

Specific & General Autobiographical Event Memories: Distinct Neural Networks?

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Introduction

- Conway¹ proposes there are two types of autobiographical event memories (AMs):
 - Unique, specific events
 - Repeated, general events

- These are thought to be psychologically distinct forms of AM, e.g., general event memories tend to be accessed prior to specific AMs².

- Additionally, it has been theorised that these types of AM rely on different neural substrates,¹ e.g., specific AMs should be associated more on posterior regions supporting visual imagery than general AMs.

- In a recent fMRI study, our univariate analyses revealed no differences between specific and general AMs³.

- However, it may be that although a similar retrieval network is activated by specific and general AM retrieval, each memory task is more strongly associated with a sub-network of these regions.

- Use of multivariate network analyses such as spatiotemporal partial least squares (ST – PLS) enables examination of distributed patterns of brain activity associated with specific cognitive tasks, and how engagement of these networks changes over time.

- Thus, we conducted ST – PLS analyses on the data reported in Addis et al. (2004), with the following hypotheses:

- That AMs (specific and general) should activate a network distinct from that recruited during the control tasks.
- That if specific and general AMs are in fact neurally distinct, they should be associated with different regions of this retrieval network, as predicted by Conway¹ (see above).
- That if general AMs are accessed prior to specific AMs, this should be reflected in the temporal patterns of engagement of any identified specific and general AM networks.

Methods

Participants

- 6 male and 6 female participants (20 – 40 years)

Pre-Scan Interview

- Participants retrieved and described 20 specific and 20 general AMs.
- A "title" was provided for each memory, to be later used as a cue in the scanner.

Scanning Protocol

- AM tasks: *General and Specific AMs*
 - Retrieve a general or specific AM in response to a visually presented AM title (6 sec)
 - Rate AM for level of recollection (data used elsewhere; 4 sec)
 - Rest (6 sec)
- Control task: *Sentence completion*
 - Complete a visually presented sentence (4 sec)
 - Rate for task difficulty (4 sec)
 - Rest (8 sec)
- Control task: *Size discrimination*
 - Decide which of two named objects is larger (4 sec)
 - Rate for task difficulty (4 sec)
 - Rest (8 sec)

- All tasks presented in a random order
- Ten of each task presented in each run
- Subjects completed two runs

Post-Scan Interview

- Check if AMs recalled in MRI – one general AM was not recalled and thus dropped from all analyses.

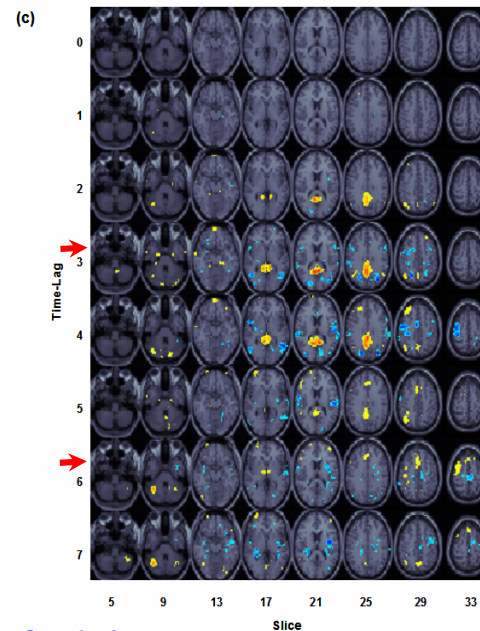
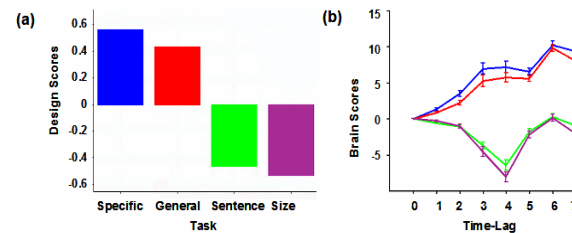
Analyses: Spatiotemporal Task PLS

- Analyses covariance of brain voxels and tasks across the length of the event
- Outputs latent variables (LVs) providing optimal correlation between a set of tasks and patterns of whole – brain activity
- Statistics: Permutation tests and bootstrapping

- Task ST – PLS analysis: AM and control tasks
- Task ST – PLS analysis: specific and general AMs

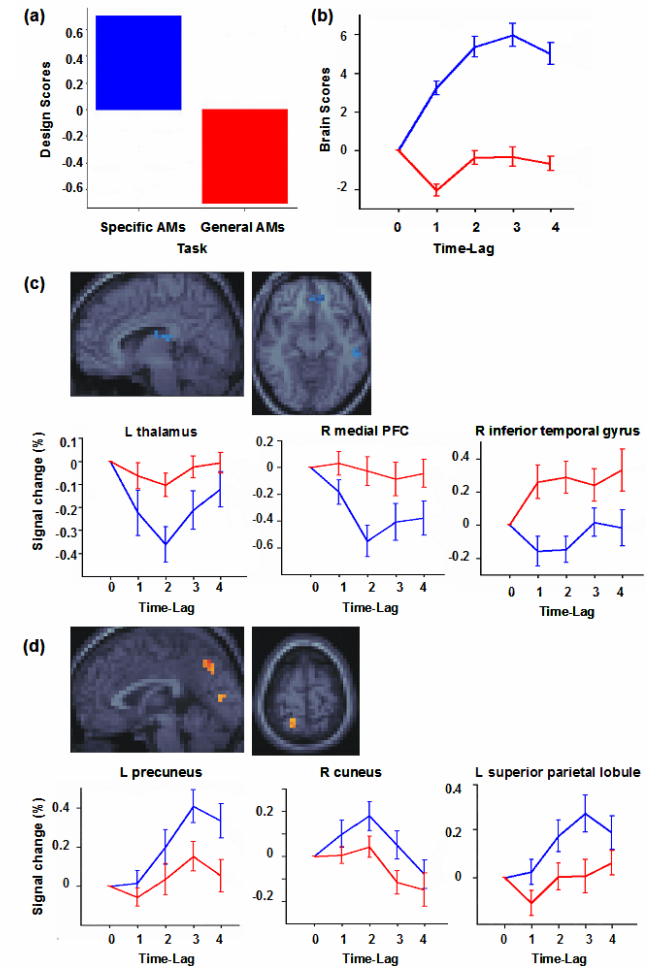
Results: ST – PLS of AM and Control tasks

- LV1: Distinguished AM and control tasks ($p < .001$)
- AM retrieval network: Peaked LAG 3 (6 – 8 sec after onset);
- Rating task: A peak of activity in frontal regions is evident approx. 6 – 8 seconds after the onset of the rating task



Results: ST – PLS of Specific & General AM tasks

- LV1: Distinguished specific and general AMs ($p < .001$) both spatially and temporally



Conclusions

- ST – PLS confirmed our univariate finding that both specific and general AMs depend on left - lateralized & medial retrieval network which peaks at 6 – 8 s.
- Despite this general similarity, closer examination in our second PLS analysis revealed that these AM types can be differentiated spatially and temporally.
 - Specific AMs were more strongly associated with regions involved in visuospatial processing and episodic imagery.
 - General AMs were associated with greater activity in right inferior temporal gyrus.
- Overall brain activity supporting general AM retrieval peaked 2 – 4 s after task onset, while that associated with specific AMs peaked later (6 – 8 s). The same temporal pattern was evident in some of the peak voxels associated with these two AM tasks.

References

- Conway, M.A., & Pleydell – Pearce, C. W. (2000). The construction of autobiographical memories in the self – memory system. *Psychological Review* 107, 261 – 288.
- Haque, S., & Conway, M.A. (2001). Sampling the process of autobiographical memory construction. *European Journal of Cognitive Psychology* 13, 529 – 547.
- Addis, D.R., et al. (in press). Recollective qualities modulate hippocampal activation during autobiographical memory retrieval. *Hippocampus*.