Medical Xpress

Similarity breeds proximity in memory, researchers find

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Researchers at New York University have identified the nature of brain activity that allows us to bridge time in our memories. Their findings, which appear in the latest issue of the journal *Neuron*, offer new insights into the temporal nature of how we store our recollections and may offer a pathway for addressing memory-related afflictions.

"Our memories are known to be 'altered' versions of reality, and how time is altered has not been well understood," said Lila Davachi, an associate professor in NYU's Department of Psychology and Center for Neural Science and the study's senior author. "These findings pinpoint the brain activity that explains why remember some events as having occurred closer together in time and others further apart."

While our actual experiences are quite fluid and not neatly organized, our memories of them are discrete—like "beads on a string," Davachi explains. However, our recollections of the temporal distance among these events varies—in our memories, sometimes the beads are placed close together in time and sometimes they are spaced further apart.

The neurological process that explains why we place some memories closer together in time than we do others is not clear.

"Temporal information is a key organizing principle of memory, so it's important to understand where this organization comes from," Davachi said.

Understanding this process may lead to ways to address maladies of memory organization, such as schizophrenia, in which the ability to place recollections in temporal order is impaired.

Davachi and her co-author, Youssef Ezzyat, an NYU doctoral student, sought to shed light on this dynamic by studying the brain's hippocampus—a region known to play a significant role in memory.

In this experiment, the researchers had participants look at a series of pictures while monitoring brain activity using functional magnetic resonance imaging (fMRI). The participants viewed objects and faces that were separated in time; each stimulus was also paired with a picture of a scene. For every presentation, the participants were asked to imagine a scenario in which either the object or the face played a role in the scene they just viewed—the process was designed to create, or encode, a series of memories in the participants.

Later, after scanning, the participants performed a retrieval test in which they were presented with two stimuli (i.e., object and face) from the preceding phase and asked to indicate how far apart in time the two items were when they were encoded. Participants were given the following four response options: very close, close, far, and very far.

Their results showed a relationship between hippocampal activity and how close or far in time the participants placed their memories. When hippocampal activity was more stable across time, memories were remembered as having occurred closer together. By contrast, when hippocampal stability was diminished, participants were more likely to recall the memories as having occurred further apart in time.

"Clearly, the hippocampus is vital in determining how we recall the temporal distances between the many memories we hold, and similarity in the brain across time results in greater temporal proximity of those memories," Davachi says.

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