Sleep does not benefit learning in older adults as it does for young people: study

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(Medical Xpress) -- Neuroscientists have long known that memory, sleep quality and sleep duration deteriorate with age, yet sleep enhances two major types of learning in young people. To date, few investigations have looked at whether cognitive decline is related to decreases in sleep quality and quantity in older adults.

Now, preliminary results of the latest study in a series conducted by sleep researcher Rebecca Spencer and her doctoral student Laura Kurdziel at the University of Massachusetts Amherst suggest that sleep does not enhance either motor skills or sequential learning in older adults. Spencer discussed her findings on sleep and aging brain on Sunday morning, Nov. 13 at a press conference held during the Society for Neuroscience's annual conference on Nov. 12-16 in Washington, D.C.

"We've been exploring how much of our memory decline is related to sleep impairment in healthy aging," she says. "We recently found that sleep does not benefit learning a finger movement task for older individuals. Does this deficit extend to the tasks of everyday life? Should doctors treat memory decline with therapies that enhance sleep? Or will that only help with some of the tasks of daily life and not with others?"

Spencer and Kurdziel's experiment specifically investigated the role of sleep on a non-motor sequence learning task. They taught a computer game to 25 young people and 24 adults between 51 and 70 years old who participated in the study. It required players to learn the correct sequence of 10 differently colored doors to successfully navigate through 10 virtual rooms. In each room, players used trial-and-error to determine which of three doors was the next correct choice.

In the first session, one room was added with every trial, gradually building up to the entire 10-door sequence to be remembered. Study participants continued to navigate until they chose only the correct doors in four consecutive trials.

Memory for the sequence was tested 12 hours later, following either a daytime wakeful interval or an overnight interval including sleep. An additional probe assessed whether learning was of individual correct doors or the full sequence of correct doors.

Young adults benefited from sleep on this task, making significantly fewer errors after a 12-hour period with sleep than after a 12-hour period awake. They also made fewer distracter errors, demonstrating that the actual sequence of the doors was better remembered following sleep, Spencer reported.

Performance of the older adults, however, did not benefit from the sleep interval. "Our results support a general decrement in sleep-dependent consolidation of sequence learning in older adults," she said.

"We know that in young adults sleep is not a single process, it's a series of processes," Spencer explains. "Each sleep stage is accomplishing a different function for our cognitive abilities. We think during deep sleep (slow wave sleep) you are literally replaying a memory from the day. Later in the night, roughly in the last two-thirds, you alternate between REM sleep and Stage 2 sleep. We think that in REM the brain tests out ideas for relatedness with other things you know and this produces creative ideas and could also be helpful for decision-making."

The psychology researchers wonder if Stage 2 sleep, which has been associated with motor learning, might also be important in sequential learning. "Older adults actually get more Stage 2 sleep than young people so we initially thought they'd get more benefit from sleep on the motor task because it's so important in young adults," Spencer explained. "But it's fragmented by transitions to REM or wake, which may interrupt the

memory processing." She has yet to analyze physiological data from the study presented during this week's conference.

Provided by University of Massachusetts Amherst

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