

Sleep helps people learn complicated tasks

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(PhysOrg.com) -- Sleep helps the mind learn complicated tasks and helps people recover learning they otherwise thought they had forgotten over the course of a day, research at the University of Chicago shows.

Using a test that involved learning to play video games, researchers showed for the first time that people who had "forgotten" how to perform a complex task 12 hours after training found that those abilities were restored after a night's sleep.

"Sleep consolidated learning by restoring what was lost over the course of a day following training and by protecting what was learned against subsequent loss," said Howard Nusbaum, Professor of Psychology at the University of Chicago, and a researcher in the study. "These findings suggest that sleep has an important role in learning generalized skills in stabilizing and protecting memory."

The results demonstrate that this consolidation may help in learning language processes such as reading and writing as well as eye-hand skills such as tennis, he said.

For the study, researchers tested about 200 college students, most of whom were women, who had little previous experience playing video games. The team reported the findings in the paper, "Consolidation of Sensorimotor Learning During Sleep," in the current issue of *Learning and Memory*. Joining Nusbaum in the research were lead author Timothy Brawn, a graduate student in Psychology at the University; Kimberly Fenn, now an Assistant Professor of Psychology at Michigan State

University; and Daniel Margoliash, Professor in the Departments of Organismal Biology & Anatomy and Psychology at the University.

The team had students learn video games containing a rich, multisensory virtual environment in which players must use both hands to deal with continually changing visual and auditory signals. The first-person navigation games require learning maps of different environments.

For the study, researchers used first-person shooter games, with the goal of killing enemy bots (software avatars that play against the participant) while avoiding being killed.

The subjects were given a pre-test to determine their initial performance level on the games. Then they were trained to play the games and later tested on their performance. One group was trained in the morning and then tested 12 hours later after being awake for that time. A second group was trained in the morning and then tested the next day, 24 hours after being trained. Another group was trained in the evening, then tested 12 hours after a night's sleep and a fourth group was trained in the evening and then also tested 24 hours after training.

When trained in the morning subjects showed an 8 percentage point improvement in accuracy immediately after training. However after 12 waking hours following training, subjects lost half of that improvement when tested in the evening. When subjects were tested the next morning 24 hours after training, they showed a 10 percentage point improvement over their pre-test performance.

"The students probably tested more poorly in the afternoon because following training, some of their waking experiences interfered with training. Those distractions went away when they slept and the brain was able to do its work," Nusbaum said.

Among the students who received evening training, scores improved by about 7 percentage points, and went to 10 percentage points the next morning and remained at that level throughout the day.

The study follows Fenn, Nusbaum and Margoliash's earlier work, published in *Nature*, which showed for the first time that sleep consolidates perceptual learning of synthetic speech.

"In that study we showed that if after learning, by the end of the day, people 'forgot' some of what was learned, a night's sleep restored this memory loss," Nusbaum said. "Furthermore a night's sleep protected memory against loss over the course of the next day."

The latest study expanded that work to show that sleep benefits people learning complicated tasks as well, Nusbaum said.

Source: University of Chicago

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