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## Pillow Talk: the science behind the all-nighter

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# PILLOW TALK:

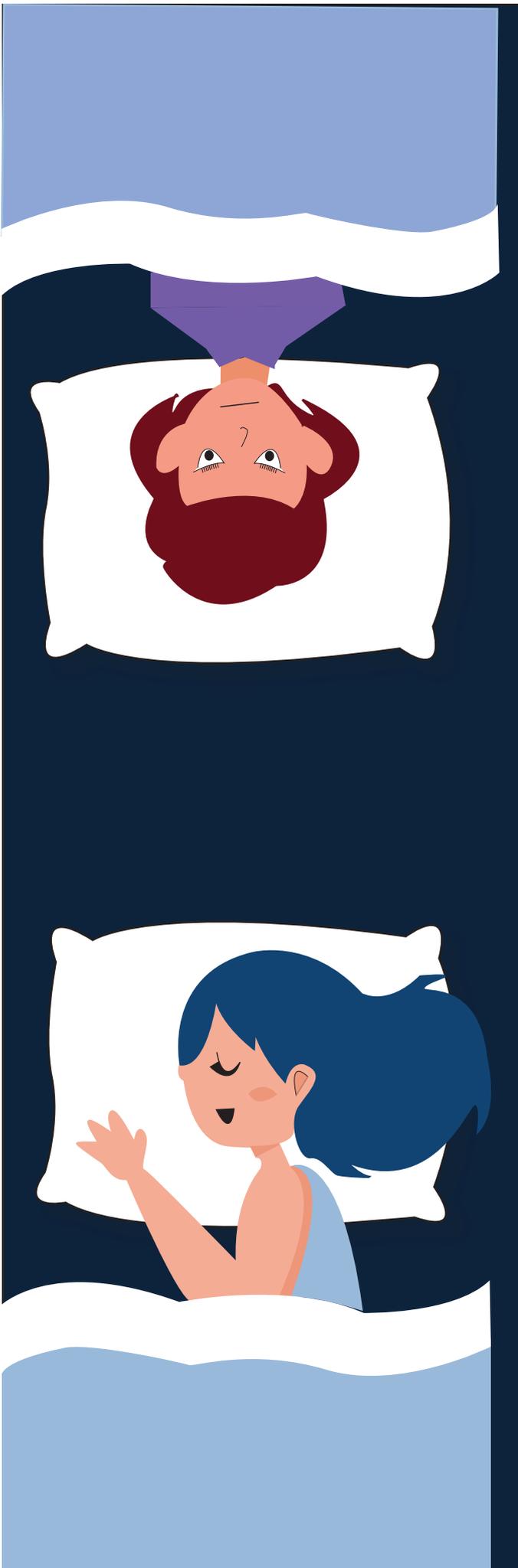
## the science behind the all-nighter

BY Rilyn McKallip

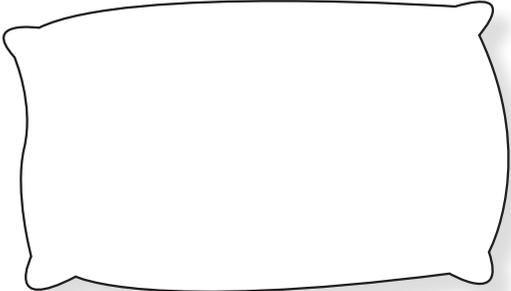
It's that crazy part of the semester. Finals are coming up, and you find yourself staying awake later and later trying to cram for important tests. The night before your toughest final, you decide to pull an all nighter. It's the only way you'll be able to learn all those facts. The day of the test, you feel awful, but you make it through, and have a feeling you probably passed. As you go back to your dorm to crash, all seems well. You think to yourself, "that one night of lost sleep probably won't hurt me at all."

How much does a sleepless night really affect you? As it turns out, sleep is crucial for many bodily functions, and even one night without sleep can have harmful physiological effects.<sup>1</sup> Longer periods of sleep deprivation (generally defined as less than 7 hours of sleep a night) are associated with many health risks, including an increased chance of obesity, diabetes, and cardiovascular disease.<sup>2</sup> Why is sleep so important, and how do these sleep related problems occur?

When you wake up after a good night's sleep, you probably feel refreshed and have a general sense of well being. This is because your body repairs itself in your sleep. Hormones are released, organs are repaired, proteins and lipids are produced, and waste is removed from the brain. Some of the hormones released are related to growth and development, so getting enough sleep helps an individual grow and develop properly.<sup>3</sup> The brain is full of activity during sleep, as it uses this time to clear out waste products that accumulate in the brain. This function of clearing out toxins and wastes in the brain is almost exclusive to sleep, as the brain cannot expel these products and process sensory information at the same time. Therefore, a lack of sleep causes these toxins to build up in the brain and impede memory and brain function.<sup>4</sup> Additionally, while you are asleep, the brain repairs neurons and myelin sheaths, the protein and lipid combination that encloses the axons of neurons and allows them to fire faster. When you don't get enough sleep, or get no sleep at all, the myelin may not be repaired or produced in the proper amounts.



A study examining sleep deprivation on myelin production showed that even a single night without sleep can have detrimental effects. In this study, the researcher showed that myelin is produced and maintained during sleep, a sleepless night can lead to myelin damage, and that sleepless participants had a reduction in white matter (neurons with myelin sheaths) in their brains.<sup>1</sup> Another study looked at both cognitive and physiological effects of an all-nighter in college aged students. After one night, the researchers gave the participants a series of tests to measure cognitive abilities, including a game similar to SIMON© involving repeating a series of colors and sounds and a test consisting of reading words mismatched with their color (for example, “red” printed in blue ink). Reaction time and cardiovascular health were also measured, using a ruler drop test and



exercise test, respectively. The sleepless participants exhibited a significantly slowed reaction,

with a reaction time of about .01 seconds longer than the control group. While this may not seem like a large increase, even that small of a delay can have disastrous consequences in high risk situations, like driving. According to the study, a night of no sleep affects judgment while driving to the same degree as a 0.1% Blood Alcohol Content (BAC), which is greater than the legal BAC level for driving.<sup>5</sup>

Maybe you’re thinking-- “well, I never pull all nighters, per se, so I’m all good, right?” Not necessarily. Sustained poor sleeping habits can have even more disastrous health effects in the long run. On average, adults need 7-8 hours of sleep per night. When that minimum is not met, the body cannot perform its restorative functions as well, and there can be adverse health effects.

A leading journal on sleep showed a relationship between sleep loss and obesity: adults who consistently got less than 6 hours of sleep were 7.5 times more likely to have a higher Body Mass Index than those who

got the recommended amount of sleep. The authors suggest that this difference may be because sleep deprivation is associated with increased appetite, as seen by a decreasing amount of leptin, a hormone that suppresses appetite, and increasing levels of ghrelin, a hormone that signals hunger. Consistent sleep loss can lead to weight gain because it may cause an individual to feel hungrier on a daily basis. According to the journal, long term sleep loss is also associated with diabetes, as sleep loss leads to a decrease in glucose tolerance. Those who receive less than 6 hours of sleep are 1.7 times more likely to get diabetes than the adults receiving the recommended amount of sleep. Additionally, not getting enough sleep is associated with cardiovascular disease, with people who sleep less than 5 hours a night experiencing a 45% increase in risk of nonfatal heart attack as compared to adults getting 7-8 hours a night.<sup>2</sup>

While students tend to sacrifice sleep in favor of schoolwork and other activities, getting enough rest is a crucial part of a healthy life. Try to set aside time to get your seven to eight hours. Your body will thank you for it!

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#### SOURCES:

1 Elvsåshagen, T., Norbom, L.B., Pedersen, P., Quraishi, S.H., Bjørnerud, A., Malt, U. F... Westlye, L. T. (2015). Widespread Changes in White Matter Microstructure after a Day of Waking and Sleep Deprivation. Retrieved from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0127351>

2 Institute of Medicine (US) Committee on Sleep Medicine and Research (2006). Colten HR, Altevogt BM, editors. Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem. Washington (DC): National Academies Press (US); 3, Extent and Health Consequences of Chronic Sleep Loss and Sleep Disorders. Retrieved from: <https://www.ncbi.nlm.nih.gov/books/NBK19961/>

3 National Institutes of Health (US); Biological Sciences Curriculum Study. (2007). Information about Sleep. NIH Curriculum Supplement Series [Internet]. Retrieved from: <https://www.ncbi.nlm.nih.gov/books/NBK20359/>

4 Eugene, A. R., & Masiak, J. (2015). The Neuroprotective Aspects of Sleep. *MEDtube science*, 3(1), 35–40.

5 Patrick, Y., Lee, A., Raha, O., Pillai, K., Gupta, S., Sethi, S., ... Moss, J. (2017). Effects

of sleep deprivation on cognitive and physical performance in university students. *Sleep and biological rhythms*, 15(3), 217–225. doi:10.1007/s41105-017-0099-5