How the brain links memory and behaviour

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The study, 'From rapid place learning to behavioural performance: A key role for the intermediate hippocampus', published online in PLoS Biology, was led by Dr Tobias Bast of the UK's University of Nottingham. The researchers set out to define which parts of the brain are responsible for which types of memory. For example, a repetitive task such as driving to work requires a different type of memory than standing at the fridge trying to remember what you wanted to take out or wondering where you put your keys.

The research team focused their investigations on the hippocampus, a banana shaped part of the brain beneath the temporal lobe. The hippocampus is responsible for 'place cell firing' - the ability to hone memory to certain places. Previous hippocampal research on rats has shown that hippocampal neurons are fired when the rat passes a certain place, sparking its memory. But until now, how this hippocampal memory is translated into behaviour, has not received great attention.

Dr Bast's team tested rats in a water maze experiment, in which the animals had to locate a platform in the water. Different parts of the rats' hippocampus were disabled using a neurotoxin and their consequent memory abilities were measured.

The results showed that if approximately 30-40% of neuronal tissue in the middle of the rats' hippocampus - called the intermediate region - was left intact, the rats could

still carry out the task of identifying where the water platform was. But when the intermediate hippocampus was disabled, with only 30-40% of tissue at two ends of the hippocampus (the 'septal' and 'temporal' regions) left intact, the rats struggled with the task.

The research also revealed that the septal end of the hippocampus, which has links to precise visual-spatial information, can still quickly form an accurate place memory, but cannot translate this into behaviour because it needs the help of the intermediate hippocampus to provide links to behavioural control.

'People often focus on memory deficits when thinking about the significance of aberrant hippocampal function,' said Dr Bast. 'But our new findings highlight the important hippocampal links to behavioural control. We plan to build on these findings and examine the possibility that aberrant hippocampal function - depending on where in the structure it occurs and to which extent - may give rise to selective memory deficits, as well as to more profound disruptions of behavioural control.'

The team plans to continue its research by focusing on how abnormal hippocampal activity is involved in many neuropsychiatric conditions such as schizophrenia.

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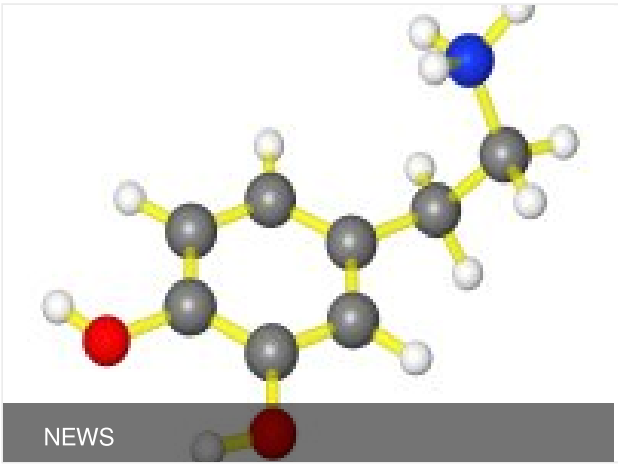

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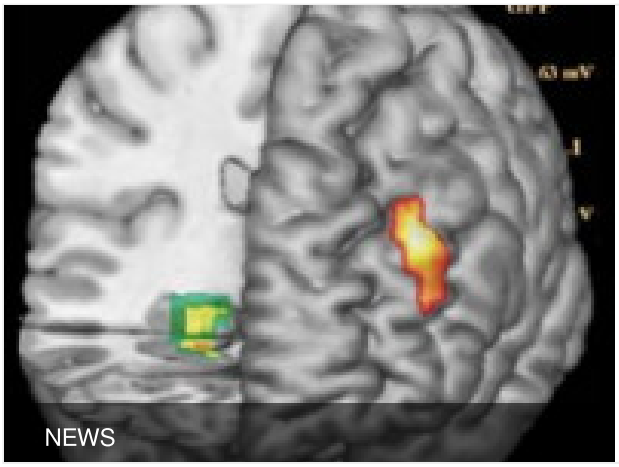

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