

Background

- Emotional arousal impacts how memories are formed and remembered^{1,2}.
- Emotional arousal can also impact how subsequent memories are formed, presenting as a carry-over memory-enhancing effect of arousal³.
- Since everyday events involve a variety of details that unfold over time, we ask:
 - How does arousal impact the way event details are encoded into memory?
 - Does the presence of an arousing event affect how new non-arousing events are encoded?

Methods

Participants: 20 healthy adults (F = 17, M age = 24 years) recruited from McGill University SONA participant pool

Materials: Emotional (negative and high arousal) and Neutral clips (~3.5 min) from two stories "Bates Motel" and "Pihu"



Procedure: Participants watched all four videos

Story One	Emotion First Group		Story Two	Neutral First Group	
Emotional Clip	Neutral Clip	Emotional Clip	Neutral Clip	Neutral Clip	Emotional Clip
Neutral Clip	Emotional Clip	Neutral Clip	Emotional Clip	Emotional Clip	Neutral Clip

After 5 minutes, participants recalled and rated the videos

Recall all the details from the video	Arousal? Valence? 1 to 5	Familiar? 1 to 5
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Scoring

Each recollection was scored for the number and temporal order of event details in comparison to how they were presented in the video

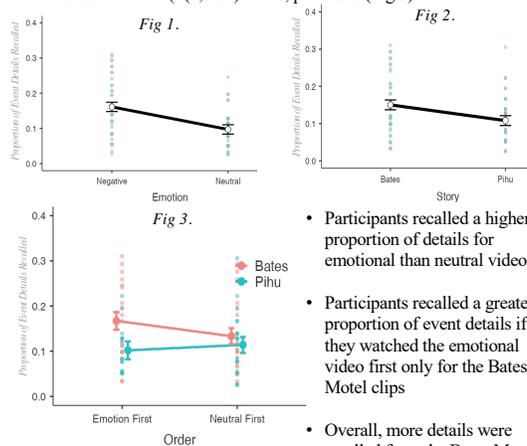
Video Event Details	Recalled	Order
1. She entered the room	0	
2. She washed dishes	1	3
3. There was a noise	1	1
4. A man arrived	1	2

She hears a noise. A man was there. She was washing dishes.

Analysis and Results

Number of Event Details / Total Details

- A linear mixed model estimated the proportion of event details recalled from EMOTION (emotion, neutral), GROUP (emotion first, neutral first), and STORY (Bates Motel, Pihu) and the interactions of these factors
- A MAIN effect of EMOTION ($F(1, 52.1) = 32.16, p < 0.001$ (Fig 1), STORY ($F(1, 52.1) = 13.98, p < 0.001$ (Fig 2), and an interaction between ORDER*STORY ($F(1, 52.1) = 4.46, p = 0.040$ (Fig 3)



- Participants recalled a higher proportion of details for emotional than neutral videos
- Participants recalled a greater proportion of event details if they watched the emotional video first only for the Bates Motel clips
- Overall, more details were recalled from the Bates Motel story than from the Pihu story

What is driving the effect of STORY on the proportion of details?

	Bates Motel	Pihu	Significance (p-value)
Number of Events	59.5 (1.0)	37.5 (1.52)	<.001
Arousal Ratings (1 to 5)	2.48 (1.32)	2.65 (1.25)	0.545
Valence Ratings (1 to 5)	3.55 (1.34)	3.48 (1.22)	0.729
Familiarity Ratings (1 to 5)	1.75 (1.10)	1.0 (0.0)	<.001

Temporal Order Correlation

- A correlation between the order of events present in the video and those in the recall was computed
- A linear mixed model was run to estimate these correlations from EMOTION (emotion, neutral), GROUP (emotion first, neutral first) and STORY (Bates Motel, Pihu) and the interactions of these factors.
- There were no significant effects of any of our variables of interest on the temporal order correlation of the recalled events

Discussion

- We confirmed that emotionally arousing events are recalled better (a higher proportion of emotionally arousing event details were recalled) than neutral events
- We found no evidence that emotional arousal impacts the order in which these details are encoded into memory
- We found partial evidence for a carry-over enhancement effect of arousal on memory. Only for the Bates Motel story, when an emotional (arousing) video was seen first, a following neutral video was encoded and recalled with more details
- Why was this effect selective to Bates Motel? Exploratory analyses indicate that this could be due to greater familiarity with Bates Motel compared to Pihu or that more events occurred in the Bates Motel story than in the Pihu story
- Future work will address how familiarity and story complexity modulate the effect of arousal on memory

References

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- Tambini, A., Rimmele, U., Phelps, E. A., & Davachi, L. (2017). Emotional brain states carry over and enhance future memory formation. *Nature neuroscience*, 20(2), 271-278.

Acknowledgments

