

Changes in Autobiographical Memory Retrieval Network Following Removal of Functionally Active Regions in the Medial Temporal Lobe

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Neuroimaging and lesion evidence show the hippocampus is a key structure in the network supporting autobiographical memory (AM) retrieval. We were interested in how damage to, and removal of, this critical node alters the engagement and connectivity of the AM network. Participants included 11 left temporal lobe epilepsy (LTLE) patients and 14 age-matched controls. An event-related fMRI paradigm was used; participants retrieved AMs to personalized cues and completed semantic retrieval tasks. AM-related activity in the hippocampus and across the AM network was significantly reduced in LTLE patients relative to controls. Furthermore, the strength of effective connections involving the left hippocampus was also reduced, but those between left parahippocampal/retrosplenial cortex and left medial prefrontal cortex (LMPFC) were increased. Using a case-study approach, three LTLE patients were re-scanned approximately one year after surgical removal of the left hippocampus, and AM-related activity from pre-surgical and post-surgical scans was compared. Two of the three patients engaged residual left hippocampal tissue pre-surgically; removal of this functionally-active tissue resulted in increased activity in LMPFC but not in the undamaged right hippocampus. Furthermore, there was evidence of significant increases in correlations between left retrosplenial and LMPFC regions. The third patient did not engage residual left hippocampal tissue pre-surgically, engaging only the right hippocampus; post-surgically, there were no changes in hippocampal or LMPFC activity. In summary, removal of functionally-active tissue in the left hippocampus has significant consequences for the engagement and connectivity of the AM network, over and above those changes associated with left hippocampal damage in LTLE.