Memories take hold better during sleep: study

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In experiments, researchers in Germany showed that the brain is better during sleep than during wakefulness at resisting attempts to scramble or corrupt a recent memory.

Their study, published in Nature Neuroscience, provides new insights into the hugely complex process by which we store and retrieve deliberately acquired information -- learning, in short.

Earlier research showed that fresh memories, stored temporarily in a region of the brain called the hippocampus, do not gel immediately.

It was also known that reactivation of those memories soon after learning plays a crucial role in their transfer to more permanent storage in the brain's "hard drive," the neocortex.

During wakefulness, however, this period of reactivation renders the memories more fragile.

Learning a second poem at this juncture, for example, will likely make it harder to commit the first one to deep memory.

Bjorn Rasch of the University of Lubeck in Germany and three colleagues assumed that the same thing happens when we sleep, and designed an experiment to find out if they were right.

Twenty-four volunteers were asked to memorise 15 pairs of cards showing pictures of animals and everyday objects. While performing the exercise, they were exposed to a slightly unpleasant odour.

Forty minutes later, half the subjects who had stayed awake were asked to learn a second, slightly different pattern of cards.

Just before starting, they were again made to smell the same odour, designed to trigger their memory of the first exercise.

The 12 other subjects, meanwhile, did the second exercise after a brief snooze, during which they were exposed to the odour while in a state called slow-wave sleep.

Both groups were then tested on the original task.

Much to the surprise of the researchers, the sleep group performed significantly better, retaining on average 85 percent of the patterns, compared to 60 percent for those who had remained awake.

"Reactivation of memories had completely different effects on the state of wakefulness and sleep," said lead author Susanne Diekelmann, also from the University of Lubeck.

"Based on brain imaging data, we suggest the reason for this unexpected result is that already during the first few minutes of sleep, the transfer from hippocampus to neocortex has been initiated," she said in an email exchange.

After only 40 minutes of shuteye, significant chunks of memory were already "downloaded" and stored where they "could no longer be disrupted by new information that is encoded in the hippocampus," she explained.

Diekelmann said the positive impact of short periods of sleep on memory consolidation could have implications for memory-intensive activities such as language training.

The findings, she said, also point to a strategy for helping victims of post-traumatic stress syndrome, a debilitating condition caused by extreme experiences.

The reactivation techniques "might prove useful in re-processing and un-learning unwanted memories," she said. "And reactivation of newly learned memories during ensuing sleep could then help consolidate the desired therapeutic effects for the long-term."

Diekelmann cautioned that computers are an imperfect metaphor for the way memories are stored in the brain.

"Human memory is absolutely dynamic. Memories are not statically 'archived' in the neocortex but are subject to constant changes by various influences," she said.

Likewise, the act of remembering does not simply entail "reading" the stored data, she added. "Recall is a reconstructive process in which memories can be changed and distorted."

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