Hippocampal atrophy and autobiographical memory in temporal lobe epilepsy: Preliminary findings

D. R. Addis[1], M. Moscovitch[2,3], S. Black[3,4,5], F. Q. Gao[4,5] and M. P. McAndrews[2,6]

[1] Dept. of Psychology, Harvard University; [2] Dept. of Psychology, University of Toronto; [3] Rotman Research Institute, Baycrest Centre for Geriatric Care, Toronto;

[4] Sunnybrook & Women's College Health Science Centre, Toronto; [5] Division of Neurology, Dept. of Medicine, University of Toronto; [6] Toronto Western Research Institute

Introduction

- Lesion and neuroimaging studies have established that the hippocampus plays a key role in the retrieval of episodic memory, particularly autobiographical event memory (AM)[1,2].
- In contrast, the hippocampus appears to be less involved in the retrieval of semantic memory, including personal semantic information[2].
- Memories of autobiographical events, however, are not composed exclusively of personal episodic details. Rather, these AMs are composites of both episodic and semantic details[3,4,5].
- Few studies examining AM in patients with hippocampal damage have parsed autobiographical event memories into episodic and semantic components[3,4] .
- Here, we examined integrity of episodic and semantic aspects of AM in patients with temporal lobe epilepsy. We predicted that the episodic aspects of autobiographical event memories would be significantly impaired, with a relative sparing of semantic details.
- Finally, we investigated whether the degree of hippocampal atrophy (as determined by a linear hippocampal width measurement) in these patients correlates with loss of episodic, but not semantic, aspects of AM.

Methods

Participants

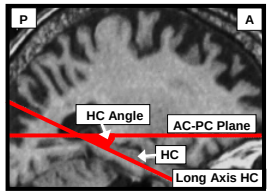
- 14 controls participants (6 male)
- 9 left TLE patients (5 male)
- 6 right TLE patients (4 male)

Autobiographical Interview (AI)[5]

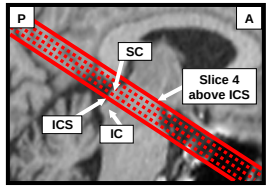
- Recalled 2 recent and 2 remote AMs
- Transcribed AMs were segmented into details
- Each detail classified as **episodic** (i.e., details internal to the central event) or **semantic** (i.e., details external to central event).

Medial Temporal Lobe (MTL) Width[6]

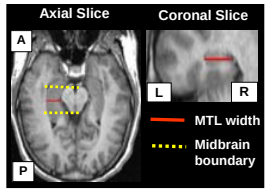
- Measure of hippocampal atrophy
- *Anatomical T1 – weighted scans*
  - FOV = 220; 60 axial slices, 2.2 mm thick
- *MTL width measurement: ANALYZE*
  - Step 1: Determine hippocampal angle
    Slices then reconstructed along long axis



  - Step 2: Level of inter – collicular sulcus (ICS)
    Measurements taken at 4th slice above ICS



  - Step 3: Measure thinnest hippocampal width within boundaries of anterior & posterior midbrain

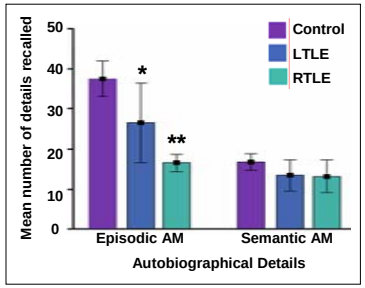


- **Correlation of AI performance & MTL width in TLE patients**
  - Correlations of MTL width with episodic and semantic AI scores
  - All correlations with episodic AI score were partial, controlling for effect of PIQ (due to correlations between these variables in TLE patients; see results)

Results

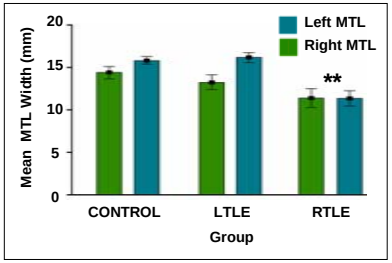
Autobiographical Interview

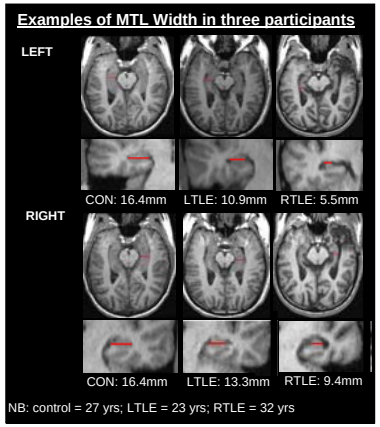
- Left and right TLE patients recalled significantly fewer episodic details than control participants.
- Two outliers in LTLE group who recalled considerably more episodic detail than the group mean
  - Conducted correlations with neuropsychological tests to investigate how these patients differ from patients with poor AM
  - Episodic AI score correlated significantly with PIQ in LTLE patients (r_s = .711) and outliers on episodic AM are also outliers on PIQ.
  - Correlation of episodic AM and PIQ is also significant across all TLE patients (r_s = .535)
  - Thus, high functioning patients tend to recall more episodic details
- No group differences in number of semantic details recalled
  - Nor did semantic AI score correlate with any other measures, including PIQ



MTL Width

- RTLE: significant bilateral hippocampal atrophy
- LTLE: trend for left hippocampal atrophy





Correlation of AI performance & MTL width in TLE

- **Episodic AI score & MTL width:**
  - Partial correlations controlling for effect of PIQ
  - Significant correlations between episodic AM and level of atrophy in the left (r = .639) and right (r = .558) hippocampus
- **Semantic AI score & MTLE width:**
  - No significant correlations between semantic AM and hippocampal atrophy (left, r = .189; right, r = – .041)

Conclusions

- This study extends previous work from our group showing that TLE patients exhibit a differential impairment of episodic relative to semantic AM[2].
- This pattern of differential impairment in retrieval of episodic and semantic detail is evident even within autobiographical event memories[5], which have been typically considered exclusively episodic in nature.
- These findings further support the idea that the structural integrity of the hippocampus is correlated with the ability to recollect the episodic aspects of personal experiences[3,4].

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