

A Neural and Computational Basis for Switch-cost: Converging Evidence From Rats and Recurrent Neural Networks

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Behavioral flexibility is at the heart of higher cognition. One prominent feature of this flexibility is that there is a 'switch cost', an increase in errors and reaction time when switching between tasks. To investigate the mechanisms underlying switch cost, we trained rats and recurrent neural networks (RNN) to perform a task-switching paradigm using similar training procedures. Both rats and RNNs developed switch cost, which diminished with more training, suggesting that switch cost is not caused by biological circuit constraints, and likely results from a lack of experience on switches. We then analyzed activity and performed perturbation experiments in well-trained rats and RNNs, and found neurophysiological and in silico causal evidence that the cost of switching is largely due to interference from residual memory of the previous task. Together, our results provide insights to the source of switch cost and suggest potential ways to improve behavioral flexibility.

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