Learning in your sleep – the right way

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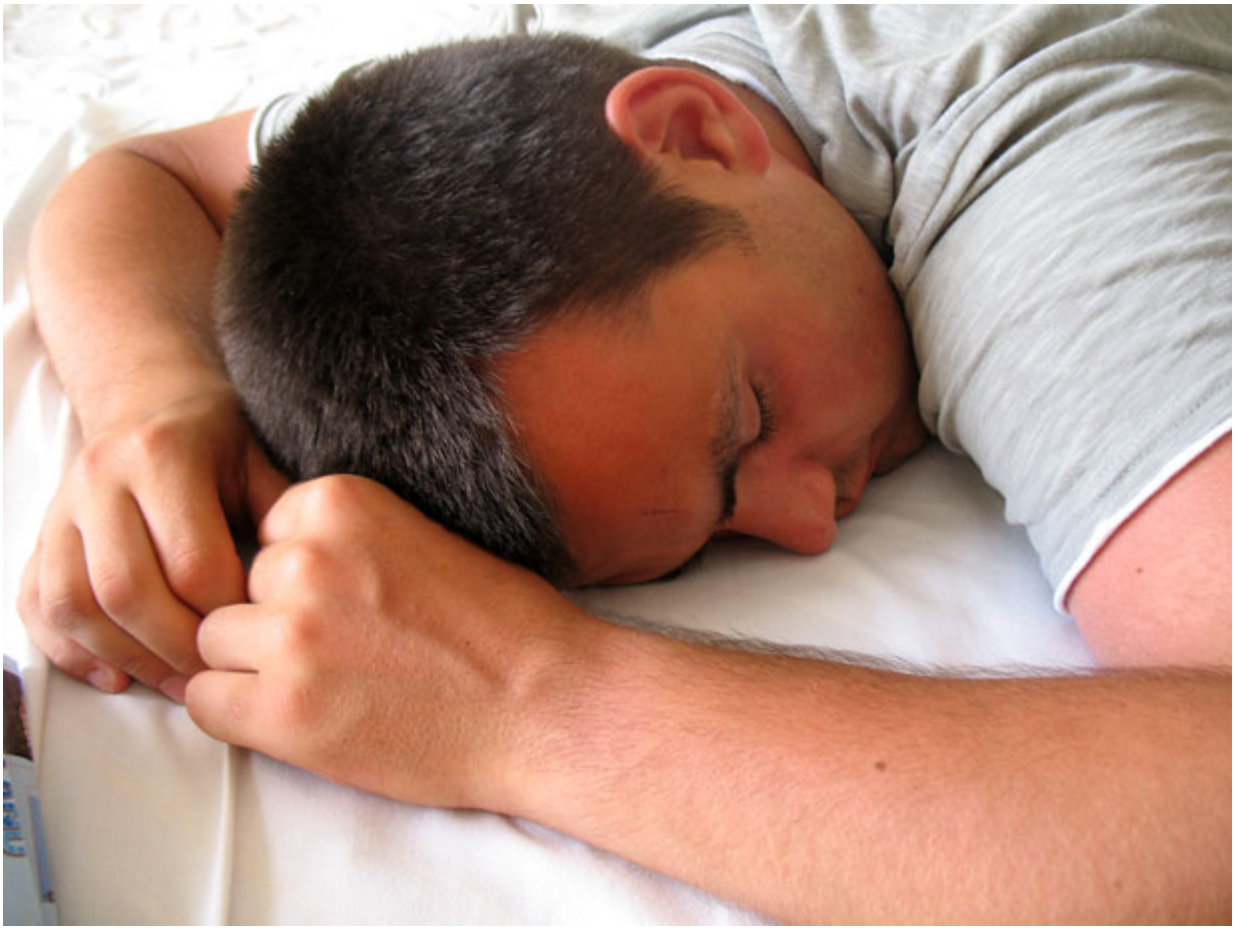

Credit: Vera Kratochvil/public domain

You can swot up on vocabulary in your sleep – but only if you don't confuse your brain in the process. Researchers funded by the Swiss National Science Foundation have invited people to their sleep lab for a

Dutch language course.

You can't learn new things in your sleep. Nevertheless, if you've been learning vocabulary in a foreign language, it can be highly effective to hear these words played over again while you sleep, as was already shown a year ago by researchers from the university of Zurich and Fribourg. Their new study, funded by the Swiss National Science Foundation, demonstrates that this only works if the brain can do its job undisturbed.

Translating doesn't help

The researchers got 27 German-speaking test subjects to learn Dutch words, then let them sleep for three hours in the sleep lab. The scientists already knew that playing back this vocabulary softly would help the test subjects to remember the words. Now they wanted to give them more information while they were asleep. The research team, led by biopsychologist Björn Rasch from the University of Fribourg, wanted to enhance the technique's impact by supplying German translations after the Dutch words. They also wanted to achieve the opposite – in other words, they hoped that supplying incorrect translations would make the test subjects forget what they'd learnt.

"To our surprise, we were neither able to enhance their memory, nor able to make them forget what they'd learnt", says Rasch. He was able to confirm the original findings – that simply cueing the Dutch vocabulary during sleep enabled the subjects to recall about ten percent more words. "But playing a second word right after the first seems to disrupt the relevant memory processes that had hitherto been activated", says Rasch. He and his team have concluded that it's not the total information offered to the brain that is important. Instead, the brain just needs a nudge in order to enhance the ability to recall.

Only in the lab – for now

The results of this memory test were reflected in the brain wave patterns of the test subjects. While individual Dutch words were being played, the researchers recorded an enhancement in the waves characteristic of sleep and recollection (sleep spindles and theta-oscillation). But these activity patterns disappeared completely as soon as another word followed on from the first.

In a subsequent experiment, the researchers were also able to demonstrate that the time span between word pairs was of decisive importance. If the German translation followed only after 2 seconds instead of after 0.2 seconds, the disruptive effect disappeared. But there was still no enhancement of impact.

"For us, these results are further evidence that sleep promotes memory formation, with the brain spontaneously activating content that it had learnt beforehand. We were able to enhance this effect by playing back the words", says Rasch. It's as yet uncertain whether there will soon be an app to help people get better marks in their vocabulary tests. "Now we really want to get out of the controlled situation of the sleep lab, to see whether the impact we've observed can also be reproduced under realistic conditions in everyday life", he says.

More information: Thomas Schreiner et al. Auditory feedback blocks memory benefits of cueing during sleep, *Nature Communications* (2015). DOI: 10.1038/ncomms9729

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