Memory Effects of Emotionally Arousing Events

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INTRODUCTION

- Emotionally arousing events that occur throughout our lifetime are often remembered and recalled better than non-emotional events
- The effects of arousal also do not disappear directly after an emotional event, but rather carry over and affect encoding of subsequent stimuli (Tambini et al. 2016)
- In our study, we assessed how arousal affects memory for complex events, particularly for **event, perceptual, and conceptual** details**,** and if the persisting effects of arousal influence the types of details that are encoded and later recalled for low arousal events

METHODS

Materials

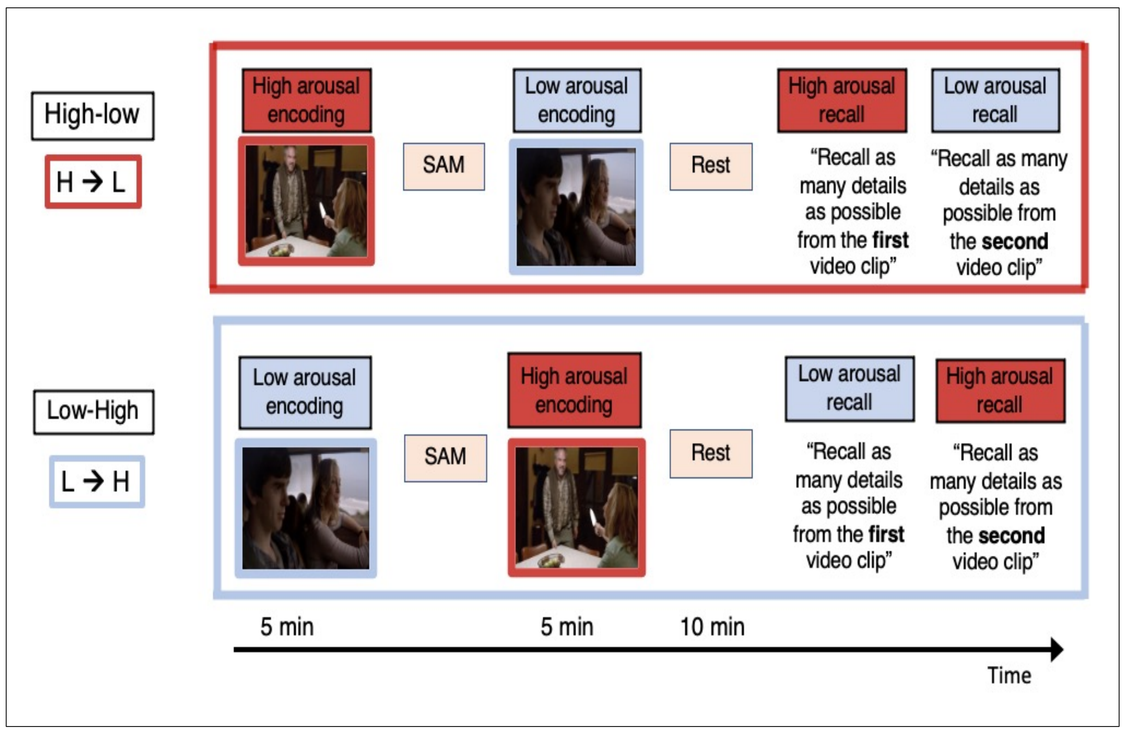
- One five-minute **high arousal negative video** from the Bates Motel
- One five-minute **low arousal neutral video** from the Bates Motel

Participants

- M = 52; Age: *M*: 20.28 years, *SD* = 1.36 years; Gender: 35 females, 17 males, recruited from the McGill Psychology participant pool (SONA)
- Randomly assigned to the low-high arousal condition (watch low arousal video first) or the high-low arousal condition (watch high arousal video first)

Design

- Participants rated their own level of arousal and valence, as well as for the clips, using the Self-Assessment Manikin (SAM)



Scoring

- Participants were given a point each time they correctly recalled any of the three types of episodic details:

(1) Event detail	Action or utterance made by the main characters that **moves the plot forward**
(2) Perceptual detail	**Sensory-perceptual**, spatial, temporal, or feature-based object details
(3) Conceptual detail	Inferences suggested by the clips, **thoughts** on the clips

- Participants given a point for "event incorrect" each time they incorrectly recalled an event detail

HYPOTHESES

1) Global enhancement effect of arousal: An **increase** in event, perceptual, and conceptual details for **high arousal clips** compared to low arousal clips
2) Carry-over effect of arousal: Viewing high arousal clip first leads to encoding the following low arousal clip with **more event details**, compared to when the high arousal clip follows the low arousal clip

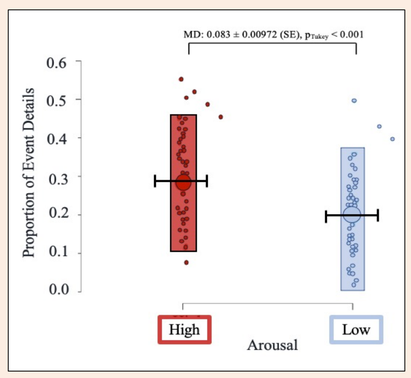
RESULTS

Hypothesis 1: Global enhancement effect of arousal

- Linear mixed effects model (LMM) revealed:

1) **Main effect of arousal on event details** ($p < 0.001$): Greater proportion of event details for the high vs. low arousal clip (**MD = 0.083**)
2) **Main effect of arousal on perceptual details** ($p < 0.01$): Greater number of perceptual details for high vs. low arousal clip (**MD = 6.94**)
3) **Main effect of arousal on conceptual details** ($p < 0.05$): Greater number of conceptual details for high vs. low arousal clip (**MD = 1.35)**

(1)



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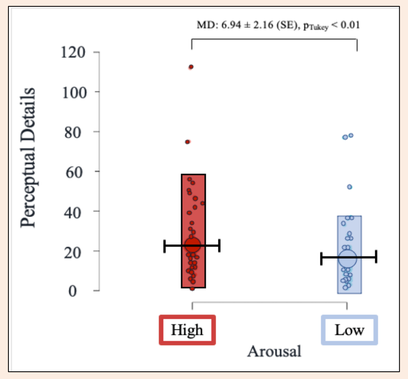

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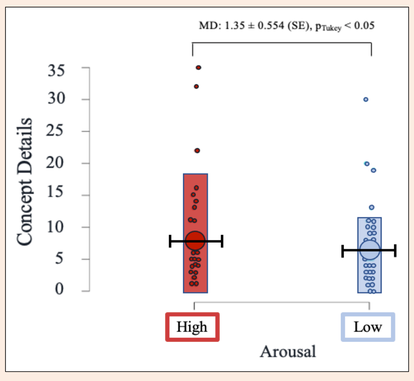
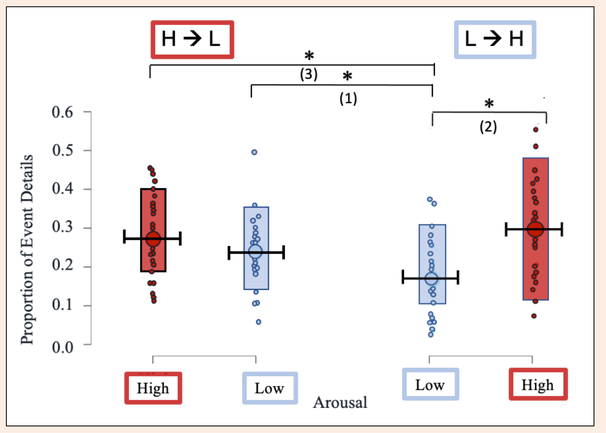


Hypothesis 2: Carry-over effect of arousal

LMM revealed a **significant interaction effect between order and arousal,** and post-hoc tests revealed three significant contrasts:

1) For low arousal clip: High-low group recalled greater proportion of event details compared to the low-high group ($p_{Tukey} < 0.05$)
2) In low-high group: Greater proportion of event details for high vs low arousal clip ($p_{Tukey} < 0.001$).
3) Greater proportion of event details in high-low group for high arousal clip compared to low-high group for low arousal clip ($p_{Tukey} < 0.01$)



CONCLUSION

- Our main findings indicated **a global enhancement effect of high arousal conditions**, increasing the amount of event, perceptual, and conceptual details recalled for these events
- Arousal may result in this global enhancement due to increased attention and amygdala activation (Mather, 2007)
- We also observed that viewing highly arousing negative events before low arousal neutral events enhanced the recall of event details for this low arousal material, exhibiting a **proactive, unidirectional carry-over effect of emotional arousal**
- This finding aligns with research on mood induction effects on memory and studies on biasing effects of arousing brain states on future neutral stimuli
- Overall, these results extend prior work by observing global enhancement and carryover effects with stimuli depicting complex events unfolding over time

Sources

- Mather, M. (2007). Emotional Arousal and Memory Binding: An Object-Based Framework. *Perspect. Psychol. Sci.* 2(1), 33-52. https://doi.org/10.1111/j.1745-6916.2007.00028.x
- Tambini, A., Rimmele, U., Phelps, E.A., & Davachi, L. (2017). Emotional brain states carry over and enhance future memory formation. *Nat. Neurosci.* 20, 271–278. https://doi.org/10.1038/nn.4468