Temporal Structure of Episodic and Semantic Details within Autobiographical Memory Recall: A Pilot Study

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Introduction

- Researchers across disciplines have asked whether there is a common cognitive structure in narratives[1].
- There is ample evidence suggesting arcs of emotional details in narrations[2-3] but most of this work has focused on literature and theatre. Narrative structures in memory retrieval are less explored [4].
- When a memory is retrieved, are specific episodic details retrieved early on, or do they only become available with elaboration?

Primary Question:

Where in a memory narration are episodic and semantic details temporally structured?

Participants

- Pilot Study, N = 6 (5F, 1M)
- Sessions conducted in person in 2019
- **Inclusion criteria:** Age 65-80 years (M = 71), fluency in English, no reported neurological conditions or hearing impairments, memory for sufficient early-life events and musical artists*, MoCA score >=21
- Due to the pandemic, the full dataset (N = 75) is now being conducted online via Zoom [5]
- Participants listened to different music clips in each session before being prompted to recall events. The music clips and their manipulation is tangential to the present analyses[5]

Memory Prompt Selection

During a pre-screening call, participants viewed a list of events and were instructed to select those that they had relevant memories about. Those prompts were used in subsequent sessions.

Autobiographical Interview Sessions

Example Memory Recall

Participants recall a memory about a specific event they selected during prescreening
15 trials for each developmental stage (childhood, adolescence, early adulthood)
45 trials in total
Session order counterbalanced across participants

Memory Prompt - *A friend's birthday party in elementary school* → Memory Recall - Participants recall a specific memory about the prompt for 4 minutes.

Each session is about 60-90 minutes long

Scoring Recalled Memories

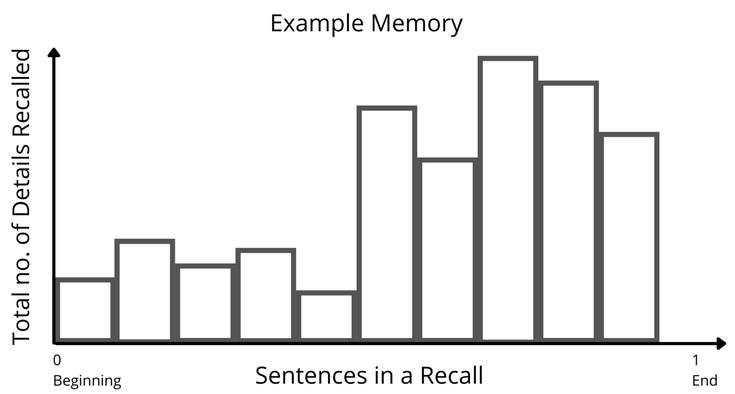
Memories were scored for *internal* vs *external* details using the Autobiographical Interview [6]

Prompt - A friend's birthday party in elementary school

Internal Details	External Details
Episodic + specific event details	Semantic + non-prompted episodic
"On Lisa's 9th birthday, we ate chocolate cake during recess"	"I have always loved birthdays"
	"This year we had a Zoom party"

For any given memory, the position of details from the beginning to the end of recall was calculated as follows:

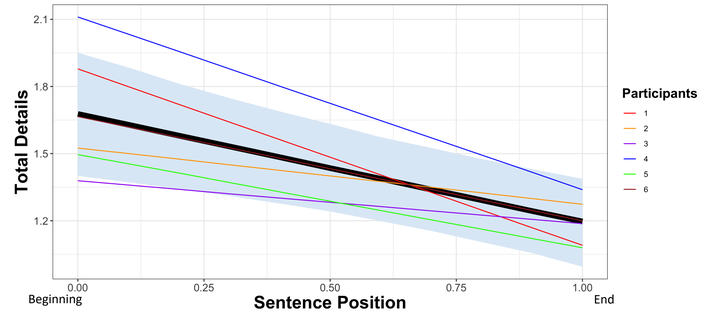
$$\textit{Sentence Position} = \frac{\textit{Number of sentences so far}}{\textit{Total Number of Sentences in the memory}}$$



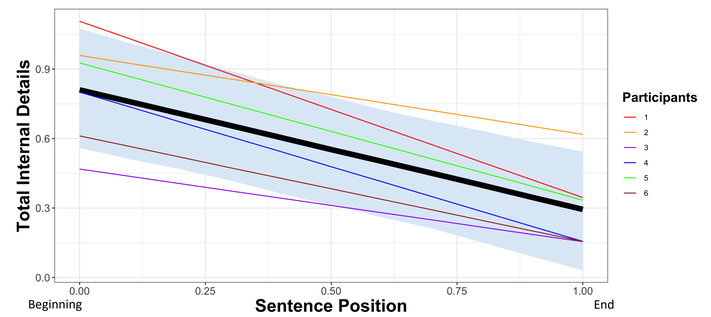
*Each bar represents 1 sentence in the memory recall

Preliminary Results

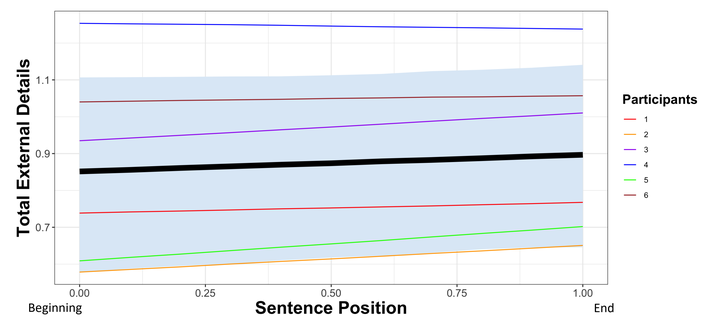
Lines in the following plots represent fitted model predictions, where coloured lines represent individual participants, and the black line is for the fixed effect (group average)



Participants' recall of all details decreased as a function of sentence position.



Participants' recall of all internal details decreased as a function of sentence position.



Participants' recall of all external details were relatively constant as a function of sentence position.

Conclusions

- Specific episodic details are recalled as soon as memory retrieval is initiated, but decrease over time.
- We expect to replicate this pattern in our full dataset (N = 75).

References

1. León, C. (2016). *An architecture of narrative memory. Biologically Inspired Cognitive Architectures, 16, 19–33.* doi:10.1016/j.bica.2016.04.002
2. Reagan, A. J., Mitchell, L., Kiley, D., Danforth, C. M., & Dodds, P. S. (2016). *The emotional arcs of stories are dominated by six basic shapes. EPJ Data Science, 5(1).* doi:10.1140/epjds/s13688-016-0093-1
3. Boyd RL, Blackburn KG, Pennebaker JW. The narrative arc: Revealing core narrative structures through text analysis. Sci Adv. 2020 Aug 7;6(32):eaba2196. doi: 10.1126/sciadv.aba2196. PMID: 32821822; PMCID: PMC7413736.
4. Gillian Wigglesworth. Children's individual approaches to the organization of narrative. *Journal of Child Language*, 24(02):279–309, 1997.
5. Bloom, P. A., Bartlett, E., Kathios, N., Algharazi, S., Siegelman, M., Shen, F., ... Aly, M. (2020, October 6). Stage 1 Registered Report Manuscript: Effects of familiar music exposure on deliberate retrieval of remote episodic and semantic memories in healthy aging adults. https://doi.org/10.31234/osf.io/tejb4
6. Levine, B., Svoboda, E., Hay, J. F., Winocur, G., & Moscovitch, M. (2002). Aging and Autobiographical Memory: Dissociating Episodic From Semantic Retrieval. *Psychology and Aging, 17*(4), 677–689. https://doi.org/10.1037/0882-7974.17.4.677

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