield. We time-locked the ERPs to the onset of the moving objects and recorded throughout the trial. Approximately 400 ms following the onset of the movement, we observe a sustained negative wave at electrode sites that were contralateral with respect to the hemifield the subject was tracking. This wave persisted throughout the entire trial and its amplitude increased as a function of the number of items the subject was tracking on a given trial (1, 2, or 3 items). Together, these results suggest that this activity reflects a neural mechanism for tracking multiple objects.

David G. Elmes & Kathryn Van Veen
Department of Psychology, Washington and Lee University

Enhancing memory in the elderly via false positive feedback

The socio-cognitive approach to memory (Miller & Lachman, 1999) provided the impetus for a series of experiments concerning the memory performance of college students and elderly participants. The theory suggests that a person's expectations and control beliefs concerning their memory strongly influences performance. Our current work focuses on social factors that may enhance the memory performance of the elderly. The general procedure includes a multi-trial learning task that requires learning the names and employment of a number of faces. In two experiments, half the participants received positive, but false feedback about their initial performance. This false feedback led to a larger enhancement of subsequent performance for the elderly subjects than for the college students. In accord with Miller and Lachman, some of the poor memory evinced by the elderly may arise from a negative self-fulfilling hypothesis.

Marci A. Flanery & Amy L. Shelton
Department of Psychological and Brain Sciences, Johns Hopkins University and Department of Neuroscience, Johns Hopkins University

Examining the relationship between memory strength and ROC analyses

Leading theories of long-term memory differ in their view of whether single or multiple processes support recollection and familiarity. One possibility, generally supported by ROC analyses, is that dual-processes support recollection and familiarity (see Yonelinas, 2002 for review). A second possibility, supported by the relationship between memory strength and functional activation within the hippocampus (Law et al., 2005), is that recollection and familiarity are supported by a single, graded system. However, due to differences in the paradigms used to collect data for these analyses, direct comparisons between ROCs and memory strength have not been made. Therefore, to better understand the relationship between these two measures we tested subjects in an old-new recognition task while collecting data sufficient to perform both a memory strength and an ROC analysis. We compare and contrast the results of these analyses and discuss how they may speak to the two competing theories.

Peter Graf

Department of Psychology, University of British Columbia

A task-momentum hypothesis of performance on prospective memory tests

Prospective memory is the ability to make plans and to recollect them later upon the occurrence of the appropriate retrieval cues. In the context of everyday life, we may fail to follow through with a plan, such as posting a letter, because we are immersed in a demanding ongoing activity, for example a heated conversation, at the time of walking past the mailbox. We hypothesized that successful completion of planned tasks requires interrupting ongoing activities, that some ongoing activities are easier to interrupt than others, and that the ease of interrupting an ongoing activity depends on its momentum. Borrowing from physics where Momentum is defined as equal to Mass * Velocity, we have operationalized mass in terms of the difficulty or complexity of an activity, and velocity in terms of the number of stimuli, events, acts or responses that occur/need to be made in a given time period. In a series of experiments we explored the hypothesis that prospective memory test performance is determined by the momentum of the ongoing activity in which the retrieval cues are encountered, with high momentum activities defined as those which are more difficult to interrupt. We manipulated momentum in a number of different ways, for example, by giving subjects speed versus accuracy instructions for an old/new recognition test, or by presenting prospective cues in the context of a simple or a difficult anagram solving task. The results showed higher prospective memory test performance with cues occurring in the course of lower momentum ongoing activities.

Pierre Jolicœur, Nicolas Robitaille, & Kevin Sauvé

Université de Montréal, Canada; Centre de Recherche en Neuropsychologie et Cognition

Neural loci and timecourse of encoding and maintenance in visual short-term memory: Evidence from magnetoencephalography

Recent results from human electrophysiology has revealed a lateralized component of the event-related potential, the sustained posterior contralateral negativity (SPCN), that reflects neural activity specifically related to the maintenance of information in visual short-term memory. Here we present results from 275-channel whole head magnetoencephalography (MEG) that allowed us to measure the MEG equivalent of the SPCN, the SPCM (sustained posterior contralateral magnetic field) in the event-related magnetic fields. In each trial an arrow indicated whether information should be encoded from the left or right visual field. After a short delay, two or four coloured disks were presented on the left of fixation along with an equal number on the right of fixation, for 200 ms. After a 1200 ms retention interval a test display with one disk on either side of fixation was presented. Observers decided whether the colour of the test disk, on the encoded side, matched or mismatched the colour of the encoded disk at that location. We show that the SPCM is larger over the hemisphere contralateral to the encoded side and that it has a larger amplitude during the retention interval as the amount of encoded information is increased. MEG signals were also analyzed using independent components analysis (ICA) to isolate the neural generators of the SPCM. In several observers we were able to isolate ICA components with a clear dipolar field structure and with corresponding timecourses showing significant effects of visual memory load and a larger contralateral response relative the visual field from which the information was encoded. Source localization of this activity, in posterior parietal cortex, showed good correspondence across observers and good agreement with recently published fMRI results. The results advance our understanding of the functional and neural basis of visual short-term memory.

Ellen C. Klostermann, Ari Kane, & Arthur P. Shimamura

Department of Psychology, University of California, Berkeley

Parietal activation during the successful retrieval of abstract and concrete auditory information

In previous fMRI studies, successful recognition performance has been associated with a left frontal-parietal network that includes prefrontal, inferior parietal and precuneus regions. As nearly all fMRI studies use visual stimuli or visualizable auditory stimuli, it is unclear whether activations in parietal regions are specifically associated with memory or if they reflect visuospatial processing. Here, we investigated recognition performance — and particularly the status of parietal activations — for abstract and concrete nouns presented auditorally. Greater activation was observed in virtually identical left inferior parietal areas (BA 40) for the successful recognition of both abstract and concrete nouns. Successful recognition was also associated with activity in anterior cingulate (BA 24), bilateral prefrontal cortex (BA 45/46) and precuneus (BA 7). These findings suggest that parietal activations during retrieval are not simply related to bottom-up visuospatial processes but may be more directly related to memory processes.

Angela Lafratta & Sergio C. Masin
University of Padua, Italy

Study of the ability to use information integration rules

Many studies in cognitive algebra show that subjects use addition, multiplication and averaging with remarkable regularity as information integration rules. Our ability to use these rules has been little explored. Two questions of interest are whether newly learned rules supersede natural rules (that is, rules used spontaneously) and whether we differ in the ability to control natural and learned rules. We report on a study that addressed these questions. There were four sessions, each with the same subjects. In the first session, subjects judged the risk of esophagus cancer caused by consuming specific daily amounts of wine and specific daily amounts of cigarettes. All subjects produced their judgment using a natural weighted-average rule. In the second session, subjects learned to judge the risk of esophagus cancer using a multiplicative rule. The third session was a replica of the first session. In the third session all subjects produced their judgment using the learned multiplicative rule. Thus, the learned rule superseded the natural rule. In the fourth session, subjects were asked to judge the risk of esophagus cancer as much as possible in the same manner as they did in the first session. The results show that, while all subjects used the same natural rule and all learned the same new rule, some subjects were able to reuse the natural rule while others were unable to switch from the learned to the natural rule. These individual differences suggest differences in subjects' ability to control information integration rules.

Ayelet N. Landau, Michael Esterman, Lynn C. Robertson, Shlomo Bentin, & Bill Prinzmetal
University of California, Berkeley, and Hebrew University, Jerusalem

Electrophysiological correlates of voluntary and involuntary attention to faces

Behavioral evidence suggests differences between voluntary (endogenous) and involuntary (exogenous) spatial attention. We recorded EEG in a spatial cueing paradigm to investigate the different time-course and processing modulation introduced by voluntary and involuntary attention. Participants performed a face discrimination task. Involuntary attention was manipulated by preceding the face with a non predictive spatial cue (one of two boxes in the periphery changing color). The effects of voluntary attention were assessed in a separate block using the same spatial cue in a predictive condition: The face appeared in the cued location on 70% of the trials (valid trials) and in the un-cued location on 15% of the trials (invalid trials). In the remaining trials cues were followed by no target-face. All stimulus parameters were identical for voluntary and involuntary attention blocks except for cue predictability. As in previous studies, both voluntary and involuntary attentional manipulations produced significant validity effects in reaction time. While the ERP analysis does not distinguish between the two attentional conditions, analysis of induced gamma band activity (in the spectral domain) reveals clear differences related to task demands. During the cue period, there is significantly more power in the gamma frequency range in the predictive condition compared to the non predictive condition. After the target appears there is an interaction between validity and predictability in gamma band activity that is related to the processing demands of the task.

Richard Lapointe-Goupil, Josée Bluteau, Claudette Fortin, & Sébastien Tremblay

École de Psychologie, Université Laval

Dual-tasking: Effects of interference, facilitation, and shift in decision criteria

Fundamental limitations in human information processing are apparent in multitasking, when two or more tasks are performed simultaneously. This study investigates capacity limitation with a visual detection and time reproduction dual-task paradigm. Both tasks were executed in single-task and dual-task conditions. In the visual task, detection of the second target was impaired when it followed the first target of a few hundreds milliseconds, a phenomenon known as the “attentional blink.” In line with recent evidence suggesting that multitasking can sometimes support performance in visual detection (Oliviers & Nieuwenhuis, 2005), the attentional blink was significantly reduced in the dual-task relative to the single-task condition. However, analyses using an index of sensitivity (d') suggest that enhanced detection in the visual task is mostly attributable to a shift in a decision criterion in the dual-task relative to the single-task condition. Nevertheless, there is interference between the two tasks as evidenced by longer time estimates in the dual-task condition. This result can be explained by a change model (e.g. Brown, 1995) which would predict that a greater number of perceived changes in the dual-task condition should result in temporal overestimation. This pattern of results demonstrates that the deployment of attentional resources is more flexible than assumed in most current attentional theories, being influenced by decision criteria.

D. Stephen Lindsay & Justin Kantner

Department of Psychology, University of Victoria

Recognition memory test performance with versus without trial-by-trial feedback

The mind/brain can use feedback to hone a wide range of skills (e.g., motor control, categorization, etc.). Yet we have amassed a large pile of null effects of feedback on recognition memory discrimination. In our basic procedure, subjects study items and later attempt to discriminate studied from nonstudied items. Some subjects receive feedback after each test response, others receive no such feedback. The experimental hypothesis is that feedback will enable subjects to tune in on effective memory-retrieval and/or -weighting strategies, such that by the end of the test those given feedback will be doing better than control subjects. We were building up to submitting a long paper to the Journal of Null Effects & Replication Failures (NERF) when we came across a stimulus domain in which feedback lowers false alarm rates. This paper will report experiments intended to explain why feedback effects recognition discrimination in some domains but not others.

Kay Livesay & Phillip Duggins
Linfield College

Modeling semantics in high dimensional space

Early researchers (e.g., Osgood & Suci, 1955) constructed high-dimensional semantic spaces by deciding on a fixed set of qualities (e.g., pleasant/unpleasant, abstract/concrete, animate/inanimate) and had people rate the words based on these qualities (using a Likert scale). There are inherent difficulties with this approach; it is time-consuming, it relies on subjective judgments and the qualities identified may not necessarily be the qualities that best identify any particular word. More recently, researchers (Lund & Burgess, 1996; Landauer, Foltz, & Lahem, 1998) have used large corpora of words and co-occurrence statistics to create high-dimensional semantic spaces. These new spaces are not limited by the subjective nature of the previous work and allow for latent associations to emerge via contextual co-occurrence. The present research uses a new input corpus consisting of approximately 80 million words to create a high-dimensional model of semantic memory. Replicating human priming data is central to any model of semantic memory. Early results suggest that this new corpus is similar to other corpora in representing semantic content. The new model produces reliable distance priming that correlates with human priming data.

Barbara Luka
Psychology Program, Bard College

Long lasting structural priming in language comprehension

When generating novel utterances, speakers tend to use sentence structures like those they have just heard or read — the syntactic priming effect. In production tasks, it is difficult to evaluate the temporal duration of this effect. A newer paradigm demonstrates structural facilitation in comprehension — that readers judge sentences as more grammatical when they share syntactic structure with recently-read sentences, although all of the content words are different (Luka & Barsalou, 2004). For instance, a sentence like “The organizers praised the selflessness in the volunteers” is deemed more acceptable if “The beat poets mocked the self-righteousness in the authorities” had been read earlier. Two experiments show that structural facilitation effects persist for three and seven days after the initial exposure to the “priming” sentences. These results suggest long-term learning of grammar in adulthood, which is likely to depend on a memory system that tracks probability and co-occurrence patterns of grammatical structures over extended durations.

Andrew McCollough & Edward Vogel
Department of Psychology, University of Oregon

Electrophysiological measures of working memory process

Visual working memory is a highly capacity limited system maintaining only three to four objects at a time. This limitation requires mechanisms which are able to constantly add to and remove the contents of working memory as new items become salient and old items lose relevance. Here we report a neurophysiological measure of this memory updating mechanism in humans. We examined the deletion of items from working memory while adding new item representations, that is, “swapping,” and found that the efficiency of updating is a function of individual differences in visual working memory capacity. These data suggest that moment-by-moment capacity allocation is correlated with attentional control, which varies from individual to individual.

Suzanne Mitchell, Vanessa Wilson, Stacy Legg, & Alexander Stevens
Oregon Health & Science University

Modeling risk-taking: Separating the representation of risk from the acceptable risk threshold

Assessing the probability of a good versus a bad outcome plays an essential role in whether individuals chose to engage in a particular behavior or not. Few studies examine how individuals form a representation of the probabilities based on repeated experience and the influence of this representation on subsequent behavior. Our risk-taking task required that participants hold down a key to inflate a balloon on a computer screen: the larger the balloon, the more points are accumulated but the larger the probability that the balloon will burst, causing the points to be lost. Participants can stop inflating the balloon at any time and save the points accumulated. We varied the size of the balloon when it exploded during practice trials to manipulate risk assessment and found a limited impact on this assessment on the subsequent inflation of balloons. Also we provided participants with information about the behavior of others on the task to assess the role of social influence on risk-taking.

Susan M. Ravizza, & Cameron S. Carter

Department of Psychology, Imaging Research Center, University of California, Davis

Task switching is not a unitary phenomenon: Behavioral and neuroimaging evidence

Task switching is operationalized in a variety of ways across studies with the assumption that this control process is a unitary phenomenon. However, some switching studies require shifts of attention evoked by external stimuli whereas others demand a shift between internal representations (e.g., the type of information retrieved, the process carried out). In a behavioral experiment, we contrasted stimulus-driven shifts of attention (perceptual shifting) with switches that required internally-generated information about a set of items (contextual shifting). We found that effects of the irrelevant dimension and stimulus priming differed depending on the type of shift required. Moreover, in an fMRI experiment, we demonstrate that activity of the prefrontal cortex is greater in the contextual shifting condition whereas parietal regions are more active in when switching between perceptual features. Taken together, these experiments suggest that task switching is not simply one cognitive control process, but that behavioral effects and neural engagement depend on the domain (e.g. visuospatial, conceptual).

Jane E. Raymond

The School of Psychology at the University of Wales, Bangor

Attentional modulation of emotional responses

Processes of selective attention and emotion operate together in prioritizing our thoughts and actions, and there is now an abundance of evidence that emotionally salient stimuli and affective states can determine how visual attention is allocated. However, the brain regions mediating the effects of attention and emotion include shared and reciprocally connected structures. This raises an intriguing question about a reciprocal effect: Does attention also influence emotional responses? I will review a series of recent studies that show that indeed it does. The results specifically indicate that attention has an emotionally deleterious effect for otherwise neutral visual stimuli (abstract patterns and unfamiliar faces) that must be ignored or otherwise inhibited during the performance of a task. Finding that selective attention has distinct emotional consequences for visual stimuli represent a new, fundamental discovery about the relation between the two main systems of prioritization in the human brain.

Miranda Scolari, Andrew Kohnen, Brian Barton, & Edward Awh
Department of Psychology, University of Oregon

Spatial attention, preview, and popout: Can diminished crowding effects be explained by reductions in critical spacing?

Crowding refers to the phenomenon in which nearby distractors impede target processing. This effect is reduced as target-distractor distance increases, and it is eliminated entirely at a distance that is labeled the critical spacing point. Attention, distractor preview, and popout are each known to facilitate processing in crowded displays. Eight experiments examined whether this is accomplished via a reduction in critical spacing. Attention was manipulated via spatial cueing, whereby a peripheral cue elicited a stimulus-driven shift of attention. Distractor preview was examined by manipulating whether the crowding distractors onset prior to or simultaneous with the target. Popout was examined by manipulating whether there was a salient color difference between the target and distractors. As demonstrated in previous studies, we found robust benefits of spatial cueing, preview, and popout in crowded displays. However, critical spacing was reduced by preview and popout, but not attention. These disparate results indicate that attention diminishes crowding effects in a qualitatively different manner than do the other factors. Moreover, at least in the case of stimulus-driven spatial attention, these results challenge the view that the spatial extent of crowding is a direct index of the resolution of attention.

Kimron Shapiro

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The role of distributed neural processing networks in attention

The study of the role of attention has benefited greatly from investigations with dual-task paradigms such as the psychological refractory period (PRP), repetition blindness (RB) and the attentional blink (AB). Such approaches have led us to believe that some aspects of information processing are performed in a parallel or near parallel manner, whereas others appear to be performed in a serial manner, leading to the notion of a central bottleneck. The research I will present arises from data collected with my students and colleagues, using behavioural and neurophysiological approaches, and suggests that this bottleneck may not be immutable and has a neuroanatomical locus in various areas of the brain. Conclusions will be drawn centred around the notion that the key to understanding such limits of attention depends on interactions in a distributed neural network.

Jonathan Smallwood & Jonathan Schooler
Department of Psychology, University of British Columbia

The restless mind: Mind wandering as the decoupling of executive process

This talk reviews the hypothesis that mind-wandering can be integrated into executive models of attention. Evidence suggests that mind-wandering shares certain similarities with traditional notions of controlled processing. When the mind wanders, the executive components of attention shift away from the primary task, a phenomenon described as “decoupling,” leading to failures in task performance and superficial representations of the external environment. One challenge for incorporating mind-wandering into standard models of executive control is that it often occurs in the absence of explicit intention — a hallmark of controlled processing. However, mind-wandering, like other goal-related processes, can be engaged without explicit awareness; thus, mind-wandering can be seen as a goal driven process, albeit one that is not directed towards the primary task.

Eric Soetens & Natacha Deroost
University of Brussels (VUB), Belgium

Endogenous attention is needed for perceptual sequence learning

Many daily activities, like handwriting or speech production, rely on the implicit acquisition of sequential regularities. A popular tool to investigate implicit sequence learning is the Serial Reaction Time (SRT) task with stimuli following a regular sequence pattern. Despite participants’ unawareness of this regularity, learning can be inferred from RT costs when random stimulus sequences are introduced. Most studies seem to support that these learning effects are based on the structure of responses. However, we found clear perceptual learning effects in some exceptional cases. In follow-up studies we demonstrated the importance of attention for perceptual learning. In a SRT task participants responded to target stimuli surrounded with distractors that were similar or dissimilar to the targets, resulting in endogenous or exogenous visual search. Participants displayed more sequence learning with similar than with dissimilar distractors, suggesting that implicit sequence learning is enhanced when attention is endogenously as compared to exogenously oriented.

George Sperling & Jian Ding
University of California, Irvine

How the two eyes combine information: A neurally-plausible mathematical theory and some supporting evidence

In binocular combination, light images on the two retinas are combined to form a single “cyclopean” perceptual image, in contrast to binocular rivalry which occurs when the two eyes have incompatible (“rivalrous”) inputs and only one eye’s stimulus is perceived. We propose a computational theory for binocular combination based on two neurally plausible principles of interaction: in every spatial neighborhood (1) each eye exerts gain control on the other eye’s signal in proportion to the contrast energy of its own input and (2) each eye additionally exerts gain control on the other eye’s gain control. For stimuli of ordinary contrast, when either eye is stimulated alone, the predicted cyclopean image is the same as when both eyes are stimulated equally — a significant nonlinearity that coincides with an easily observed property of natural vision. The gain-control theory is contrast dependent: Very low-contrast stimuli to the left- and right-eyes add linearly to form the predicted cyclopean image. The intrinsic nonlinearity manifests itself only as contrast increases. To test the theory more precisely, 48 combinations of horizontal sinewave gratings that differ in phase and contrast are presented to each eye; the apparent phase of the cyclopean sinewave indicates the relative contributions of the two eyes. In another experiment, noise added to the stimulus in one eye is shown to cause that eye to dominate in binocular combination. In all, six experiments define the parameters of the theory; the theory accounts for 96.9 to 99.4% of the variance of these data. Conclusion: A simple, robust, physiologically plausible gain-control theory accurately describes an early stage of binocular combination.

Alexander Stevens & Arun Garg
Oregon Health & Science University

What the blind tell us about the mind’s eye: Frontal eye fields in the congenitally blind

Neuroimaging with sighted subjects has implicated a common network of cortical areas including, in particular, the frontal eye fields (FEF), in both overt and covert attention shifts. The FEF role remains unclear, however, due to possible confounds from active inhibition of eye movements. Here we use functional magnetic resonance imaging with an auditory covert attention task and show robust stimulus-locked activation of FEF in congenitally blind individuals, in whom eye movements are irrelevant. Activation patterns were strikingly similar in blind subjects and sighted controls, suggesting that a module within the putative human FEF plays a broad, supramodal role in controlling spatial attention. The medial occipital cortex was also activated in the blind, suggesting a reorganized, cue-mediated role in processing sounds.

Padmanabhan Sudevan, John Holmes, Megan Golla, Autumn Hensel, & Jennifer Roskopf

Department of Psychology, University of Wisconsin, Stevens Point

Effects of priming operations with non-repeating primes

Advance cues or primes have been used to direct attention to a specific cognitive operation or task in studies of priming and task switching. Such an advance task cue or operation prime might have a repetition effect that adds to the task preparation benefit when it physically matches the actual task cue accompanying the stimulus. Using task switching paradigms, Arrington and Logan (2005) and Logan and Bundesen (2003) found that benefits accruing from the cue are almost entirely due to cue repetition. They suggest that there is little task preparation based on the cue, only an encoding advantage for the task cue. Using an operation priming paradigm, we have recently obtained significant benefits from operation primes even when they do not match the task cue physically. This finding indicates that there may be both stimulus repetition effects and task preparation effects that accrue from operation primes.

Meghan Sumner & Arthur Samuel

Department of Psychology Stony Brook University

Overcoming perceptual bias in the processing of non-native speech

Listeners constantly face an incredibly variable speech signal. Individual and language-specific variation complicate the task of understanding speech. The processing of foreign-accented speech is even more complex. Foreign-accented speech is influenced by the native language (L1) of a speaker. For example, a native German speaker of English may produce the English words “cart” and “card” in a way that is indistinguishable to the ears of native English speakers (e.g., both with final [t]). In order to process these two words as distinct, a listener must overcome a perceptual bias: The use of a familiar acoustic cue (e.g., vowel length, glottal pulsing) to signal a voiced sound must be replaced with a non-native, or unfamiliar, cue (e.g., the duration of consonant closure). We examine the perceptual shift from native to non-native acoustic cues and the long-term encoding of this information. We report the results from perceptual and long-term priming experiments explaining how listeners are able to make this shift and how the relevant acoustic details are encoded in the long-term.

François Vachon, Sonia Packwood, & Sébastien Tremblay
École de Psychologie, Université Laval, Canada

Effects of masking in the attentional blink: A direct comparison between vision and audition

When two masked targets (T1 and T2) are presented in rapid succession, processing of T1 produces an attentional blink (AB), that is, an impairment of T2 identification. The current experiment was conducted to compare the impact of masking T1 and T2 between vision and audition. Within a sequence, each of the two verbal targets, discriminated by either their offset (Experiment 1) or their onset (Experiment 2), could be followed by either a single item, acting as a mask, or a silent period. Masking of T2 appeared to be necessary for both the visual AB and the auditory AB to occur. However, whereas masking of T1 influenced the magnitude of the visual AB in both experiments, such an effect was observed in the auditory modality only when the targets varied at the onset. These results provide further evidence that processing auditory and visual information is restricted by similar attentional limitations but also suggest that these limits are constrained by properties specific to each sensory system.

Cyma Van Petten & Pedro Macizo
University of Arizona and University of Granada

Semantic access to embedded words in spoken word recognition

Because word boundaries in running speech are only occasionally marked by anything as obvious as a silent pause, speech scientists have invested great effort in determining how the segmentation problem is solved. It is generally agreed that lexical knowledge — knowing when a word begins and ends because it matches an item in your vocabulary — contributes to segmentation. A remaining problem, however, is how listeners deal with embedded words — phoneme sequences like C-A-P in both CAPTIVE and HANDICAP. Some models of spoken word recognition suggest that embedded words are accessed, but suppressed via subsequent competition among active candidates. Other investigators suggest that embedded words are less problematic than they appear because subphonemic acoustic properties differentiate single-syllable words from syllables in longer words. We report six semantic priming experiments evaluating the impact of such acoustic differences, word properties (stress pattern, etc), and task manipulations on unintentional semantic access to embedded words.

Robert B. Welch, Merrit Hoover, & Jennifer Sweeton

NASA Ames Research Center, University of California, Santa Cruz, and Stanford University

Delayed visual feedback is not “fatal” to prism adaptation

It appears to be an article of faith that delays of visual feedback, even very small ones, preclude prism adaptation and, by extension, adaptation to any sensory rearrangement. This belief stems from research done long ago by Richard Held and his colleagues in which observers viewed the visually displaced hand as they moved it from side to side before a homogenous visual background (Held, Efstathiou, & Greene, 1966). We propose that one major reason why these investigators found delays as small as .3 sec sufficient to completely abolish adaptation was the absence of error-corrective feedback during the exposure phase. In our research we compared prism exposure with and without visual error-corrective feedback and delays ranging from 0 to 10 sec. Congruent with expectation, we obtained substantial adaptation, as measured by post-pre shifts in hand-eye coordination, partial intermanual transfer of these shifts, and adaptive changes in visual straight ahead, in even the longest delay condition.

Geoffrey F. Woodman & Leanne Boucher

Department of Psychology, Vanderbilt University

Eye movements reveal individual differences in strategic interactions between visual working memory and perceptual attention during visual search

Theories of attention propose that maintaining an object representation in visual working memory guides perceptual attention to select similar items. However, Woodman and Luck (in press) found that when participants held a representation in visual working memory and performed visual search the presence of a memory-matching distractor did not slow search. Here we sought to directly measure overt selection by tracking observers’s eye movements. Participants’s manual responses replicated previous findings. Interestingly, the eye-movement data revealed two distinct groups of observers. One group avoided fixating the memory-matching item until search was completed speeding search reaction time. The other group frequently fixated the memory-matching item during search apparently to maximize memory-task performance. All subjects frequently fixated the memory-matching item after search, consistent with a visual working memory maintenance strategy of perceptual resampling. These findings emphasize how interactions between perceptual attention and visual working memory are governed by higher-order strategies that vary between observers.

Brad Wyble, Howard Bowman, & Patrick Craston
Computing Laboratory, University of Kent, Canterbury, UK

In search of sparing: Spatial cueing can be triggered contingently by discrimination of visual form

Recent modeling work has implicated transient attention (Nakayama & Mackeben, 1989) in the phenomenon of sparing that precedes the attentional blink. Furthermore, our experimental data demonstrates that not only is T2 spared at lag 1, but is sometimes elevated above baseline accuracy. This cueing effect presumably involves attentional resources deployed in response to the T1, but that extend in time to benefit the T2. This requires that transient attention is contingently deployable in response to targets but not distractors. We have developed a series of experiments intended to prove that transient attention can be configured by top-down control to respond to targets and ignore distractors as defined by visual form (e.g. letters and digits). This deployment of attention in response to a T1 results in potent cueing (enhanced performance) of a T2 that is spatially local to the T1. This attention is only evident for T1-T2 SOAs of less than 200 ms. This cueing occurs even though the first target is presented too briefly to be seen on a great majority of trials. We describe these experiments with reference to recent macaque data (DiCarlo & Maunsell 2003, Hung et al., 2005) that describes how the ventral visual stream can detect a target and then deploy attention contingently to its spatiotopic location within just 50 ms of stimulus onset.

Steven Yantis, Adam Greenberg, & Daryl Wilson
Department of Psychology, The Johns Hopkins University

Domain-independent mechanisms of cognitive control

Selective attention grants sensory input access to awareness and memory. We have investigated the neural mechanisms of attentional control using fMRI during tasks that require voluntary shifts of attention between locations, features, objects, or sensory modalities (e.g., vision/audition). In each domain, we observe two aspects of attentional control: (1) attentional modulation of sensory cortex that reflects sustained states of perceptual coherence associated with the attended stimulus; and (2) transient shift signals in posterior parietal and superior prefrontal cortex that reflect the reconfiguration of attentive states. Recent experiments suggest that the same circuit responsible for the control of attention in multiple sensory domains is also responsible for the control of manual response preparation. These results can be understood as revealing aspects of a general-purpose suite of cognitive control mechanisms for maintaining and reconfiguring task sets.

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