

Re-making memories: A novel paradigm to study memory reconsolidation in rats

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. Introduction

- Memory reconsolidation is the process by which memories de-stabilized due to reactivation are re-stabilized and updated.
- Re-exposure to the experimental environment has been shown to trigger reactivation and updating.
- Most studies have focused on the role of reconsolidation in re-stabilizing a single memory trace.
- Most studies of spatial memory reconsolidation have used aversive learning tasks.
- The objective of this study is to develop a paradigm to investigate the updating of positively-motivated spatial memories in rats.

2. Methods

Animals

Male Fisher 344/Brown Norway hybrid rats

Behavioral Apparatus

 Open field arena with 8 equally spaced feeders (sugar water) with LED lights

Context

Combination of odor, texture, and visual cues in the room

Training

Pretraining

☐ List Training: rats learn a list of 3 feeders (e.g., 3-5-7) in a pseudo-random order

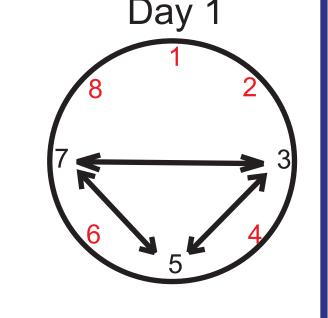
Test

Rats are cued to recall a particular list of feeders

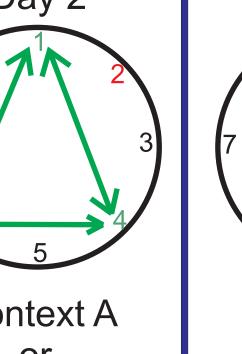
Experimental Design

Experiment 1:

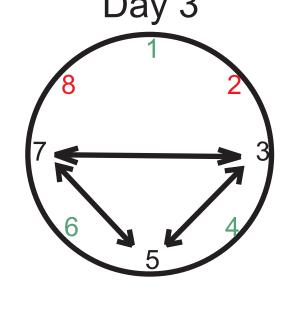
Does reactivating the List 1 memory prior to new learning result in incorporation of new information into the List 1 trace?

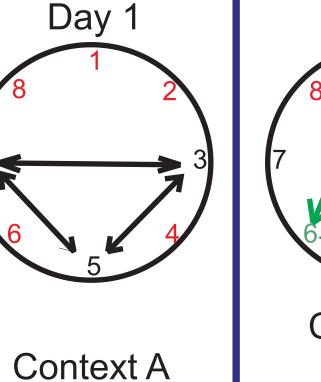


Context A



Context A Context





Experiment 2:

Experiment 4:

immediately?

Context A

Context B

Does reactivating the List 1 memory prior to

Context E

new learning affect the List 1 memory

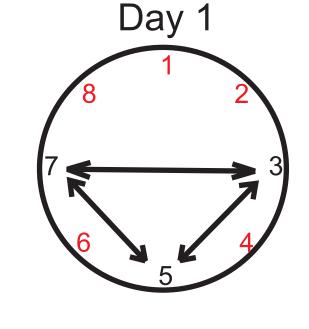
Does reactivating the List 1 memory prior to

new learning affect the List 2 memory?

Context A

Context A

Experiment 3: Does the retrieval context affect the expression of intrusions?



Context A

Context A

Day 2

Context

Context C

Context A

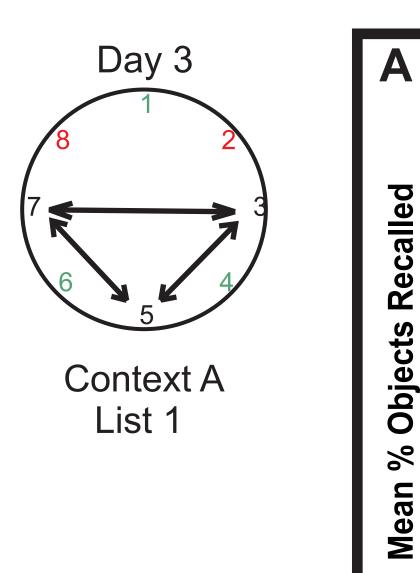
Context A

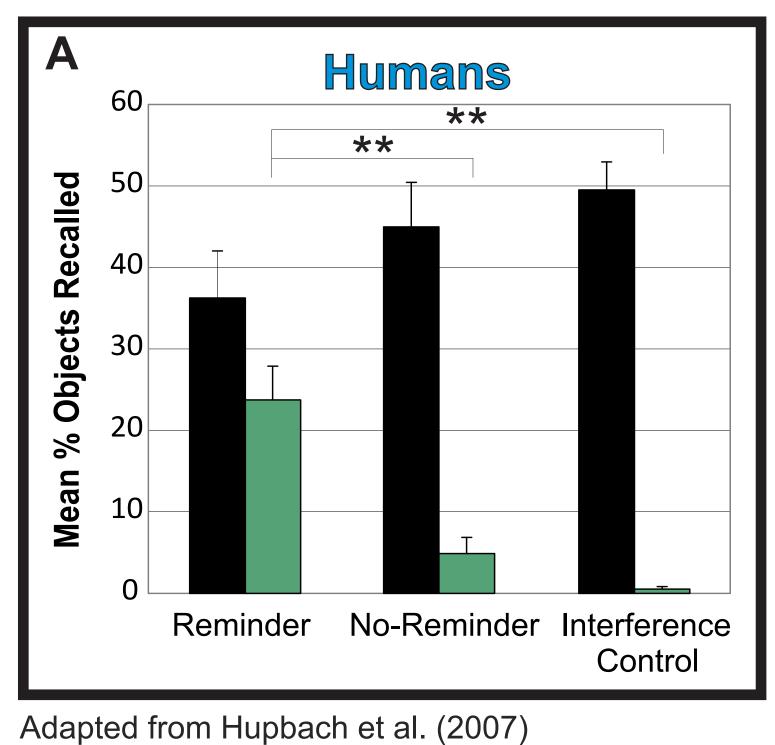
Day 2

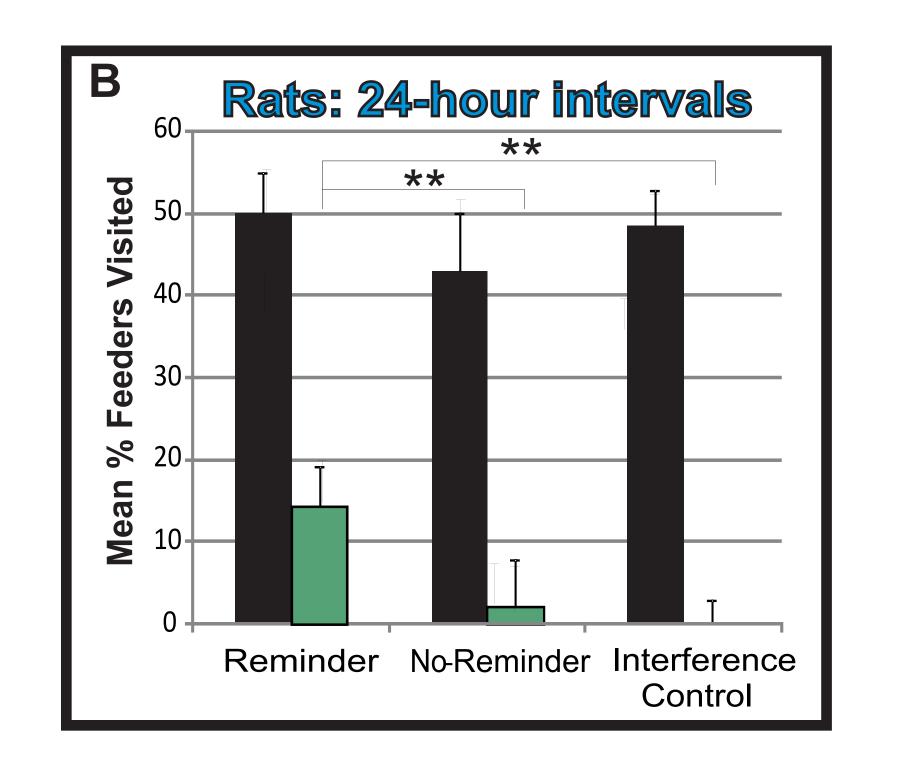
Day 2

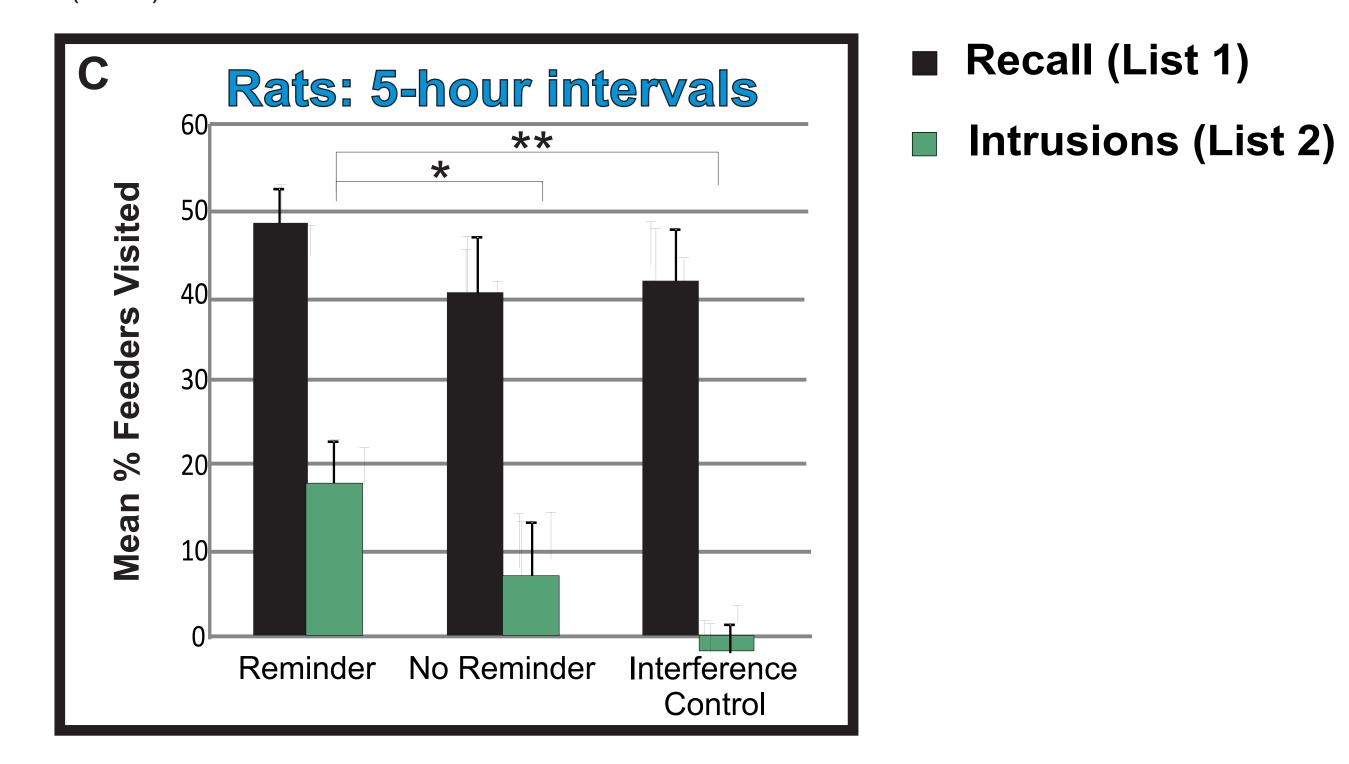
Context A

3. Exp 1: A reminder triggers memory intrusions

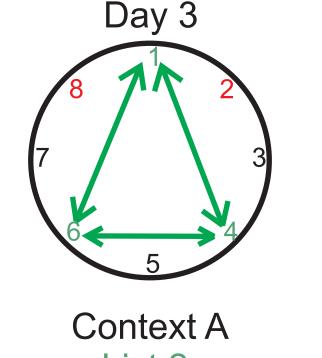


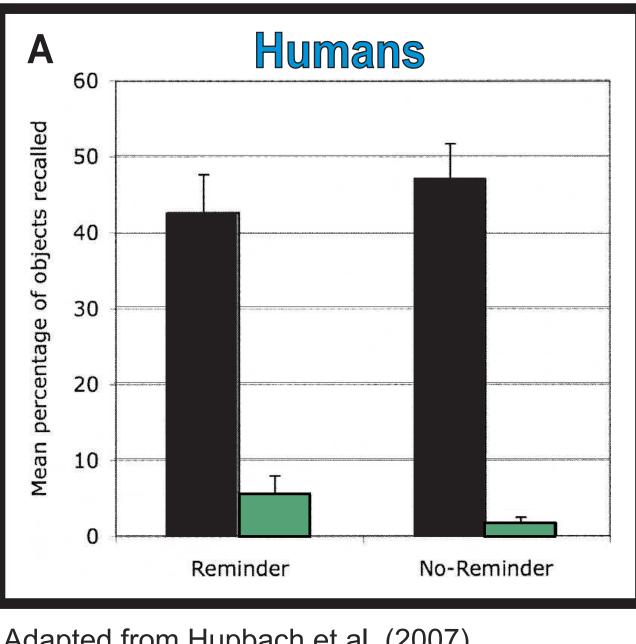


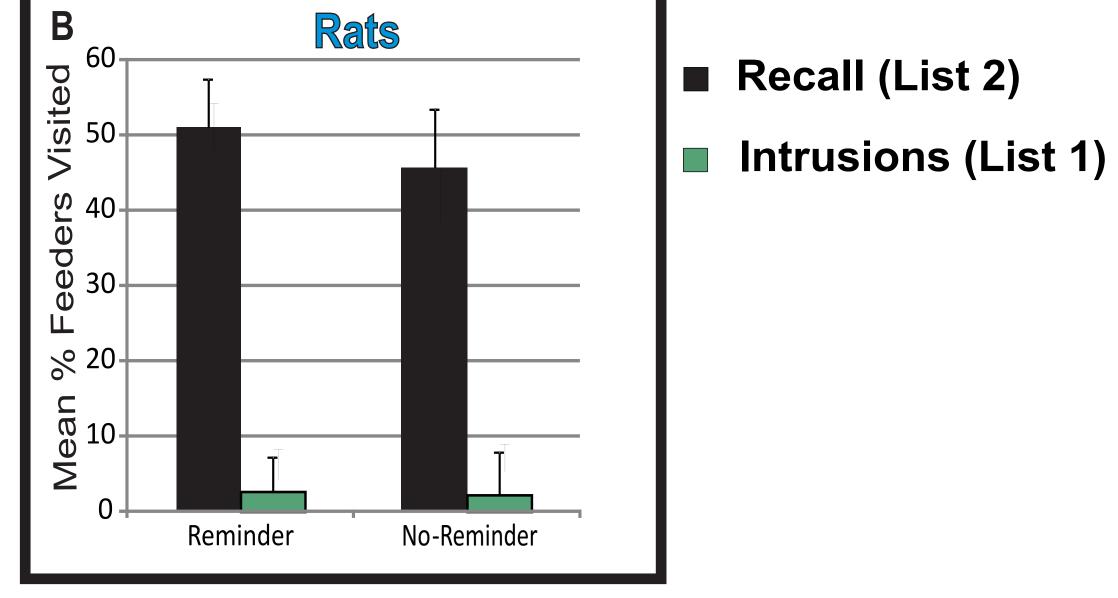




4. Exp 2: Memory intrusions are asymmetric

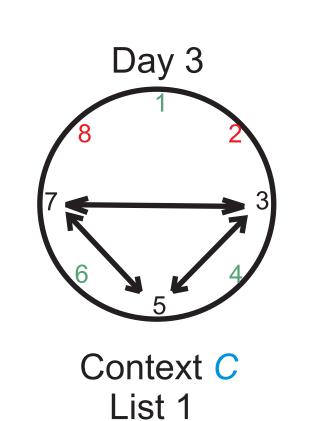


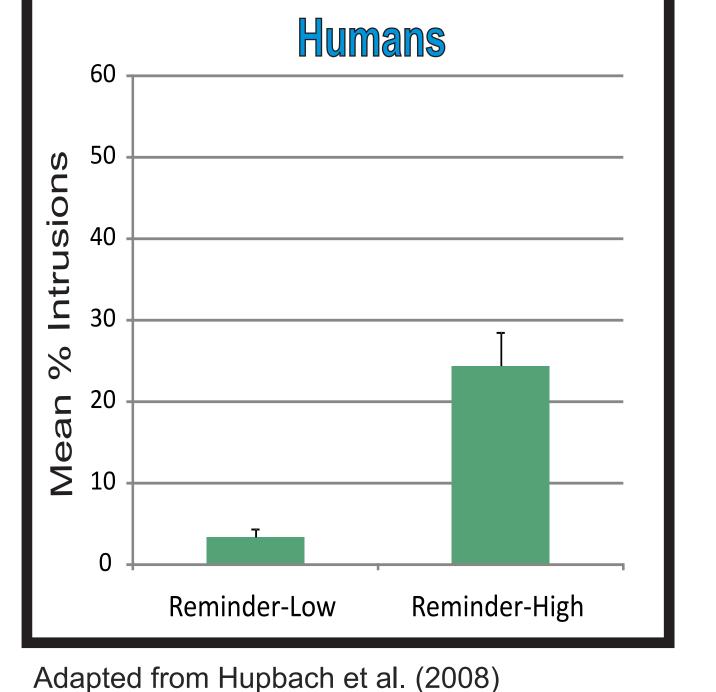


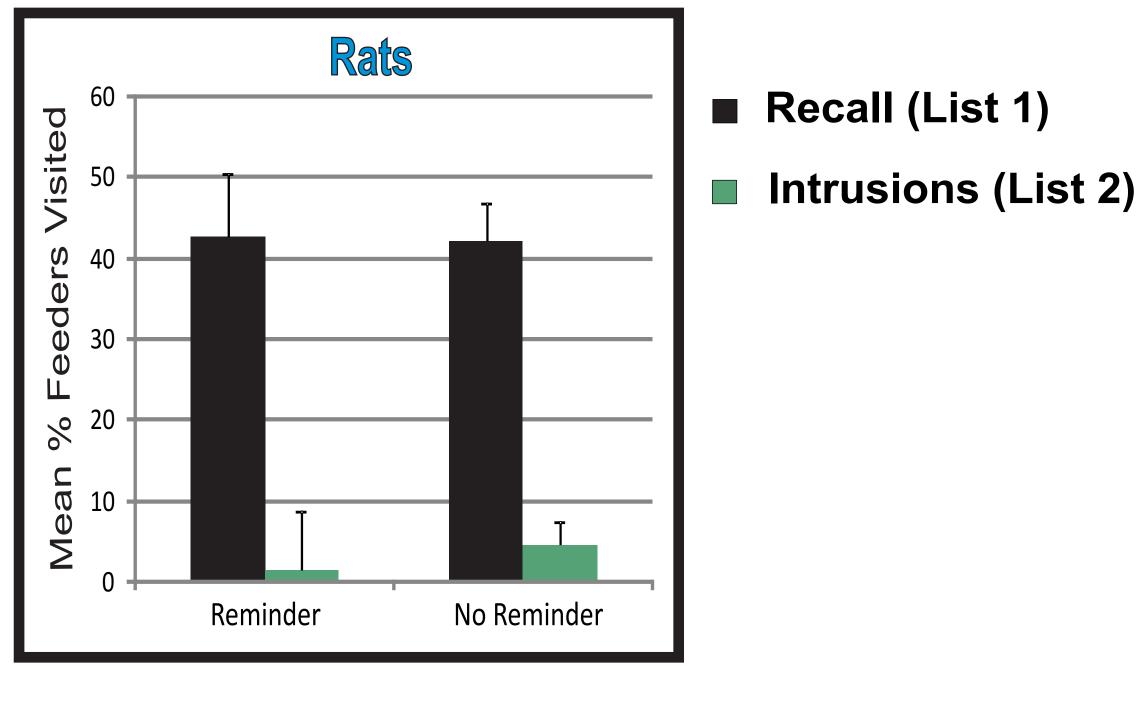


List 2

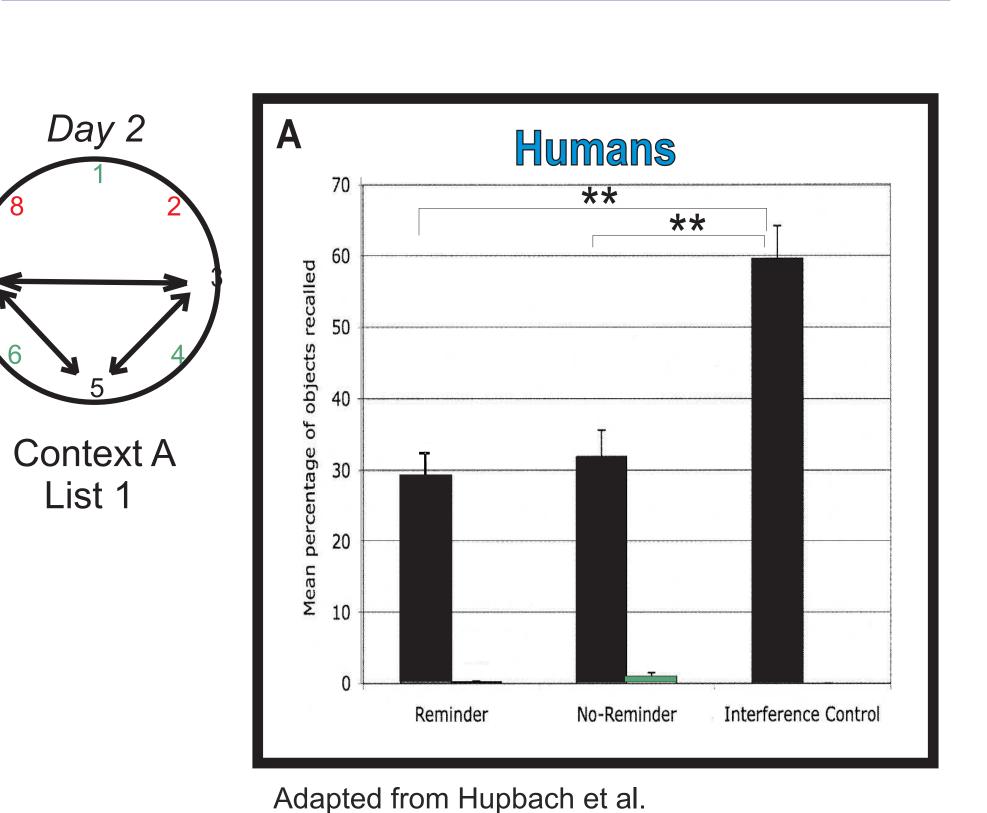
5. Exp 3: Intrusions do not occur in a neutral context

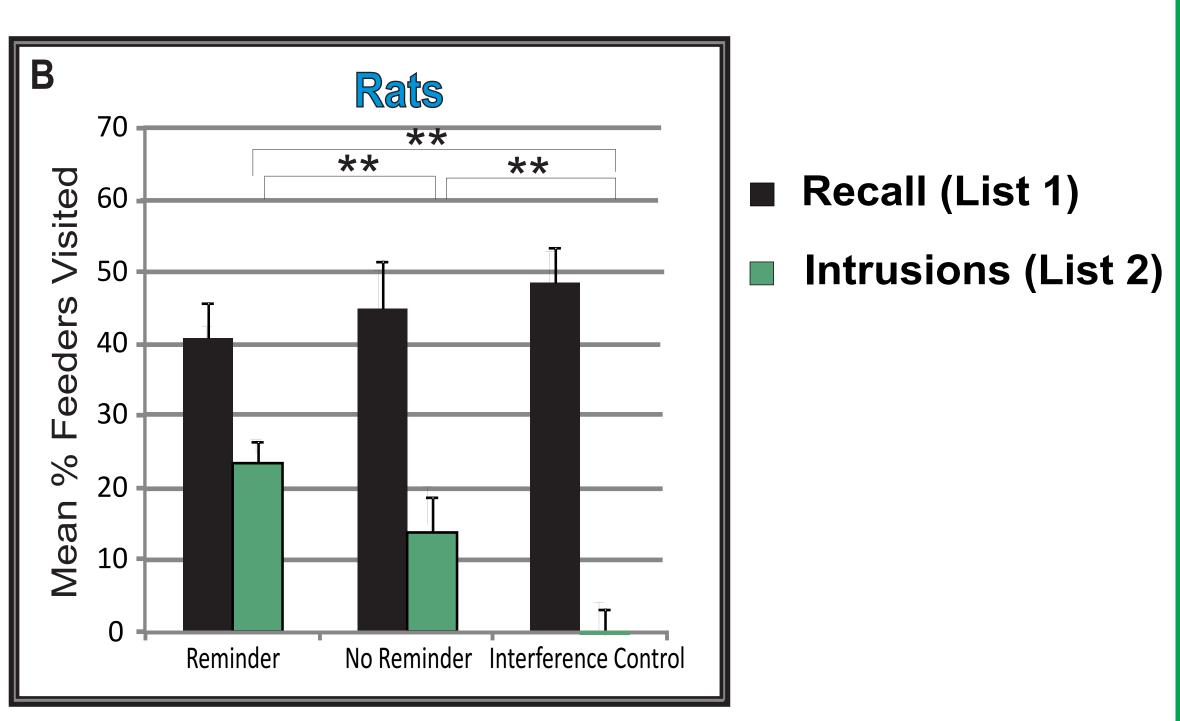




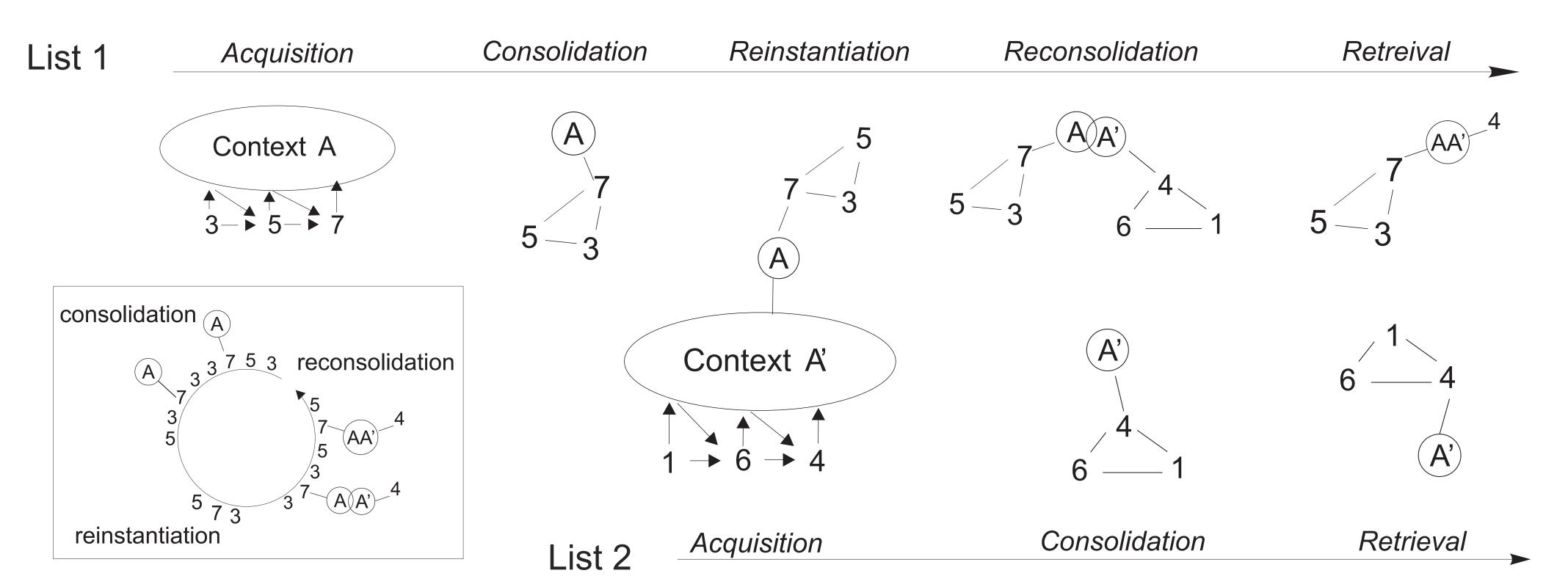


6. Exp 4: Memory intrusions occur in the short-term trace in rats





7. Conceptual Model



8. Conclusions

- □ Reactivating a positively-motivated spatial memory with contextual cues allows for updating to occur in rats.
- Updating occurs in the reactivated memory but not in the new memory.
- In rats, expression of the memory updating depends on the retrieval context.
- Memory intrusions occur in the short-term trace and may reflect competition between the reactivated memory trace and the new memory trace.
- This paradigm will allow us to investigate the neural correlates of memory updating.

9. References

Hupbach A, Gomez R, Hardt O, Nadel L. Reconsolidation of episodic memories: a subtle reminder triggers integration of new information. Learning and memory 3;14(1-2):47-53 (2007).

Hupbach A, Hardt O, Gomez R, Nadel L. The dynamics of memory: Context-dependent updating. Learning and memory 15:574-579 (2008).

10. Acknowledgements

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