

Memory function varies after damage to key area of the brain

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Scientists at the University of Liverpool have discovered dramatic differences in the memory performance of patients with damage to the hippocampus, an area of the human brain key to memory.

The hippocampus is part of the medial temporal lobe, known to play a major role in conscious memory. Damage to the medial temporal lobe due to illnesses such as Herpes Simplex Encephalitis, Meningitis and Alzheimer's disease, can cause loss of memories acquired prior to brain damage – known as retrograde amnesia - and an inability to acquire new long-term memories – known as anterograde amnesia.

However, scientists are unsure of the exact role of the hippocampus. Some neuroscientists argue that the hippocampus is critical for all types of conscious memory while others claim it is only involved in recollection and that simple recognition can be performed by other regions of the brain like the outer layer, the cortex. This is the first time that two patients with damage restricted to this area of the brain have been assessed with the same tests in the same lab and they were seen to show strikingly different patterns of memory performance.

Dr Juliet Holdstock, from the University's School of Psychology, said: "Both patients had suffered anoxia, a disruption of the supply of oxygen to the brain; one as a result of carbon monoxide poisoning and the other following complications during surgery. Both patients had brain damage restricted to the hippocampus. One patient showed no evidence of a memory deficit at all while the other had difficulty recalling newly



learned information. The latter remained able to recognise recently studied pictures and words."

"We looked at how hippocampal damage affected recall and recognition. The memory pattern differences seen between the two patients, and between them and others previously observed, could be due to subtle differences in brain pathology. It is possible that the exact location of the damage within the hippocampus may be critical or that some patients may have additional undetected damage in brain regions close to the hippocampus that may also affect their memory.

"Such small differences in brain pathology cannot be detected by even the most state-of-the-art imaging equipment that we have today. Our research has shown that selective damage to the hippocampus can produce a variety of memory outcomes ranging from no memory deficit at all to an impairment of all aspects of conscious memory."

The research is published in *Hippocampus* 18:679-691 (2008)

Source: University of Liverpool

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