Cognitive Control Mode Predicts Behavioral Expression of Model-Based Reinforcement-Learning

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Abstract: A converging body of work suggests that cognitive control operates via two distinct operating modes – proactive control and reactive control, dissociable on a number of dimensions, such as computational properties, neural substrates, temporal dynamics, and consequences for information processing. At the same time, two forms of reinforcement learning (RL), called Model-Based and Model-Free RL, which are theorized to operate and parallel and jointly control behavior, are dissociable along similar dimensions, and thus suggest that individual differences in proactive versus reactive control (which are well documented in the literature) should map onto expression of the two forms of RL. We test this hypothesis by revealing how expression of proactive control in a well-established cognitive control task predicts usage of model-based reinforcement learning in a sequential choice task. In short, we find that expression of proactive control rather strongly predicts expression of Model-Based, but not Model-Free choice.