

# Daytime sleep improves memory consolidation

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A ninety minute daytime nap helps speed up the process of long term memory consolidation, a recent study conducted by Prof. Avi Karni and Dr. Maria Korman of the Center for Brain and Behavior Research at the University of Haifa found. The research was published in the scientific journal *Nature Neuroscience*.

"We still don't know the exact mechanism of the memory process that occurs during sleep, but the results of this research suggest the possibility that it is possible to speed up memory consolidation, and in the future, we may be able to do it artificially," said Prof. Karni.

Long term memory is defined as a permanent memory that doesn't disappear or that disappears after many years. This part of our memory is divided into two types – memories of "what" (for example: what happened yesterday or what one remembers from an article one read yesterday) and memories of "how to" (for example: how to read Hebrew, how to drive, play basketball or play the piano).

In this new research, which was conducted by researchers at the University of Haifa in cooperation with the Sleep Laboratory at the Sheba Medical Center and researchers from the Department of Psychology at the University of Montreal, it was revealed that a daytime nap changes the course of consolidation in the brain.

Two groups of participants in the study practiced a repeated motor activity which consisted of bringing the thumb and a finger together at a

specific sequence. The research examined the "how" aspect of memory in the participants' ability to perform the task quickly and in the correct sequence. One of the groups was allowed to nap for an hour and a half after learning the task while the other group stayed awake.

The group that slept in the afternoon showed a distinct improvement in their task performance by that evening, as opposed to the group that stayed awake, which did not exhibit any improvement. Following an entire night's sleep, both groups exhibited the same skill level. "This part of the research showed that a daytime nap speeds up performance improvement in the brain. After a night's sleep the two groups were at the same level, but the group that slept in the afternoon improved much faster than the group that stayed awake," stressed Prof. Karni.

A second experiment showed that another aspect of memory consolidation is accelerated by sleep. It was previously shown that during the 6-8 hours after completing an effective practice session, the neural process of "how" memory consolidation is susceptible to interference, such that if, for example, one learns or performs a second, different task, one's brain will not be able to successfully remember the first trained task.

A third group of participants in the University of Haifa study learned a different thumb-to-finger movement sequence two hours after practicing the first task. As the second task was introduced at the beginning of the 6-8 hour period during which the brain consolidates memories, the second task disturbed the memory consolidation process and this group did not show any improvement in their ability to perform the task, neither in the evening of that day nor on the following morning.

However, when a fourth group of participants was allowed a 90 minute nap between learning the first set of movements and the second, they did not show much improvement in the evening, but on the following

morning these participants showed a marked improvement of their performance, as if there had been no interference at all.

"This part of the study demonstrated, for the first time, that daytime sleep can shorten the time "how to" memory becomes immune to interference and forgetting. Instead of 6-8 hours, the brain consolidated the memory during the 90 minute nap," explains Prof. Karni who added that while this study demonstrates that the process of memory consolidation is accelerated during daytime sleep, it is still not clear which mechanisms sleep accelerates in the process.

The elucidation of these mechanisms, say the researchers, could enable the development of methods to accelerate memory consolidation in adults and to create stable memories in a short time. Until then, if you need to memorize something quickly or if your schedule is filled with different activities which require learning "how" to do things, it is worth finding the time for an afternoon nap.

Source: University of Haifa

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