

Investigating neural signatures of visual encoding and recall using 7T fMRI

Elizabeth H. Hall, Wilma A. Bainbridge, Chris I. Baker.

Laboratory of Brain and Cognition, National Institutes for Mental Health

While previous work has implied a difference in perceptual processing of scenes and objects, until now, few neuroimaging studies have explored the relationship of visual free recall and encoding for objects and scenes, in both perceptual and memory-related regions. There is still a large open question of whether hippocampal-based memory processes differ based on visual content type, as different regions around the hippocampus have been separately implicated for perception of different stimulus categories (e.g., the perirhinal cortex for objects, the parahippocampal cortex for scenes). Additionally, most studies have depended upon tasks using verbal associative cues to trigger memory, while few have investigated recall memory for isolated visual events (with no verbal component). We conducted a visual free recall experiment where, for each trial, participants viewed (and encoded) a scene or object image, performed a visual distractor task, and then were asked to recall that original image and report the vividness of their memory. We used high-resolution 7T fMRI (1.2mm isotropic voxels) to investigate differential processing within hippocampal subfields, as earlier research has shown that that subdivisions within the hippocampus make distinct contributions to new memory formation. We find evidence for distinct processing of scene and object information during both encoding and recall in hippocampal and cortical regions. We also find distinct processing between encoding and recall phases. This study presents an important exploration of neural processing of encoding and recall and objects and scenes in perceptual and memory-related regions of interest.