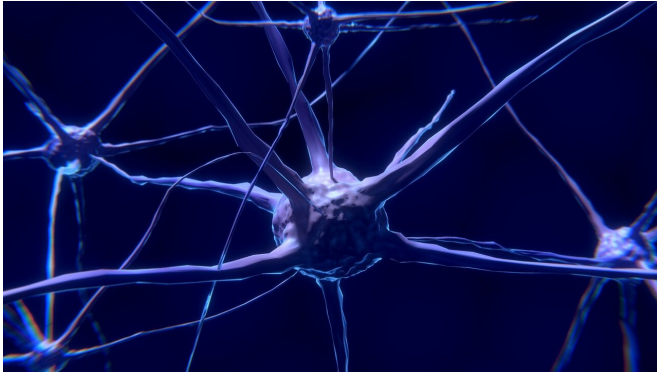


Sleep is irreplaceable for the recovery of the brain

7 January 2021



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Sleep is ubiquitous in animals and humans and vital for healthy functioning. Thus, sleep after training improves performance on various tasks in comparison to equal periods of active wakefulness. However, it has been unclear so far whether this is due to an active refinement of neural connections or merely due to the absence of novel input during sleep. Now researchers at the Medical Center—University of Freiburg have succeeded in showing that sleep is more than rest for improving performance. The findings, which were published in the journal *Sleep* on January 6, 2021, provide important information for planning periods of intensive learning or training.

"Sleep is irreplaceable for the recovery of the [brain](#). It cannot be replaced by periods of rest for improved performance. The state of the brain during sleep is unique," says Prof. Dr. Christoph Nissen, who headed the study as research group leader at the Department of Psychiatry and Psychotherapy at the Medical Center—University of Freiburg and is now working at the University of Bern, Switzerland. In earlier studies, Nissen and his team provided evidence for the notion that sleep has a dual function for the brain: Unused

connections are weakened and relevant connections are strengthened.

In the current study, the researchers conducted a visual learning experiment with 66 participants. First, all participants were trained distinguishing certain patterns. Afterwards, one group was awake watching videos or playing table tennis. The second group slept for one hour and the third group stayed awake, but was in a darkened room without [external stimuli](#) and under controlled sleep laboratory conditions. Not only did the group that slept perform significantly better than the group that was awake and active, but the sleep group also performed significantly better than the group that was awake, but deprived from any external stimuli. The improvement in performance was linked to typical deep-sleep activity of the brain, which has an important function for the connectivity of nerve cells. "This shows that it is sleep itself that makes the difference," says co-study leader Prof. Dr. Dieter Riemann, head of the sleep laboratory at the Department of Psychiatry and Psychotherapy at the Medical Center—University of Freiburg. In control experiments, the Freiburg researchers ensured that fatigue and other general factors had no influence on the results.

The study shows that [sleep](#) cannot be replaced by rest during phases of intensive performance demands at work or in everyday life.

More information: Christoph Nissen et al. Sleep is more than rest for plasticity in the human cortex. *Sleep*. Published: 06 January 2021. doi.org/10.1093/sleep/zsaa216

Provided by University of Freiburg

APA citation: Sleep is irreplaceable for the recovery of the brain (2021, January 7) retrieved 27 April 2021 from <https://medicalxpress.com/news/2021-01-irreplaceable-recovery-brain.html>

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