



Prediction error and trace dominance determine the fate of fear memories after post-training manipulations

Joaquín M. Alfei^{1,4}, Roque I. Ferrer Monti^{1,4}, Víctor A. Molina²,
Adrián M. Bueno¹ and Gonzalo P. Urceyay³

Author Affiliations

Corresponding author: gonurceyay@gmail.com

^{1,4} These authors contributed equally to this work.

Abstract

Different mnemonic outcomes have been observed when associative memories are reactivated by CS exposure and followed by amnestics. These outcomes include mere retrieval, destabilization–reconsolidation, a transitional period (which is insensitive to amnestics), and extinction learning. However, little is known about the interaction between initial learning conditions and these outcomes during a reinforced or nonreinforced reactivation. Here we systematically combined temporally specific memories with different reactivation parameters to observe whether these four outcomes are determined by the conditions established during training. First, we validated two training regimens with different temporal expectations about US arrival. Then, using Midazolam (MDZ) as an amnestic agent, fear memories in both learning conditions were submitted to retraining either under identical or different parameters to the original training. Destabilization (i.e., susceptibility to MDZ) occurred when reactivation was reinforced, provided the occurrence of a temporal prediction error about US arrival. In subsequent experiments, both treatments were systematically reactivated by nonreinforced context exposure of different lengths, which allowed to explore the interaction between training and reactivation lengths. These results suggest that temporal prediction error and trace dominance determine the extent to which reactivation produces the different outcomes.

Footnotes

[Supplemental material is available for this article.]

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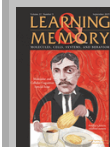
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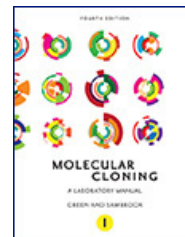
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