
Stochastic Models of Executive Control in Monkeys and Humans
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Our project is an interdisciplinary investigation of humans and monkeys to elucidate how control over attention, categorization, and response preparation are instantiated in neural processes underlying adaptive behavior. Humans and monkeys perform tasks that require them to make a saccadic eye movements towards a target. Planned eye movements may need to be cancelled because of an imperative stop signal (countermanding) or because the location of the target changes (search step). The timing and accuracy of eye movements are recorded in both humans and monkeys performing the task, and the activity of neurons in the frontal lobes of monkeys are recorded while they are performing the task. Behavior of humans and monkeys and neural activity of monkeys are described in terms of computational cognitive models. Single-cell neurophysiology by itself is limited by a lack of linking propositions that bridge the gap between single-cell behavior and psychological states of the cognitive processes that the single cells implement. Cognitive models provide quantitative descriptions of the computations underlying psychological states as well as quantitative descriptions of the neural processes that underlie them. Computational cognitive modeling by itself is limited by a mimicry problem that stems from an inability to "open the black box" and observe the inner processes that underlie behavior. Computational models with different underlying processing assumptions often predict the same overt behavior. Our research confronts the mimicry problem by identifying underlying processes with neural behavior, allowing distinctions between models that produce the same overt behavior.

Project Website

http://www.psy.vanderbilt.edu/faculty/lps