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Neural mechanisms of sensorimotor decisions in the cerebral cortex

While traditional psychological theories have viewed cognitive processes such as decision-making as separate from sensorimotor control, recent studies are beginning to question that assumption. In particular, a growing body of evidence suggests that when decisions involve action, they are made within the sensorimotor system itself. I will describe some of these studies, including recent results from my lab examining the activity of neurons in dorsal premotor cortex while a monkey makes decisions between different potential reaching movements. These results confirm predictions of a computational model in which multiple potential actions are simultaneously represented within a distributed population of tuned neurons, and engage in a competition that is biased by influences from basal ganglia and prefrontal cortex. The model proposes that while the decision process is influenced by putatively cognitive regions, its outcome is determined by neural interactions within the sensorimotor system itself. In other words, our decisions may evolve through thinking, but we commit to them by acting.

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