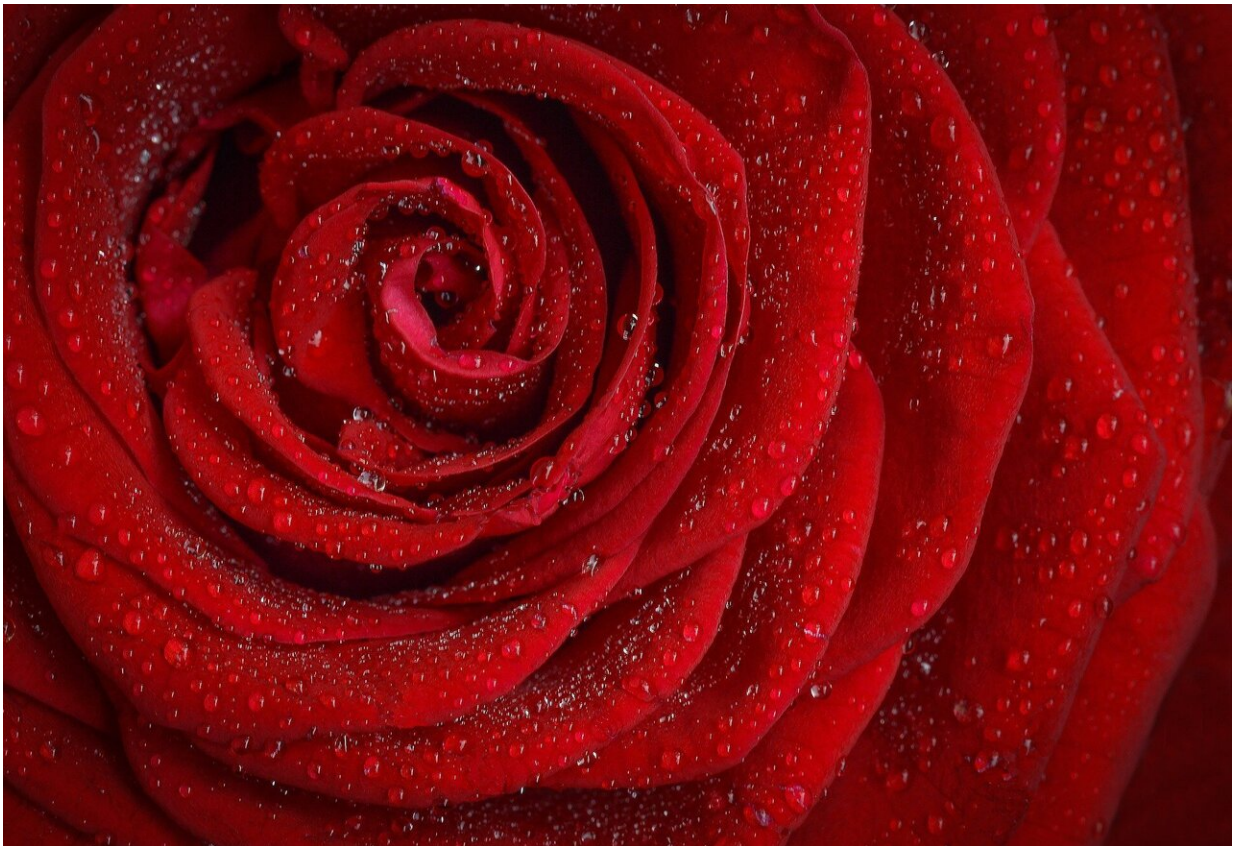


The scent of a rose improves learning during sleep

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Effortless learning during sleep is the dream of many people. The supportive effect of smells on learning success when presented both during learning and sleep was first proven in an extensive sleep

laboratory study. Researchers at the University of Freiburg—Medical Center, the Freiburg Institute for Frontier Areas of Psychology and Mental Health (IGPP) and the Faculty of Biology at the University of Freiburg have now shown that this effect can be also achieved very easily outside the lab. For the study, pupils in two school classes learned English vocabulary—with and without scent sticks during the learning period and also at night. The students remembered the vocabulary much better with a scent. The study was published in the Nature Group's Open Access journal *Scientific Reports* on 27 January 2020.

"We showed that the supportive effect of fragrances works very reliably in [everyday life](#) and can be used in a targeted way," said study leader PD Dr. Jürgen Kornmeier, head of the Perception and Cognition Research Group at the Freiburg-based IGPP and scientist at the Department of Psychiatry and Psychotherapy at the University of Freiburg—Medical Center in Germany.

The smell of roses when learning and sleeping

For the study, first author and student teacher Franziska Neumann conducted several experiments with 54 students from two 6th grade classes of a school in southern Germany. The young participants from the [test](#) group were asked to place rose-scented incense sticks on their desks at home while learning English [vocabulary](#) and on the bedside table next to the bed at night. In another experiment, they also placed the incense sticks on the table next to them during a vocabulary test at school during an English test. The results were compared with test results in which no incense sticks were used during one or more phases.

"The students showed a significant increase in learning success by about 30 percent if the incense sticks were used during both the learning and sleeping phases," says Neumann. The results also suggest that the additional use of the incense sticks during the vocabulary test promotes

memory.

Findings are suitable for everyday use

"One particular finding beyond the seminal initial study was, that the fragrance also works when it is present all night," says Kornmeier. "This makes the findings suitable for everyday use." Previous studies had assumed that the fragrance needs to be only present during a particularly sensitive sleeping phase. However, since this sleep phase needs to be determined by an effortful measurement of brain activity by means of an electroencephalogram (EEG) in the sleep laboratory, this finding was not suitable for everyday use. "Our study shows that we can make learning during sleep easier. And who would have thought that our nose could help considerably in this," says Kornmeier.

More information: Franziska Neumann et al, How odor cues help to optimize learning during sleep in a real life-setting, *Scientific Reports* (2020). [DOI: 10.1038/s41598-020-57613-7](https://doi.org/10.1038/s41598-020-57613-7)

Provided by University of Freiburg

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