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Study shows the brain replays non-spatial, sequential tasks during rest periods

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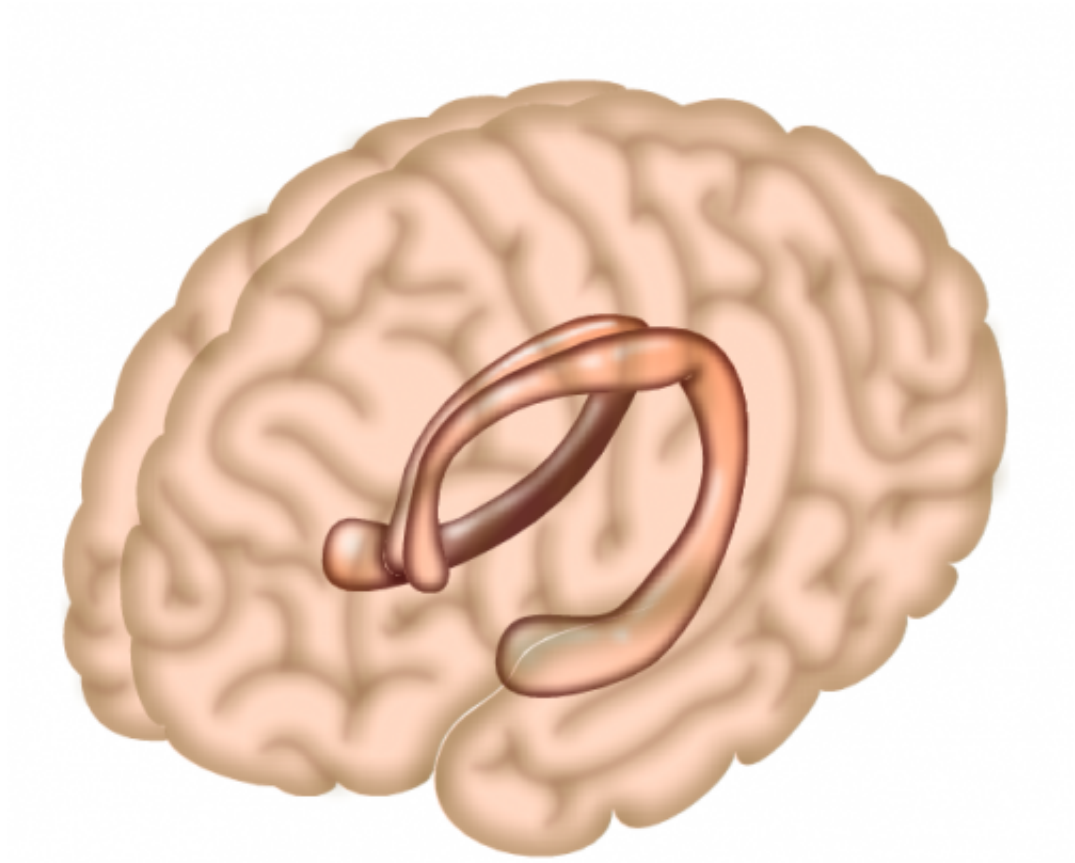

The hippocampus is a region of the brain largely responsible for memory formation. Credit: Salk Institute

A pair of researchers, one with the Max Planck Institute for Human Development, the other Princeton University, has found evidence that

indicates that part of the human brain replays non-spatial, sequential tasks during rest periods. In their paper published in the journal *Science*, Nicolas Schuck and Yael Niv describe experiments they carried out with human volunteers and what they learned.

Prior research efforts have shown that the brains of rodents that are coaxed through a maze run through the same sequence of events in their minds when they are allowed to rest. The reactivation happens in the hippocampus. fMRI recordings of their brain activity show that rats and mice replay the activity in their brains in the same sequence in which they occurred in real life. In this new effort, the researchers wondered if such sequential replay happens with non-spatial tasks, as well. To find out, they recruited 33 human volunteers to take part in an experiment.

Each volunteer sat at a computer and watched images on a screen. Each image was of a house with a human face overlaid on it. The volunteers were asked to focus initially on the house and to keep focusing on the houses that were shown in subsequent pictures until a house was shown that was clearly older or newer than those the previous houses. Once that change in age was detected, they were to begin focusing on the faces in the pictures instead—until a face appeared that was markedly different in age. At that point, they were directed to focus once again on the houses. This pattern continued for some time, and then the volunteers were allowed to rest. During the experiments, the volunteers underwent fMRI scans, and were scanned again as they rested.

In the the scans, the researchers found that the hippocampus replayed the same sequences during the rest period that it had displayed during the picture task. They claim this shows that the human brain does, indeed, replay non-spatial, sequential tasks during rest periods. The researchers also found that the more the hippocampal replay activity occurred during rest, the better the orbitofrontal cortex was in creating patterns related to the event that was being replayed—which presumably,

played a role in better memory retention.

More information: Nicolas W. Schuck et al. Sequential replay of nonspatial task states in the human hippocampus, *Science* (2019). DOI: 10.1126/science.aaw5181