

# Reinforcement Learning over Time: Effects of Spacing on the Mechanisms Supporting Feedback Learning

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**Presentation Abstract Summary** Reward learning paradigms are increasingly being extended to understand learning dysfunctions in mood and psychiatric disorders as well as addiction in the area of computational psychiatry. However, one critical characteristic that this research ignores is the effect of time on learning. Recent work has shown that rapidly-paced learning sessions rely predominantly on short-term working memory but not reinforcement learning as traditionally understood. Meanwhile, spacing is also known to have strong positive effects on reward learning in animals, but effects in humans have not been investigated. In Project 1, we examined “spaced” long-term learning completed across weeks vs. matched “massed” learning completed in a single session. Three weeks after learning, we found that spaced stimuli exhibited significantly greater maintenance of value associations. fMRI results suggest that massed value associations elicited greater PFC engagement than spaced associations. In Project 2, we examined spacing effects within a single session. After learning, we found that a brief rest increased performance for in the spaced condition, but decreased in the massed condition. Overall, these studies begin to address a large gap in our knowledge of fundamental processes of reinforcement learning, with potentially broad implications for our understanding of learning in mood disorders and addiction.

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