Big data meet deep data: Characterizing spatial navigation in hippocampal amnesia
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**Background**

**New Spatial Learning & Hippocampal Damage**

- The hippocampus is hypothesized to be critical to episodic memory and new spatial learning.¹
- Individuals with hippocampal damage are generally impaired in new spatial learning.²,³,⁷
- Allocentric spatial navigation: navigation with a cognitive map of the environment in mind, hippocampally reliant.¹
- Allocentric spatial navigation performance in hippocampal amnesia can be variable and it is possible patients with similar lesion profiles may be impaired for different reasons.
- Path integration: referring to one’s starting location after navigating.
- Combines both allocentric and egocentric (person-based) aspects of navigation.
- It has been shown to require the hippocampus but also heavily involves other brain regions.²,⁷
- Given variability in spatial ability performance, research on these processes would be enhanced by large control samples and dynamic tests.

**Study Question**

- What is the role of the hippocampus in new spatial learning and does episodic memory impairment correspond with task performance?

**Method**

**Participants**

- **Patient BL**
  - Age: 59
  - YOE: 13
  - Endothelial damage: Bilateral damage of the DG/CA3 in hippocampus
  - Medial temporal lobe damage: Left hemisphere volume loss in the superior parietal lobe, right hemisphere volume loss in the precuneus
  - Clinical profile: Mild anterograde amnesia, weaknesses in complex attention and inhibition.
  - IQ: Average

- **Patient DA**
  - Age: 68
  - YOE: 17
  - MTL Damage: Bilateral MTL damage, more severe in right hemisphere
  - MTL Damage: Left hemisphere damage with volume reduction in the posterior temporal, ventral frontal, occipital regions, anterior cingulate and posterior thalamus.
  - Clinical profile: Graded retrograde amnesia, severe anterograde amnesia and intact other domains.
  - IQ: High Average

**Map Levels**

- Overall trial performance for distance traveled and time taken was below controls.
- Trials with best performance (3) were closed and without decision point.
- Poor wayfinding performance (e.g. level 56, 11), was marked by a pattern of repeated travel down an incorrect path, including backtracking to starting location.

**Flare Levels**

- Missed 4-5/7 of trials (29-43% overall accuracy), with variability in performance across testing days.
- Control performance across trials is 58.46% (SD = 0.07).

**Results**

**Patient BL**

**Patient DA**

**Discussion**

**References**

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