

# Despite abnormalities after concussion, sleep continues to aid memory and recall

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Supporting opportunities to sleep following a concussion may be an important factor in recovery from cognitive impairments, UMass Amherst sleep researcher suggest. Credit: UMass Amherst

After a concussion, a person can be left with disturbed sleep, memory deficits and other cognitive problems for years, but a new study led by Rebecca Spencer at the University of Massachusetts Amherst suggests that despite these abnormalities, sleep still helps them to overcome memory deficits, and the benefit is equivalent to that seen in individuals without a history of mild traumatic brain injury (TBI), also known as concussion.

Spencer, with graduate student Janna Mantua and undergraduates Keenan Mahan and Owen Henry, found that individuals who had sustained a mild TBI more than a year earlier had greater recall in a word memorization task after they had slept than when tested after an equal period awake. They report that this is the first study to look at sleep-dependent [memory](#) consolidation in people with TBI history.

Spencer says, "It is interesting to note that despite having atypical or disturbed sleep architecture,

people in our study had intact sleep-dependent memory consolidation. Supporting opportunities to sleep following a concussion may be an important factor in recovery from cognitive impairments. The changes in sleep architecture we observed are in an optimal direction, that is, more rich, [slow wave sleep](#) and less light or Stage 1 sleep, is a shift in the positive direction."

Specifically, data from participants who had a concussion more than one year before had differences in sleep as measured by polysomnography, a montage of recordings used to stage sleep. They spent a significantly greater part of the night in deep, slow-wave sleep, a sleep stage where memories are replayed and consolidated to long-term storage. Their memory and recall ability was not significantly different than the study subjects who had no TBI.

The authors write, "Overall, sleep composition is altered following TBI but such deficits do not yield insufficiencies in sleep-dependent [memory consolidation](#)."

For this work, the researchers recruited 26 young adults 18 to 22 years old with a history of diagnosed TBI an average three to four years earlier from various causes, and 30 others with no history of [brain injury](#). All slept more than six hours per night, took few naps, drank moderate amounts of coffee and alcohol and had no neurological disorders other than participants who had had TBI.

Participants learned a list of word pairs and their memory for them was assessed 12 hours later. Half in each group learned the word pairs in the morning and memory was tested in the evening, while half were tested in the evening and their memory was tested in the morning after sleep.

Sleep stages were identified by polysomnography, attaching a set of electrodes to the head for physiological recordings during sleep. While slow

wave sleep was greater in those with a TBI they also had less non-REM stage 1 sleep, a form of very light sleep seen during the wake-to-sleep transition. This suggests that those with a concussion history can reach [deep sleep](#) sooner and get more of it.

For both those with a history of concussion and those without, recall was better following [sleep](#) than daytime wake. Spencer says, "We know this is not just a matter of the time of day we tested them at as they were able to learn equally regardless of whether we taught them the task in the morning or the evening."

**More information:** Study paper:  
[journal.frontiersin.org/article/.../2015.00328/abstract](http://journal.frontiersin.org/article/.../2015.00328/abstract)

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