Hippocampal functions modulate transfer-appropriate cortical representations supporting subsequent memory

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1. Transfer-Appropriate Representations

- Transfer-appropriate processing: matching cognitive operations during encoding and retrieval improve memory.1
- Encoding representations of visual and semantic properties may selectively support perceptual and conceptual memory, respectively.2
- The hippocampus may be agnostic to stimulus properties,2,3 yet it may modulate the mnemonic effect of cortical representations.

2. Experimental Design

N = 19, 7 females, age = 23.08 ± 2.73, native English speakers

Day 1: Encoding Covert naming
Day 1: Retrieval Conceptual memory test
Day 2: Retrieval Perceptual memory test

- Individual sensitivity (f') to Old/New concepts and images are positively correlated (r = 0.72, p < .001).

3. Activation Level, Neural Pattern Similarity, Representational Strengths

- We computed representational strengths (RS, visual and semantic)4 for Brainnetome brain regions.5
- We additionally computed item-wise Activation Level (AL) and Neural Pattern Similarity (NPS) for the hippocampus, to examine diverse ways in which it modulates cortical representations.

4. Hippocampal-cortical interactions

- Transfer-appropriate models
  - Perceptual memory was predicted by the interaction between representational strength of visual information in medio-ventral occipital cortex (vMOC) and hippocampal activation level (Hipp).
  - Conceptual memory was predicted by the interaction between representational strength of semantic information in left inferior frontal gyrus (L. IFG) and hippocampal activation level (Hipp).

- Transfer-incongruent models
  - Perceptual memory was boosted by semantic representation in the right perirhinal cortex and fusiform gyrus; no effects found for conceptual memory.

5. Discussion

- Cortical regions, but not the hippocampus, robustly represent visual and semantic information of everyday objects.
- Hippocampal functions modulated the mnemonic impact of cortical representations that are transfer-appropriate.
- No evidence for transfer-incongruent hippocampal-cortical interactions supporting subsequent memory.
- Future studies may evaluate the impact of other non-representational regions, such as prefrontal control regions6 on episodic memory.

References