Beyond Switch Cost as a Measure of Cognitive Control

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An area of cognitive research that has drawn increasing attention over the past 10 years is task switching, the question being how the cognitive system sets itself to perform one task as opposed to another when more than one task is possible. In a typical task-switching paradigm, there might be two simple tasks, for example classifying a digit either as even or odd or as higher or lower than some criterion (usually 5). A trial stimulus in this scenario would be a single digit, and a response one of two key-presses, with the same two keys typically used for both tasks, to increase the burden on the cognitive system in terms of keeping straight which task to perform on the current trial. There might be hundreds or thousands of trials presented in series, with the environment periodically cueing the participant as to which task to perform on the upcoming trial or trials. The conventional dependent measure is switch cost — an increase in response time (and often error) on a trial on which the task switched relative to the previous trial.

Research on task switching is important because it addresses basic questions about goal-directed behavior, and because it lies at the intersection of various domains, including selective attention, executive function, and short-term or working memory. And yet, empirical task-switching research has had tunnel vision in its focus on switch cost (Altmann, in press). Theorizing is still largely in terms of archaic metaphors in which a homunculus scurries about, "reconnecting and reconfiguring the various modules in our brains" (Monsell & Driver, 2000) when the environment cues a new task. The preoccupation with switch cost and the switching homunculus has offered little incentive to raise integrative questions about how task switching might be affected by constraints that we should be familiar with from other domains.

This presentation will identify several new task-switching phenomena, and will relate them to one another and to existing theoretical constraints from the memory domain. Among the new effects that will be discussed are within-run slowing and within-run error increase (Altmann, 2002; Altmann & Gray, 2002); an unconventional, full-run switch cost evident in errors but not latencies; and a task-cue encoding cost incurred whenever a task cue appears, regardless of whether the cue switches the task. This diverse collection may seem difficult to unify when interpreted in terms of a switching homunculus, but has a straightforward interpretation in terms of standard memory constructs like activation, and processes like priming, decay, and proactive interference. A theoretical framework will be presented that integrates these phenomena functionally, and that emphasizes a systems view of cognitive control over the narrow perspective that currently dominates the task-switching literature.

Acknowledgments

This work was supported in part by ONR grant N00014-03-1-0063.

References

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