



*Banff Annual Seminar
in Cognitive Science
May 4-6, 2001*

Task Switching: Implications and New Directions

Friday, May 4 *Glacier Salon*

7:30-10:00 pm Reception & Poster Session

Sponsored by the *Canadian Journal of Experimental Psychology* and the Canadian Psychological Association.

Please register with Peter Dixon if you have not already done so (\$70 for faculty, \$25 for students and postdoctoral fellows).

Poster Presentations

Jeung-Chan Ahn & Akira Miyake
The interaction of endogenous and exogenous control in task switching

Brian L. Brooks, Susan A. Graham, & Kim Chisholm
Examining linguistic and communicative abilities in children adopted from Romanian orphanages

Verna Chow & Glen E. Bodner
Does masked prime validity affect semantic classification?

Verna Chow, Christopher R. Sears
Exposure to print and the neighborhood size effect

Leora Dahl & Christopher R. Sears
Exploring the effect of mood on the interpretation of ambiguous information using a cross-modal semantic priming task

Audny T. Dypvik & Glen E. Bodner
Masked priming of number parity judgments

Jodi Edwards & Penny M. Pexman
What can homophone effects tell us about orthographic representation in visual word recognition?

Michael J. Emerson & Akira Miyake
Release from negative priming due to set shifting

Jonathan Fugelsang, Valerie Thompson, Ron Borowsky, Gord Sarty, & William Owen
What introspection and functional brain imaging can tell us about belief-based reasoning

Kim M. Goddard, Phil Litke, & Elzbieta B. Slawinski
Lag 1 sparing in attentional blink tasks: Some new data

Annette Henderson, Juanita N. Turner, & Suzanne Hala
Age differences in source monitoring of pretense

Gregory B. Holyk & Penny M. Pexman
Reader skill and the initial stages of word recognition

Amelia Hunt & Raymond Klein
How to eliminate switch costs

Stacey Ivanko & Glen E. Bodner
False Memories: The Effect of Retrieval Context

Sara C. Jungen, Stacey Ivanko, Melanie R. Harris & Suzanne Hala, Pexman, P. M.
"You're really nice": Children's understanding of sarcasm and personality traits

Cari S. Kilbreath, Andrea N. Wilder, & Susan A. Graham
Shape similarity and object labels guide infants' expectations about nonobvious object properties

Beat Meier, Todd Woodward, Christine Tipper, & Peter Graf
Automatic and controlled reconfiguration in task switching

Marie-H. Monfils & Penny M. Pexman
High number of features facilitates semantic processing

Kara M. Olineck, & P. M. Pexman
Understanding irony: How do stereotypes cue speaker intent?

William J. Owen & Ron Borowsky
Contextual influences on pseudohomophone base-word frequency effects

Hannah Pazderka-Robinson, Pierre Flor-Henry, & Barry Andres
The role of craving in substance dependence: A preliminary investigation of electrophysiological and neuropsychological correlates

Catherine Poulsen, P. Luu, D. Tucker, A. Speiser, N. Segalowitz, & N. Phillips, C. Davey
Do task switching and inhibition recruit distinct control mechanisms? Evidence from a dense-array event-related potentials investigation

Sharon Seymour & Christopher R. Sears
Negative affect and false memory formation

Elzbieta B. Slawinski, Kim Goddard, Phil Litke, Heather Truax, & Robert S. Sainsbury
A blink is as good as a nod: the attentional blink in special populations

Nita Turner, Jana Prete, & Suzanne Hala
Dogs, cows, pigs and where they came from: Preschoolers' reality monitoring in a collaborative context

Penny M. Pexman & Sara Unsworth
The suppression mechanism in on-line reading

Todd S. Woodward, Christian Ruff, & Peter Graf
Sources of reverse-Stroop interference

Saturday, May 5 Black Bear Room

8:30 am Coffee, tea, & pastries

Please register with Peter Dixon if you have not already done so.

8:45 am Welcome and opening remarks by Peter Dixon (University of Alberta)

9:00 am **Stephen Monsell** (University of Exeter)

Introduced by Valerie Thompson (University of Saskatchewan)

Exploring the control of task set through task switching

“Task-set” is an essential concept, with a long history, but the selection and retrieval of task-sets is poorly understood, and competition between task-sets has rarely been distinguished from competition between individual response tendencies. However, recent research on task-switching costs (or task-repetition benefits) has focused attention on how task-sets are re-instated.

I will introduce task-switching paradigms with a recent experiment directly comparing predictable and unpredictable switching. Like many others, this study demonstrates the reduction in switch costs observed with an opportunity for preparation (the “preparation effect”) and a “residual cost”: a component of the switch cost apparently resistant to elimination by advance preparation. The preparation effect is now generally agreed to index an endogenous task-set reconfiguration process, but has not yet been much exploited to explore its properties; I will describe a sample experiment on the efficacy of different types of cue. The residual cost, because counterintuitive, has excited rather more interest: I will assess interpretations of the residual cost as positive/negative task-set priming, and as the duration of an obligatory or probabilistic post-

stimulus control process required on switch trials, attempting to cover data on (a) fitting a mixture model to RT distributions, (b) asymmetries of switch cost, (c) LRPs on switch and non-switch trials, (d) additivities in switch cost, and (e) switch costs with "univalent" stimuli affording only one task.

10:30 am Coffee & tea

11:00 am **Mike Masson and Dan Bub** (University of Victoria)

Introduced by Glen Bodner (University of Calgary)

Interactive Processes in Task Switching

The starting point of our work is that skilled, seemingly automatic, performance of tasks such as word and object identification is flexible and can be powerfully influenced by contextual factors that include memory and conceptual knowledge. We describe three situations in which various forms of stimulus selection during task switching are influenced by the processing operations or knowledge bases configured in advance to complete a task. The first situation we consider involves the nature of the interaction between a response to an unambiguous stimulus (task 1--read a word printed in black) and the requirement to avoid making a similar response to an upcoming ambiguous stimulus (task 2--name the color in which a word is printed). Results show that responding in task 1 is substantially slowed when it is predictably followed by task 2. Our evidence indicates that this effect has a component that is specific to phonological processes involved in word reading, suggesting that phonological encoding of words is subject to strategic, though not necessarily conscious, modulation. The next kind of interaction we consider involves selection from an ambiguous event in memory (a color Stroop stimulus). In this situation, where selection takes place from a stimulus event that is no longer directly perceived (i.e., the stimulus has been encoded into immediate memory), our results indicate a robust reverse Stroop effect that sometimes is as large as the basic Stroop effect, even though standard color-word Stroop tasks typically reveal little or no reverse Stroop effect. Finally, we examine the nature of the interaction between selection in immediate memory and conceptual knowledge recruited when identifying objects. We discuss the important consequences of this kind of interaction for theoretical accounts of the effect of semantic category on normal and neurologically impaired object identification.

12:30 pm Lunch

2:00 pm

Katherine Arbuthnott (University of Regina)

Introduced by Penny Pexman (University of Calgary)

Task switching and task alternation: Evidence of task-set inhibition in residual switch cost

Residual switch cost refers to the RT and accuracy costs associated with switching tasks when there is ample opportunity to prepare for an upcoming switch (Rogers & Monsell, 1995). Although there is some debate, this component of switch cost likely represents a control process rather than a task execution process (Gopher, Armony, & Greenspan, 2000). Recent evidence indicates that residual switch cost is greater for alternating tasks (e.g., ABA) than for non-alternating task switches (e.g., CBA), and provides one possibility for the control process underlying residual switch cost. Specifically, the alternating-task effect is hypothesized to reflect inhibition of a no-longer-relevant task-set, which would facilitate adoption of a currently-relevant task-set. When a participant must quickly reinstate the inhibited task-set, as when alternating between 2 tasks, additional cost is associated with resolution of the inhibition. The alternating-task effect is observed across variations of task type (i.e., perceptual & conceptual judgments), response modality (i.e., vocal & manual), and cue ambiguity. Individual differences such as working memory span and mild traumatic brain injury seem to have no effect on the magnitude of the alternating-task effect, but preliminary data indicates that individuals with ADHD may not show the effect, but instead show greater switch cost than matched controls. This pattern of results for ADHD indirectly supports the inhibitory hypothesis of the alternating-task effect, as ADHD is associated with compromised inhibition in other types of tasks (e.g., stop-signal tasks). The other manipulation that eliminates the alternating-task effect is combining task switches with changes of spatial location. This suggests that the task-set inhibition process may not operate when tasks can be uniquely associated with a spatial location, and that somewhat different processes may be involved in switching tasks across spatial locations.

3:30 pm

Coffee, tea, & refreshments

4:00 pm

Gordon Logan (Vanderbilt University)

Introduced by Bruce Whittlesea (Simon Fraser University)

Executive control of visual attention in dual-task situations

A theory of executive control is presented that proposes that executive processes control subordinate processes by manipulating their parameters, reconfiguring them to respond in accord with the current task set. It adopts C. Bundesen's (1990) theory of visual attention (TVA) and R. Nosofsky and T. Palmeri's (1997) exemplar-based random walk

(EBRW) as the theory of subordinate processes. It assumes that a task set is a set of TVA and EBRW parameters sufficient to perform a task and set switching involves changing those parameters. The theory solves two computational problems that emerge in dual-task situations: the binding problem and the serial order problem. It can perform dual tasks in series or in parallel but prefers the serial strategy because it is faster and it solves the binding problem naturally. The theory accounts for concurrence cost, set switching cost, crosstalk between tasks, and the modulation of crosstalk by task set.

5:30 pm Announcement of the winner of the 2000 volume of *Canadian Journal of Experimental Psychology* (Registered students and postdoctoral fellows are eligible)

Sunday, May 6 *Black Bear Room*

8:00 am Coffee, tea, & pastries

8:30 am **Akira Miyake** (University of Colorado at Boulder)

Introduced by Peter Dixon (University of Alberta)

Individual Differences Analysis of Task Switching Cost: Implications for the Nature of the Preparation Effect and Residual Shift Cost

In this talk, I will present a series of three individual differences studies that my collaborators and I have conducted in our lab to examine the nature of cognitive abilities and processes involved in task switching. These studies examined individual differences in task switching abilities at different levels of analysis.

The first study shows that, although they are moderately correlated with one another, task switching can be distinguished from other often postulated executive control functions (e.g., inhibiting dominant or prepotent responses). The second study shows that switch costs and component processing times are also separable, showing differential patterns of correlations with other cognitive measures. The third, still-ongoing study demonstrates that two different components of task switching costs, namely the part that can be reduced by mentally preparing the upcoming shift in advance (the preparation effect) and the part that cannot be eliminated even after a long preparation period (the residual shift cost), may reflect different underlying cognitive abilities. More specifically, the preparation effect may be related to the reduction of interference (perhaps perceptual in nature) caused by the irrelevant dimension of the stimulus, whereas the residual shift cost may reflect some sort of response mapping competition between the two sets of responses. I also plan to present some new experimental results that provide converging evidence for this interpretation of the preparatory effect and the residual shift cost.

10:00 am Coffee & tea

10:30 am **Rob McCann and Roger Remington (NASA)**

Introduced by Ron Borowsky (University of Saskatchewan)

Task-switching interference and PRP interference: Similarities and differences

Recently we have been employing a task cuing paradigm to investigate task expectancy effects on real-time task processing. Participants are cued in advance to expect either a lexical decision task or a magnitude comparison task between two digits. Responses to both tasks are slower on invalidly cued trials than on validly cued trials. We also find that cuing effects are underadditive with effects of symbolic distance in the magnitude comparison task, suggesting that the operations needed to recover from an incorrect “task set” create a processing bottleneck. How similar is this task-set bottleneck to the bottleneck that has been hypothesized to cause Task 2 slowing at short stimulus-onset-asynchronies (SOAs) in the psychological refractory period (PRP) paradigm? To find out, we conducted several PRP studies in which Task 2 was magnitude comparison and Task 1 was a 2AFC tone frequency discrimination. Symbolic distance effects in the magnitude comparison task were additive with SOA effects in the standard PRP preparation. In an effort to bring the PRP and the task-cuing paradigm closer together procedurally, we then conducted a Go No-Go version of the PRP paradigm, where responses are withheld to one of the two Task 1 stimuli. Symbolic distance effects were additive with SOA effects even on No-Go trials. We then brought the two paradigms even closer together in a new study that omitted the Task 1 stimulus on a small proportion of the trials. Subjects were slower to perform the magnitude comparison task on these “withholding” trials than they were on standard dual-task trials with a long SOA. That is, just the expectancy of having to perform Task 1 slowed performance of the magnitude comparison task. However, symbolic-distance effects were still additive with the slowdown. Apparently, single and dual task expectancies generate processing bottlenecks, but the bottlenecks are not the same.

12:00 pm Closing remarks by Michael Masson (University of Victoria)

Acknowledgement

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