

Reactivating memories during sleep: Memory rehearsal during sleep can make a big difference in remembering later

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Why do some memories last a lifetime while others disappear quickly? A new study suggests that memories rehearsed, during either sleep or waking, can have an impact on memory consolidation and on what is remembered later.

The new Northwestern University study shows that when the information that makes up a [memory](#) has a high value (associated with, for example, making more money), the memory is more likely to be rehearsed and consolidated during sleep and, thus, be remembered later.

Also, through the use of a direct manipulation of sleep, the research demonstrated a way to encourage the reactivation of low-value memories so they too were remembered later.

Delphine Oudiette, a postdoctoral fellow in the department of psychology at Northwestern and lead author of the study, designed the experiment to study how participants remembered locations of objects on a [computer screen](#). A value assigned to each object informed participants how much money they could make if they remembered it later on the test.

"The pay-off was much higher for some of the objects than for others," explained Ken Paller, professor of psychology at Northwestern and co-author of the study. "In other words, we manipulated the value of the memories—some were valuable memories and others not so much, just as the things we experience each day vary in the extent to which we'd like to be able to remember them later."

When each object was shown, it was accompanied by a characteristic sound. For example, a tea kettle would appear with a whistling sound. During both states of [wakefulness](#) and sleep, some of the sounds were played alone, quite softly, essentially reminding participants of the low-value items.

Participants remembered the low-value associations better when the sound presentations occurred during sleep.

"We think that what's happening during sleep is basically the reactivation of that information," Oudiette said. "We can provoke the reactivation by presenting those sounds, therefore energizing the low-value memories so they get stored better."

The research poses provocative implications about the role memory

reactivation during sleep could play in improving memory storage," said Paller, director of the Cognitive Neuroscience Program at Northwestern. "Whatever makes you rehearse during sleep is going to determine what you remember later, and conversely, what you're going to forget."

Many memories that are stored during the day are not remembered.

"We think one of the reasons for that is that we have to rehearse memories in order to keep them. When you practice and rehearse, you increase the likelihood of later remembering," Oudiette said. "And a lot of our rehearsal happens when we don't even realize it—while we're asleep."

Paller said selectivity of [memory consolidation](#) is not well understood. Most efforts in memory research have focused on what happens when you first form a memory and on what happens when you retrieve a memory.

"The in-between time is what we want to learn more about, because a fascinating aspect of memory storage is that it is not static," Paller said. "Memories in our brain are changing all of the time. Sometimes you improve [memory storage](#) by rehearsing all the details, so maybe later you remember better—or maybe worse if you've embellished too much.

"The fact that this critical memory reactivation transpires during [sleep](#) has mostly been hidden from us, from humanity, because we don't realize so much of what's happening while we're asleep," he said.

More information: "The Role of Memory Reactivation During Wakefulness and Sleep in Determining Which Memories Endure" is published in the current issue of the *Journal of Neuroscience*.

Provided by Northwestern University

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