Endogenous Disruption of Exogenously Driven Prior Task Interference During Task Switching



Background

- Switching to a new task requires effortful inhibition of the prior task rules (Allport, Styles, & Hsieh, 1994; Rogers & Monsell, 1995).
- > Once inhibited, prior task rules can be reactivated by **involuntary mem**ory retrieval processes invoked by a stimulus event appropriate for the prior task, leading to interference from the prior task (Faust & Sanow, 2003; Waszak, Hommel, & Allport, 2003; Wylie & Allport, 2000).
- Prior-task interference (PTI) effects appear to be relatively automatic. Selection based on color during Task 1 interferes with categorical selection during Task 2, but not the reverse (Faust & Wilkins III, 1999).
- > To date attempts to document interactions between PTI and effortful cognitive control processes have been unsuccessful (Faust & York, 2005). PTI is relatively insensitive to modulation of task switch delay, expectation of interference, and memory load.
- The present study uses a **compound selection** task as Task 1 where 2 stimulus dimensions are relevant for target selection. One stimulus dimension (e.g., color) becomes irrelevant and the other remains relevant (e.g., category) with the switch to Task 2.
 - Task 1: Target is a conjunction of color & category dimensions
 - (e.g., red-animal, green-object)
 - Task 2: Target selection based on the single relevant dimension of category (e.g., animal, object)
 - Color dimension becomes irrelevant
 - Category dimension remains relevant, but an effortful switch to target selection based on new category
 - (e.g., red-animal → object)

Question

Will prior-task interference be disrupted by addition of a requirement to the target selection rule on the task-relevant dimension of category during the switch between tasks?

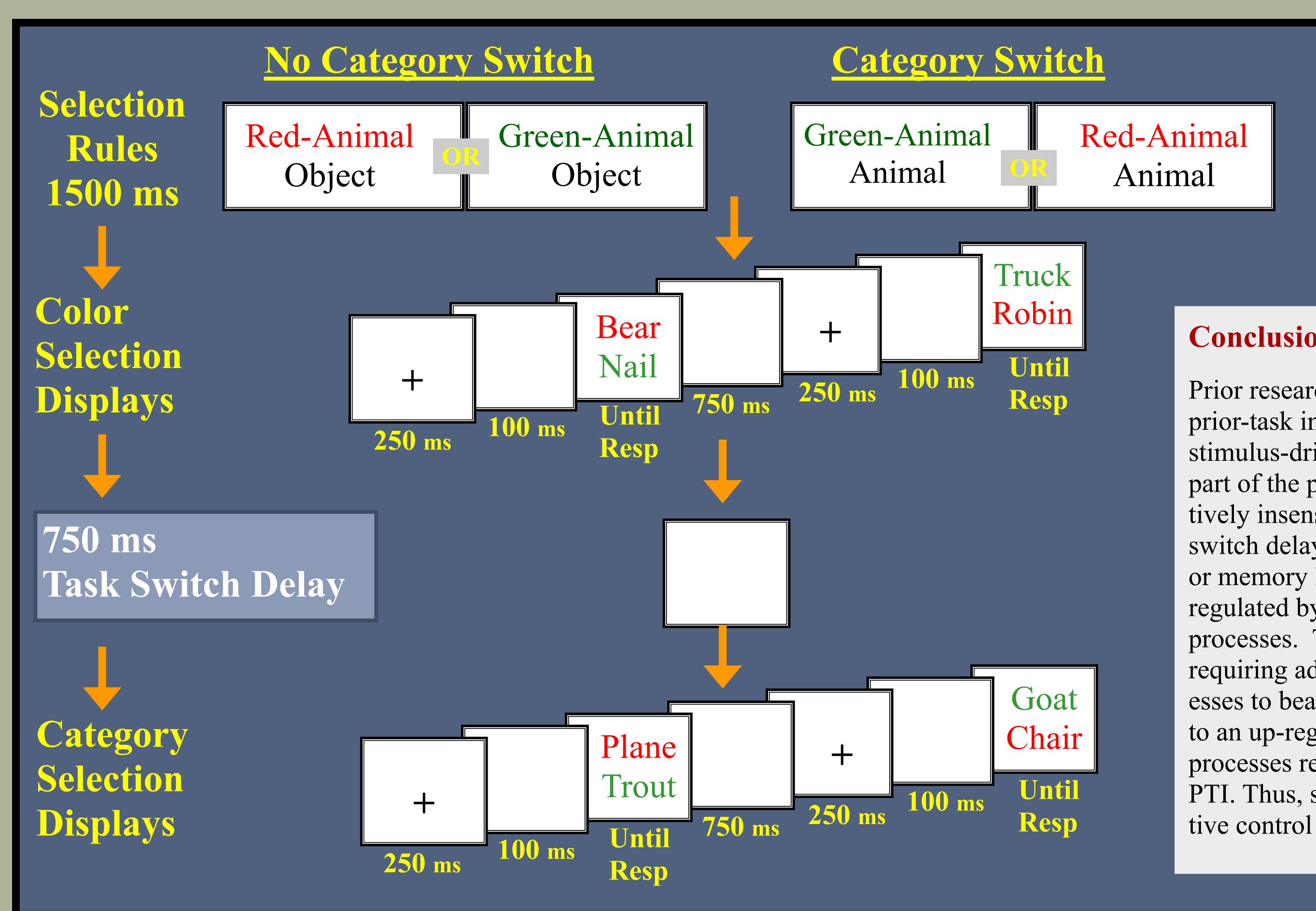
Tasks (see Figure)

- Participants view a sequence of 4 displays and name target
- Each display contains 2 words (red, green) & (animal, object)
- \blacktriangleright Task switch between 2nd & 3rd displays
- \blacktriangleright Participants told what 2 tasks to use before each display sequence
- Task 1: **Red-Animal** OR Green-Animal
- Task 2: Animal OR Object

Measuring Prior-Task Interference

- Prior-task interference measured during performance of Task 2 (Display 3 & 4)
- For the second s
- Prior-task interference is measured as a faster mean response time when the irrelevant color of Task2 is the same as the relevant color in Task1.

Mark Faust, Agnes Jasinska, Curtis Pollard, Rich Preville, Junaid Merchant, & Fadel Zeidan University of North Carolina - Charlotte



Results

- Significant 3 way interaction of Display (3 vs. 4), Task2 Category (Animal vs. Object), and Color Match (Same vs. Different), p = .039.
- > Prior-task interference present when green bar is lower than red bar in bar graphs.
- > Prior-task interference is always present when relevant category remains constant when switching from Task1 to Task2 (left side of upper and lower panels)
- > Prior-task interference disrupted when switch from Animal to Object category required when switching from Task1 to Task2 (right side of upper and lower

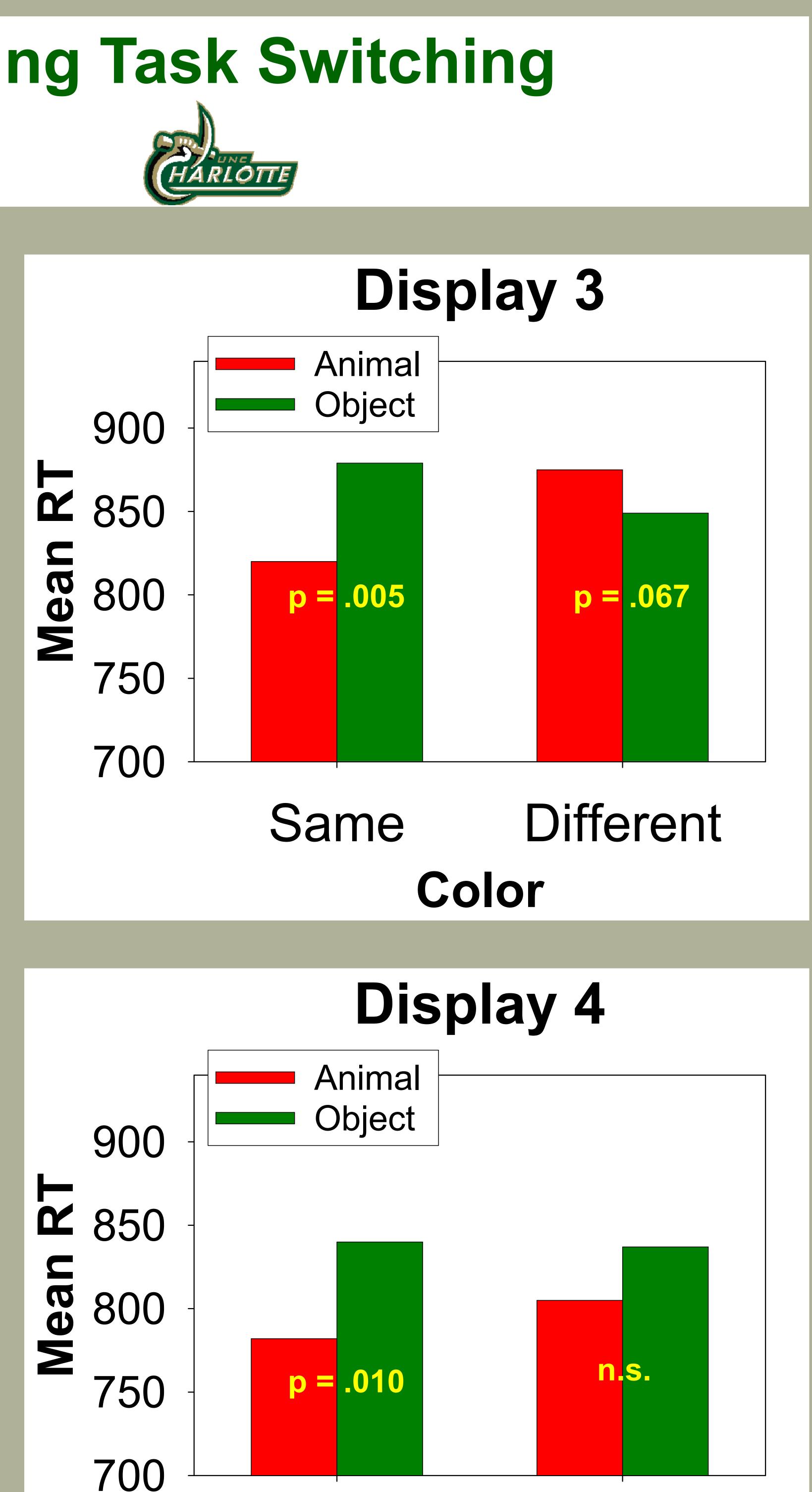
Conclusion

Prior research (Faust & York, 2005) indicates that prior-task interference effects are the result of stimulus-driven memory retrieval of at least part of the prior-task set. Because PTI is relatively insensitive to manipulation of task switch delay, proportion of interference trials, or memory load, PTI is most like directly regulated by exogenous cognitive control processes. The present results suggest that requiring additional endogenous control processes to bear during the task switch can lead to an up-regulation of exogenous control processes resulting in increased control over PTI. Thus, supporting the idea that the cognitive control system is inherently hierarchical.

References

- Allport, A., Styles, E. A., & Hsieh, S. (1994). Shifting intentional set: Exploring the dynamic control of tasks. In C. Umilta, & M. Moscovitch (Eds.), Attention and performance XV (pp. 421-452). Cambridge, MA: MIT Press.
- Faust, M.E., & Wilkins, J. P. III (1999). Inhibitory control and task switching. Poster presented at the 40th Annual Meeting of the Psychonomic Society, November 18-21, Los Angeles, CA. Faust, M.E., & York, A. (2005). Top-down expectancy and prior task interference during task
- switching. Poster presented at the 46th Annual Meeting of the Psychonomic Society, November 10-13, 2005, in Toronto, Canada.
- Faust, M.E., & Sanow S. (2003). Inhibitory control over selective attention during switching of selection criteria. . Poster presented at the 44th Annual Meeting of the Psychonomic Society, November 6-9, 2003, in Vancouver, BC.
- Rogers, R. D., & Monsell, S. (1995). Costs of a predictable switch between simple cognitive tasks. Journal of Experimental Psychology: General, 124, 207-231.
- Waszak, F., Hommel, B., & Allport, A. (2003). Task-switching and long-term priming: Role of episodic stimulus-task bindings in task-shift costs. Cognitive Psychology, 46, 361-413. Wylie, G. & Allport, A. (2000). Task switching and the measurement of "switch costs." Psycho*logical Research, 63*, 212-233.

Acknowledgments This paper (presentation) was supported by grant #501278 from the National Science Foundation



Different Same Color