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Neuroscientists find memory storage, reactivation process more complex than previously thought

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The process we use to store memories is more complex than previously thought, New York University neuroscientists have found. Their research, which appears in the journal the *Proceedings of the National Academy of Sciences*, underscores the challenges in addressing memory-related ailments, such as post-traumatic stress disorder.

The researchers looked at memory consolidation and reconsolidation. Memory consolidation is the neurological process we undergo to store memories after an experience. However, memory is dynamic and changes when new experiences bring to mind old memories. As a result, the act of remembering makes the memory vulnerable until it is stored again—this process is called reconsolidation. During this period, new information may be incorporated into the old memory.

It has been well-established that the synthesis of new proteins within neurons is necessary for memory storage. More specifically, this process is important for stabilizing memories because it triggers the production of new proteins that are required for molecular and synaptic changes during both consolidation and reconsolidation.

The purpose of the NYU study was to determine if there were differences between memory consolidation and reconsolidation during protein synthesis. Similar comparative studies have been conducted, but those focused on elongation, one of the latter stages of protein synthesis;

the PNAS research considered the initiation stage, or the first step of this process.

Using laboratory rats as subjects, the researchers used mild electric shocks paired with an audible tone to generate a specific associative fear memory and, with it, memory consolidation. They played the audible tone one day later—a step designed to initiate recall of the earlier fear memory and bring about reconsolidation. During both of these steps, the rats were injected with a drug designed to inhibit the initiation stage of protein synthesis.

Their results showed that the inhibitor could effectively interfere with memory consolidation, but had no impact on memory reconsolidation.

"Our results show the different effects of specifically inhibiting the initiation of protein synthesis on memory consolidation and reconsolidation, making clear these two processes have greater variation than previously thought," explained Eric Klann, a professor at NYU's Center for Neural Science and one of the study's co-authors. "Because addressing memory-related afflictions, such at PTSD, depends on first understanding the nature of memory formation and the playback of those memories, finding remedies may prove even more challenging than is currently recognized."

Provided by New York University

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