

# Too Little Sleep? The Dangers of Sleep Deprivation

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In modern society, it has become more and more common for people to live ever higher proportions of their lives on less and less sleep. Whether they are an employee who regularly works into the early hours to complete an assignment, a parent who is roused from sleeping by a howling infant, or a university student who has decided they deserve a night on the town for the seventh night running, almost everyone in the developed world is now familiar with the concept of sleep deprivation. It has been said that two out of three people in Britain currently suffer from insomnia, an inability to sleep (1). But can this be dismissed as a relatively harmless consequence of today's culture, or are the damaging effects of a lack of sleep too serious to be disregarded?

Sleep deprivation has been shown to induce a range of adverse physical and mental effects. Sleep researchers warn that lack of sleep is leading to poor performance at work and disrupting family life: 57% of people say that lack of sleep affects performance once or more a week (2); one in five road accidents that result in serious injury or death in the UK is due to sleep disorders or drowsiness (3); doctors who stay up all night make 20% more errors and take significantly

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more time to complete surgical operations than those who sleep through the night (4). Clearly, sleep deprivation has widespread negative effects. So what is known about the

scientific basis of how sleep deprivation affects health?

A study has suggested that missing out on sleep may stop neurogenesis, the production of new nerve cells, in the brain. Researchers from Princeton University worked on rats and found that a lack of sleep affected the hippocampus, the brain region involved in memory formation, via corticosterone, a stress hormone (5). The leader of the researchers, Dr Elizabeth Gould, said that the role of neurogenesis in the adult brain is still unclear,

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but "the suppression of adult neurogenesis may underlie some of the cognitive deficits associated with prolonged sleep deprivation" (6). Such deficits include memory and concentration difficulties. Although these experiments were done using extreme conditions of sleep deprivation, it is not known if a similar effect is seen by regularly sleeping slightly less than the amount required (6).

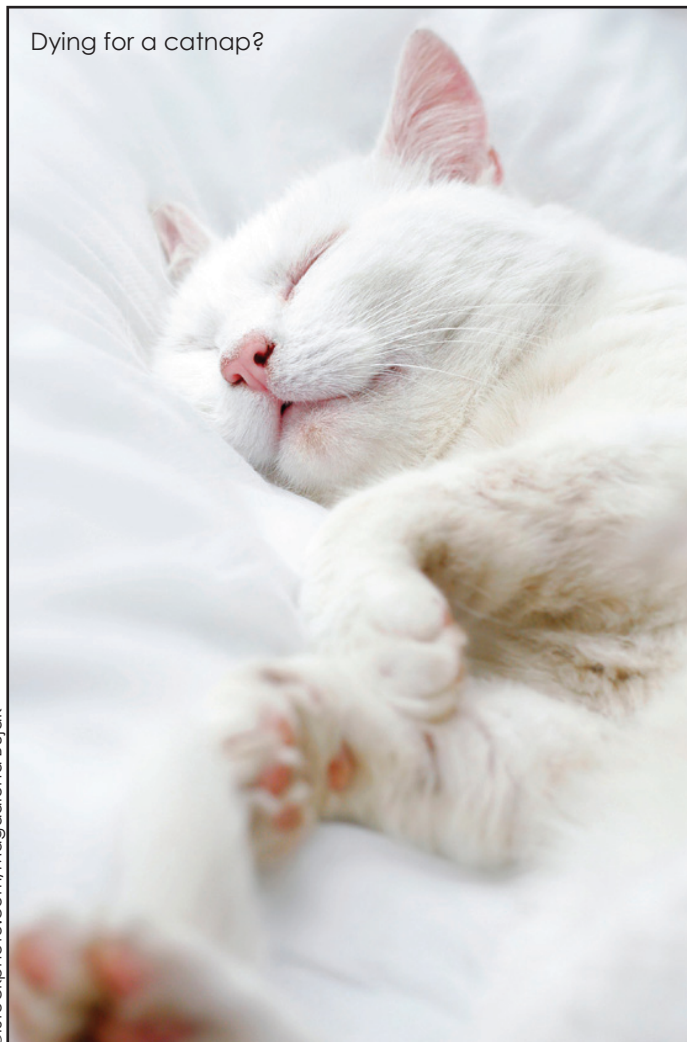
There is growing evidence that the brain uses sleep time to consolidate memories acquired during the day, implying that sleep deprivation could negatively impact memory. Dr Sidarta Ribeiro said the two stages of sleep—'slow wave' sleep and 'rapid-eye-movement' (REM) sleep (linked to dreaming)—play "separate and complementary roles in memory consolidation—periods of slow wave sleep are long and produce a recall and probably amplification of memory traces; ensuing episodes of REM sleep are short and trigger the expression of genes to store what was processed during slow-wave sleep."

Researchers from the University of Chicago found that facts forgotten by people during the day may be retrieved after sleep, concluding that "sleep consolidates memories, protecting them against subsequent interference or decay. Sleep also appears to 'recover' or restore memories." (7). Furthermore, research has found that sufficient sleep improves problem solving ability, as this is when, it is thought, the brain can 'reconstruct' information from the previous day (8). Dr Carl Hunt, from the National Centre on Sleep Disorders Research in the US, says study into the effects of sleep deprivation will "have potentially important results for children for school



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Dying for a catnap?



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performance and for adults for work performance." (9)

It is not only cognitive functions that are affected by sleep deprivation—physical health is also affected. A team from the Mailman School of Public Health and the Obesity

### Sleep is vital to ensure the efficient storage of memories and regeneration of brain cells

Research centre at Columbia University found that the less people sleep, the more likely they are to be obese (10). Dr Stephen Heymsfield, who worked on the study, said that the explanation that those who stay awake for longer are more likely to eat more is too simplistic, and that there is "scientific evidence that there's a link between sleep and the various neural pathways that regulate food intake." In fact, previous research has found that sleep deprivation is linked to a decrease in the levels of the hormone leptin and an increase in the level of ghrelin, both involved in signalling hunger (10). It is possible, however, that these changes are an indirect effect of another mechanism increasing food consumption.

Sleep is also believed to reduce the likelihood of developing some forms of cancer, by changing daily cycles

in hormone levels (11–14). Furthermore, a team from the US Department of Medicine in Chicago found that sleep deprivation has a similar effect on the body to the ageing process, and may increase the severity of age-related chronic disorders (15). Dr Tom Mackay, at the Scottish National Sleep Centre, said, "persistently high levels of glucose raised the risk of developing heart disease, diabetes and strokes." (16)

It is possible to limit the damaging effects of sleep deprivation. Clinical management of insomnia involves first attempting to identify and treat the underlying cause. Sufferers are advised, for example, not to go to bed until tired, to avoid daytime naps and establish regular bedtime

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routines (17). As a last resort, doctors can prescribe drugs such as Temazepam.

Sleep deprivation is a consequence of modern life, but it should undoubtedly not be dismissed as inevitable. Research into the physical and mental effects of sleep deprivation has only just begun, but already we have learned that sleep is vital to ensure the efficient storage of memories and regeneration of brain cells, as well as reducing the risk of developing a wide range of medical conditions. Consequently, one can clearly see that the simple recommendation of a minimum eight hours sleep per night is one that should most definitely be heeded.

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