Reinstatement of mental context facilitates retrieval of extinction memories

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INTRODUCTION

Is mental context reinstatement associated with the retrieval of extinction memories?

EXPERIMENTAL DESIGN

Category Fear Conditioning

Day 1: Extinction with Mental Context Tag

Mental Context can be tagged by associating threat intent with an ongoing task.

Scene images are repeatedly shown during the CS+ extinction, and these images are incidentally encoded alongside extinction memories.

The next day of extinction memories should lead to reactivation of other memories (scene images) encoded within the same mental context.

RESULTS

Univariate Analysis

MVPA-Univariate Regression

ROI regression using each subjects MVPA decoding day 2 context against CS+ - CS- contrast reveals activity in the vmPFC during extinction learning and recall for Control subjects only.

Extinction network activity is related to extinction context reinstatement

The multi-voxel pattern associated with scene images can be decoded the next day, when no scenes are actively perceived. This pattern of activity is a proxy for the reinstatement of mental context, the only point in time during which scenes were observed.

Representational Similarity Analysis

Extinction Encoding to Retrieval Similarity

Control subjects show significantly higher neural pattern similarity between extinction memory encoding and retrieval in both the vmPFC and PPA.

SUMMARY

• Extinction mental context reinstatement reveals activity in the vmPFC during extinction learning and retrieval in control subjects only.

• Context reinstatement is associated with retrieval of extinction memories in controls.

• Control subjects show higher vmPFC neural similarity between extinction encoding and retrieval.

• A mental context model reveals how the brain resolves competition between fear and extinction memories, and could help explain aberrant fear expression in PTSD.

REFERENCES

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Improving the Control of Fear: Healthy Adults to Pathological Anxiety