Disrupted associative binding and memory coherence for negative events and their relationship with intrusions

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Background

• Following a traumatic event, individuals might experience fragmented recall of the event and distressing intrusive images, as seen in posttraumatic stress disorder.

• Memory for events are bound together as single representations supported by the hippocampus, with recognition of a partial cue proposed to trigger holistic retrieval of all elements via pattern completion.

• A general facilitation account proposes that appearance of a negative event will up-regulate all aspects of memory, explaining the appearance of intrusions.

• A dual representation account predicts that negative events enhance memory for the negative content via amygdala up-regulation but impair hippocampal-dependent associative binding and coherence, with intrusions developing due to this imbalance.

• We examined associative binding and memory coherence of negative and neutral naturalistic events and their relationship with intrusive memories.

Experimental design

Encoding

(A) During encoding, participants watched 18 neutral and 18 negative short video clips.

Participants then were asked to record their intrusive memories about the clips for the following week.

Memory Test

(B) To test memory, 3 temporally distinct scenes were taken from each clip and all associations between scenes were tested in both directions.

After a week, participants completed a memory test assessing (C) scene recognition, (D) associative accuracy and (E) temporal order.

Coherence Analysis

Example of contingency table of four combinations for correct and incorrect retrieval of scene 2 and 3 when cued with scene 1.

<table>
<thead>
<tr>
<th>Cue with Scene 1</th>
<th>Retrieval of Scene 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrieval of Scene 2</td>
<td>Correct</td>
</tr>
<tr>
<td>Correct</td>
<td>19</td>
</tr>
<tr>
<td>Incorrect</td>
<td>4</td>
</tr>
</tbody>
</table>

Associative and temporal coherence were assessed by looking at the dependency across multiple retrievals from the same clip.

Conclusions and Implications

• Disruptions in memory coherence were observed across associative and temporal domains for negative events. The lack of temporal coherence correlated with the number of intrusions.

• Results support a dual representation account in that hippocampal-dependent associative binding and coherence were impaired for negative events.

• Findings support the dual representation theory in that traumatic events might lead to fragmented representations that could contribute to intrusive memory development.