

Partial extinction and reinstatement

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1. Summary

Introduction

Fear extinction is not permanent, but it may suffer from different forms of relapse. Partial extinction has proved to be an effective way to alleviate some forms of relapse such as rapid reacquisition (in humans [1]) or reinstatement and spontaneous recovery (in animal learning [2]).

In the partial extinction preparation used here (see Design), a gradually decreasing sparse number of CS-US pairings are introduced within the extinction treatment.



Why partial extinction works?

According to Bouton et al. [1], the safety memory developed during extinction will be more readily retrieved if CS-US pairings are not only part of the acquisition but also are part of the extinction context, as in partial extinction.

According to Gershman et al. [3], a gradual reduction in the number of CS-US pairings during extinction will not lead to the formation of a new (more vulnerable) safety memory, as it is normally assumed, but to a modification (i.e., permanent weakening) of the original fear memory.

“The CS-US trial as a retrieval cue of the safety memory”
vs.
“Weakening of the original fear memory”

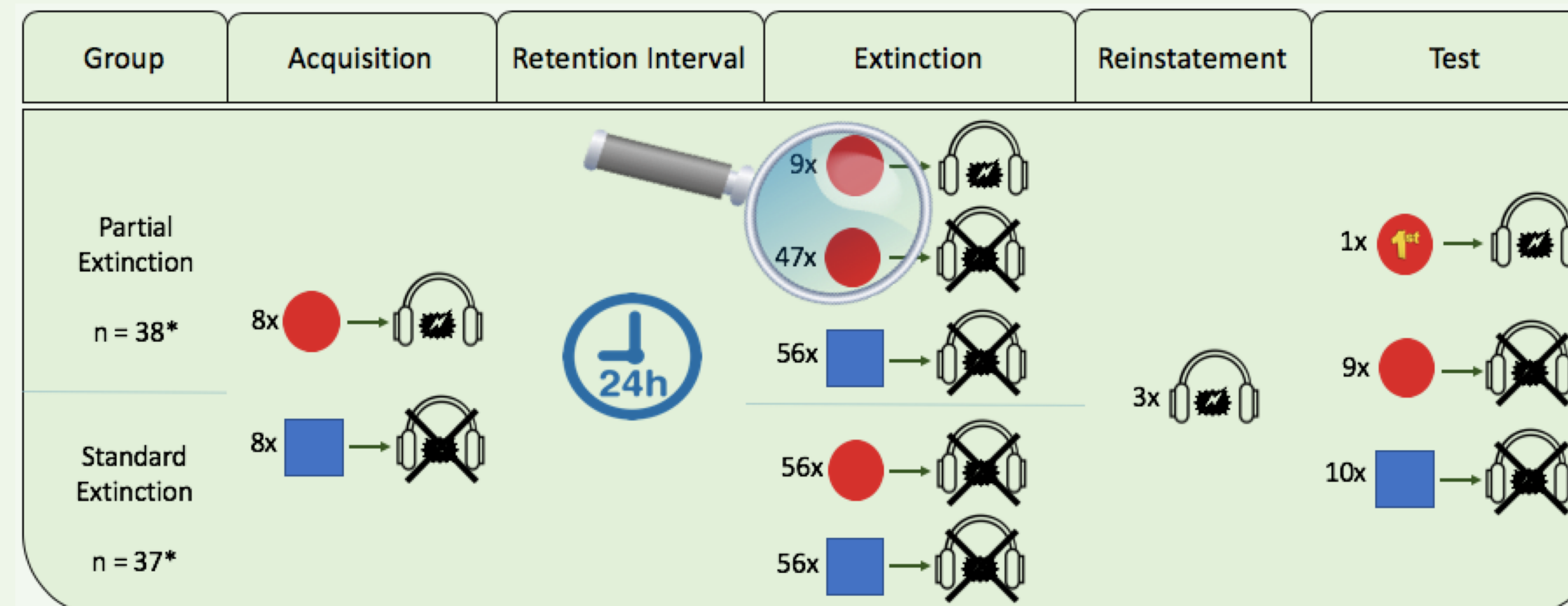
Our objectives

First, we tried to evaluate whether partial extinction can reduce the reinstatement effect in a differential human fear conditioning paradigm.

Second, we evaluated which of the two accounts of the partial extinction effect offered a better understanding of our results.

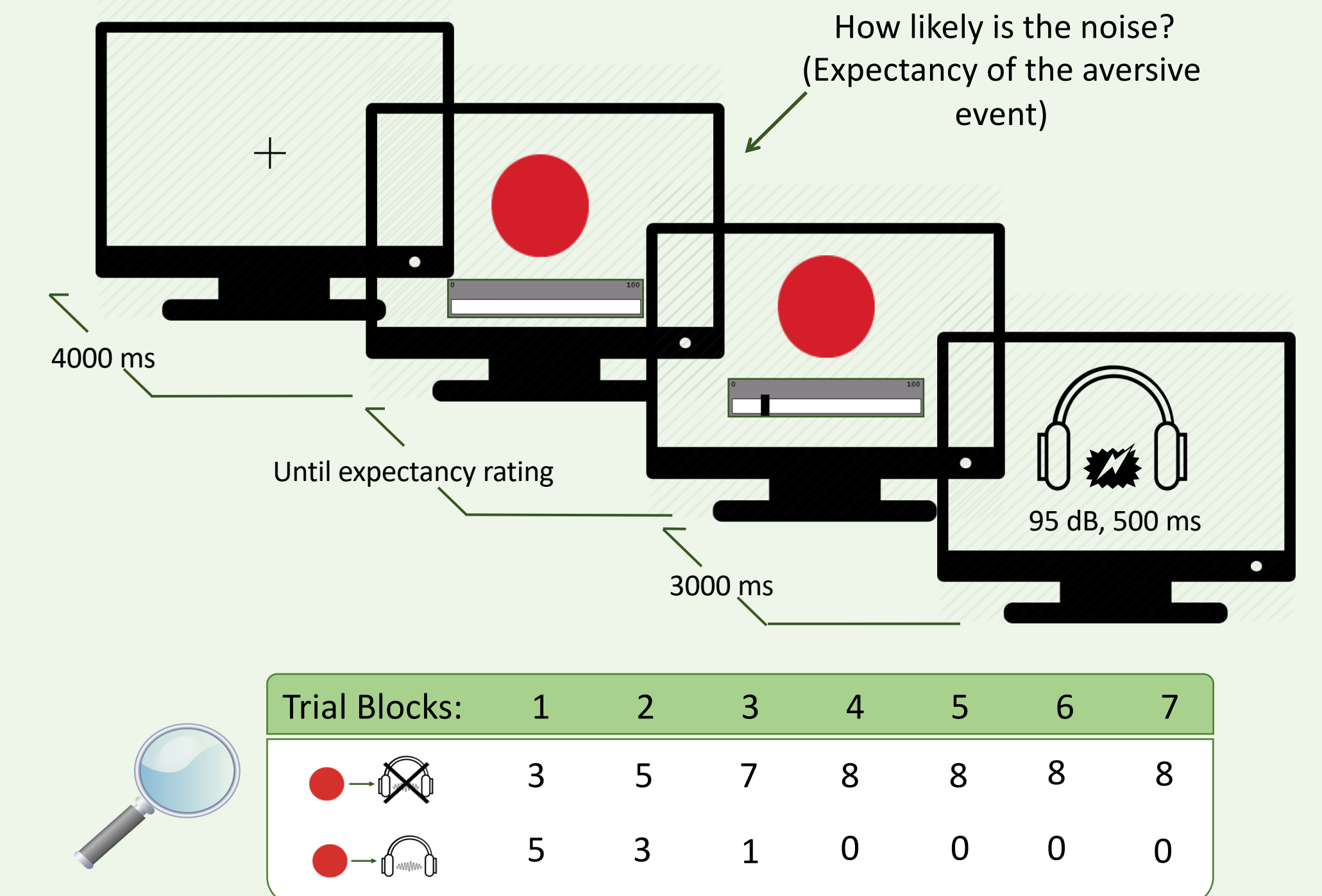
2. How did we do it?

Design

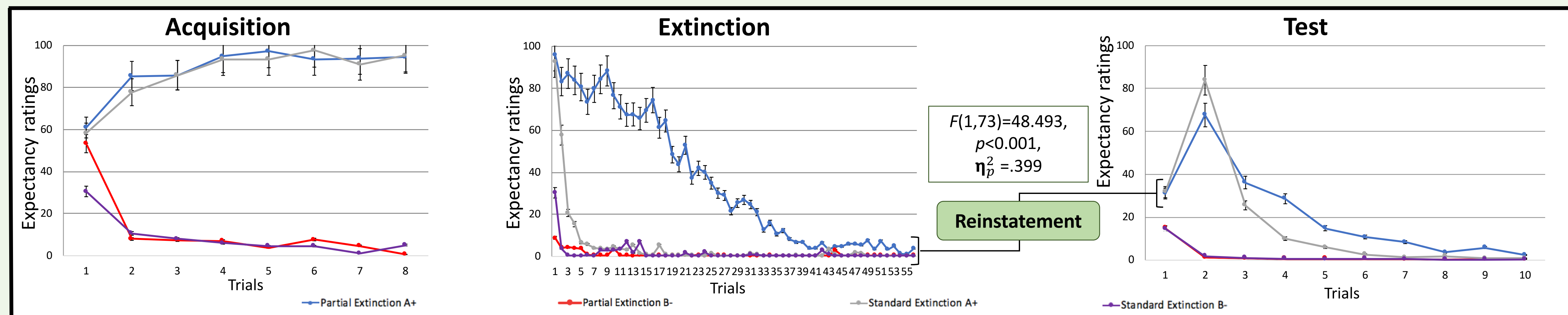


*Undergraduate students.

Procedure



3. What did we obtain?



Differential conditioning in both groups.
 $F(1, 73) = 1767.731, p = .000, \eta_p^2 = .96$

Slower extinction in the partial extinction group.
 $F(15.626, 1140.691) = 33.711, p < .001, \eta_p^2 = .316$

Equivalent asymptotic extinction in both groups.
 $t(37.07) = 1.837, p = .074, d_s = .42$

Trial 1. Ratings did not differ between both groups.
 $t(70.613) = -.076, p = .939, d_s = -.018$

Trial 2. Ratings were higher in the standard than in the partial extinction group.

$t(71.027) = -2.246, p = .028, d_s = -.52$
Ratings decreased more slowly in the partial than in the standard extinction group.

$F(3.291, 269.83) = 5.376, p = .001, \eta_p^2 = .062$

4. Conclusion

Regarding objective 1, partial extinction did not serve to reduce reinstatement: **Reinstatement was significant and equivalent in both groups.**

Regarding objective 2, results from trials 1 and 2 in the test phase are better accommodated by Bouton et al's account of partial extinction than by Gershman et al's (see Predictions for the Test Phase). Besides, the slower reacquisition of extinction during the test in the partial extinction group seems also consistent with Bouton et al's account (see a comparable result when the test phase is conducted in acquisition as shown by Morís et al. [4]).

References

- [1] Bouton, M. E., Woods, A. M., & Pineño, O. (2004). Occasional reinforced trials during extinction can slow the rate of rapid reacquisition. *Learning and Motivation, 35*, 371-390.
- [2] Gershman, S. J., Jones, C. E., Norman, K. A., Monfils, M. H., & Niv, Y. (2013). Gradual extinction prevents the return of fear: implications for the discovery of state. *Frontiers in Behavioral Neuroscience, 7*(164).
- [3] Gershman, S. J., Monfils, M. H., Norman, K. A., & Niv, Y. (2017). The computational nature of memory modification. *Elife, 6*, e23763.
- [4] Morís, J., Barberia, I., Vadillo, M. A., Andrades, A., & López, F. J. (2017). Slower reacquisition after partial extinction in human contingency learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 43*, 81-93.

Predictions for the Test Phase

Trial 1 (before any CS-US trial; see Design)		Trial 2 (after a CS-US trial; see Design)	
Bouton et al.	Gershman et al.	Bouton et al.	Gershman et al.
Reinstatement should be obtained in both groups.	Reinstatement should only be obtained in the standard but not in the partial extinction group.	Conditioning should be lower in the partial than in the standard extinction group.	-