Mental context reinstatement may underlie successful retrieval of extinction memories

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1. INTRODUCTION

Context refers to the many facets of information that characterize the situation in which an episodic memory occurs, and place our memories in space and time. Both fear & extinction learning take place in distinct external contexts (Shafir, M. E., 2004). Extinction learning, unlike fear, readily generalizes to novel contexts; and the over expression of generalized fear is a hallmark of neurodevelopmental disorders such as PTSD (Bloom et al., 2013).

Successful retrieval of extinction memories is contextually specific (Bouton, M. E., 2004). Extinction conditioning images are paired with an electric shock to the finger in a controlled environment. Successful retrieval of extinction memories is contextually specific. Memory retrieval is influenced by the context of the original encoding event, and the extinction context will be associated with the reinstatement of the mental context. We predict that the successful retrieval of extinction memories is contextually specific.

Mental context reinstatement may underlie successful retrieval of extinction memories. Extinction test could be associated with the reinstatement of the mental context in which extinction learning occurred.

A mental context framework of episodic memory can be used to understand how humans learn and remember fear and safety. Extinction mental context reinstatement was observed in subjects who exhibited conscious extinction recall the following day. Future directions will explore how fear and extinction contexts compete for extinction, as well as how emotional learning modulates encoding success of episodic memories.

2. METHODS

I. Baseline Category identity decisions are made about images from categories paired with no electric shock. 12 shocks total.

II. Category Fear Conditioning Pavlovian conditioning. Images from one category are paired with a real electric shock to the finger (50mA stimulation). The Next 100 pictures included mental context.

IV. Extinction Recall Subjects are told that a shock is still possible, but receive none.

V. Recognition Memory: Saccade re-generation confirms a test is given for all images in order to build the mental context tag.

VI. Localizer H-back task uses images from the training classifier. Categories include animals, tools, scenes, and text.

3. RESULTS

I. Baseline

Day 1

Category identity decisions are made about images from categories paired with no electric shock. 12 shocks total.

No images are repeated. Emotional learning generalizes to an entire category rather than specific exemplars (Bouton & Murphy, 2010).

Half the images from a single category are paired with an electric shock. 12 shocks total.

Participants report higher levels of shock expectancy ratings. Scene images are flashed for 1s each, 5-7 per ITI.

Scene images in order to build the mental context.

The mental context reinstated at test could influence the renewal of fear or the forgetting of extinction memories.

A one-vs-all logistic regression classifier was trained on exemplars collected during the localizer and used to decode category evidence during experimental runs. ROI for MVPA analysis included Ventral piriform cortex, Ventromedial prefrontal cortex (VMPFC), and Thalamus. Activity is a proxy for the mental context.

A mental context tag can be associated with the reinstatement of the mental context in which extinction learning occurred. The mental context reinstated at test could influence the renewal of fear or the forgetting of extinction memories.

A mental context framework of episodic memory can be used to understand how humans learn and remember fear and safety. Extinction mental context reinstatement was observed in subjects who exhibited conscious extinction recall the following day. Future directions will explore how fear and extinction contexts compete for extinction, as well as how emotional learning modulates encoding success of episodic memories.

4. SUMMARY

A mental context framework of episodic memory can be used to understand how humans learn and remember fear and safety. Extinction mental context reinstatement was observed in subjects who exhibited conscious extinction recall the following day. Future directions will explore how fear and extinction contexts compete for extinction, as well as how emotional learning modulates encoding success of episodic memories.