

Detail and spatiotemporal structure in naturalistic recall



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Background

In laboratory (e.g. word list) recall, episodic memory is defined by **temporal contextual organization**¹

Encoding
...apple cat boat dog cup... Retrieval
"cup" "cat" "dog" "cup"...

In autobiographical recall, episodic memory is defined by **recovering specific details (sights, feelings..)**²



Temporal organization is a **universal organizing principle** in word list recall at short delays³

What about **recall of complex real-world experiences** at naturalistic delays?

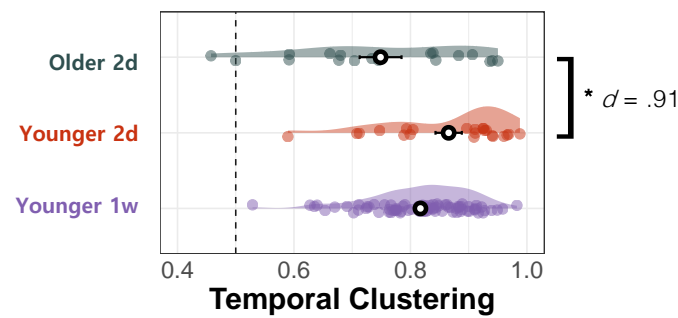
Are more **temporally structured** memories richer in **episodic detail**⁴?

Results

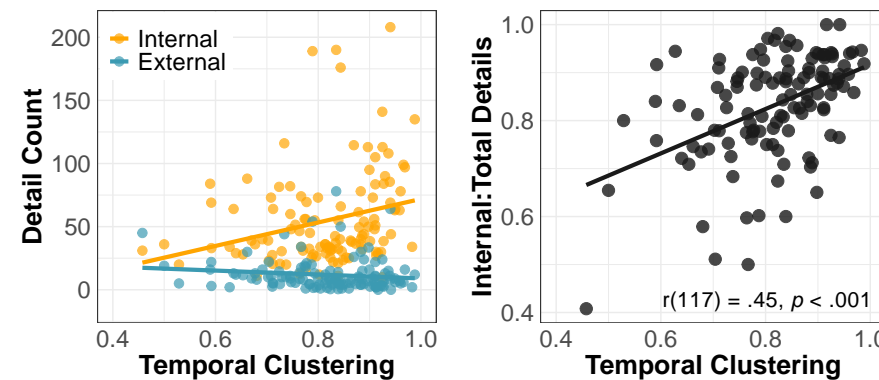
spatiotemporal context guides real-world recall dynamics

clustering

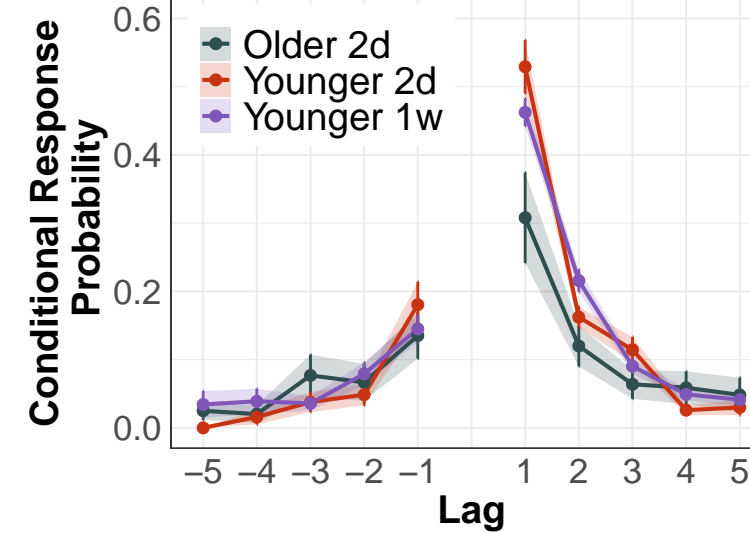
impaired with age but not remoteness



+ correlates with **internal (episodic) details**

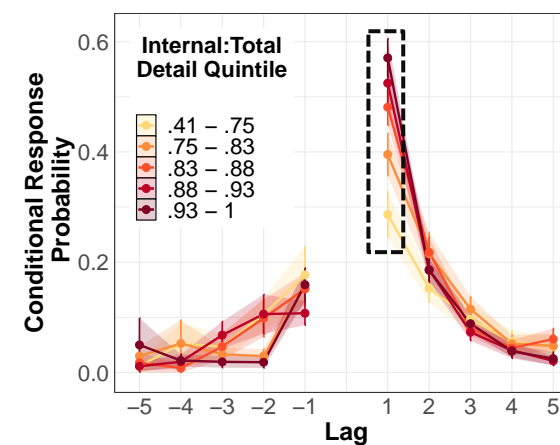


- Details log-transformed for analysis to correct for significant skewness
- interaction between clustering & detail type ($F(1,113) = 13.12, p < .001$); no interaction with group
- Temporal clustering significantly predicts internal:total details while modelling the number of time-tagged items recalled (i.e. transitions made)



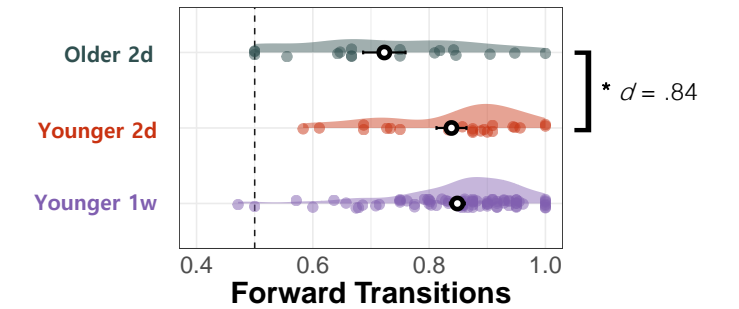
Errors bars are bootstrap-derived standard error (1000 iterations)
Significant age-related reduction at Lag 1 ($p = .009, d = .77$)
No difference in serial position or recall initiation curves (not shown)

more **context reinstatement**, more **detail-rich recall**

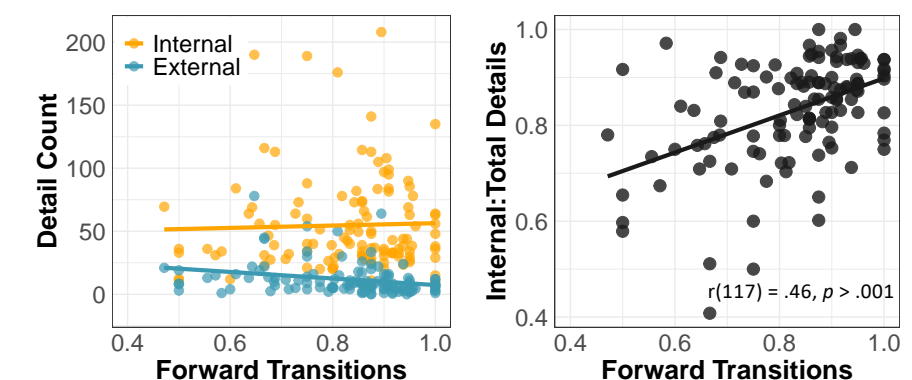


forward asymmetry

impaired with age but not remoteness



- correlates with **external (non-episodic) details**



- Details log-transformed for analysis to correct for significant skewness
- interaction between asymmetry & detail type ($F(1,113) = 10.58, p < .001$); no interaction with group
- Asymmetry significantly predicts internal:total details while modelling the number of time-tagged items recalled (i.e. transitions made)
- temporal clustering and forward transitions are correlated but explain unique variance in internal:total detail proportion when modelled together

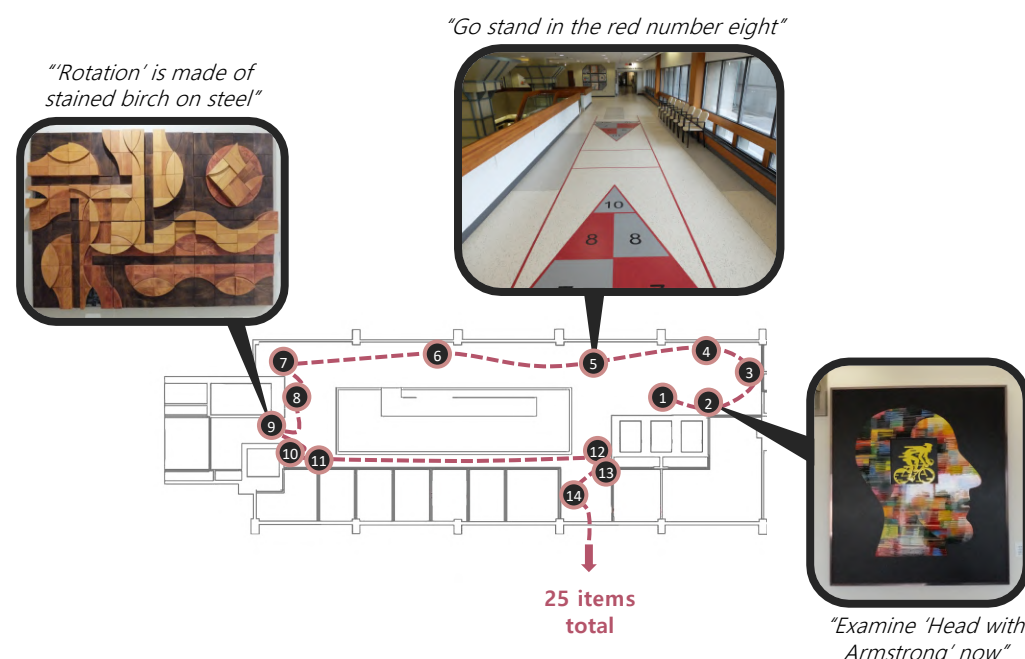
Methods

Participants underwent one of two audio-guided real-world walking tours of the artwork in Baycrest Hospital



Baycrest Tour 1.0
• Younger, 2 day delay ($N = 22$)
• Older, 2 day delay ($N = 19$)

Baycrest Tour 2.0
• Younger, 7 day delay ($N = 79$)



Free Recall Analysis

Contextual organization (recall dynamics):

We tagged mentions of target items with their ordinal positions then analyzed vectors of tags extracted from recall transcripts:

- Lag-conditional response probability curves^{1,3,5}
- Probability of recall transitions as a function of ordinal lag

- (spatio)temporal clustering score⁵
- rank of each transition distance relative to possible distances

- Forward asymmetry score
- What proportion of transitions moved forward?

Details (recall content):

- Internal details²
- Event-specific; perceptual, event, spatial, temporal, thoughts
- External details²
- Not event specific; semantic, editorializing, metacognitive, etc.

Conclusions

- Principles of contextual organization in word list recall at short delays extend to naturalistic recall of one-shot real-world experiences**
 - This suggests that temporal organization is not driven by recency, rehearsal or strategy
- Ageing is associated with impaired temporal context reinstatement**
 - Despite no age difference in recall initiation nor serial position curves; it's about dynamics
- Spatiotemporal context reinstatement and episodic detail richness are associated, as predicted⁴. The way we move through memory space shapes the kinds and quantity of details that come to mind.**
 - Spatial/temporal clustering may bring ambient episodic details into higher resolution
 - Chronologically-ordered search may suppress external detail interjections

References

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