# Sleep mode: The energy cost of sleep deprivation

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The findings show that missing a night of sleep burns roughly 135 calories, the equivalent of two slices of bread or a 225 ml glass of semi-skimmed milk. In terms of physical exertion, this amounts to walking just under two miles. On the flip side, eight hours of sleep saved the same approximate amount of energy.

'While the amount of energy saved during sleep may seem small, it was actually more than we expected,' says Professor Kenneth Wright, lead author of the study and Director of Colorado University's Sleep and Chronobiology Laboratory. 'If one considers the amount of positive energy storage needed to explain the obesity epidemic is 50 calories a day (Hill et al., 2003), the energy savings represented by sleep is physiologically meaningful.'

The tightly controlled study included seven carefully vetted young adult subjects, with the participants required to stay in bed and follow a weight maintenance diet for the entire three-day duration. The first day established baseline data and consisted of a typical 16 hours of wakefulness followed by eight hours of sleep. Days two and three included 40 hours of total sleep deprivation followed by eight hours of recovery sleep.

The findings showed that compared to a typical night of sleep, the amount of energy expended by the subjects during 24 hours of sleep deprivation increased about seven per cent. In contrast, energy expenditure decreased to five per cent during the recovery episode,

which included 16 hours of wakefulness (following the sleep deprivation night), then eight hours of recovery sleep.

The study proves there is a direct correlation between the sleep–wake cycle and how the body uses energy. It also demonstrates that sleep deprivation is metabolically costly. 'The function of sleep, especially in humans, is considered one of the most important scientific enigmas,' commented Wright, who hopes the new data will help researchers better understand one piece of the sleep puzzle.

One question arising from the study concerns why humans don't conserve more energy during sleep. 'There are other functions of sleep that are important and cost energy,' explains Wright. 'Some conserved energy may be re-distributed to support vital physiological processes like learning and memory consolidation, immune function, and hormone synthesis and release.'

Wright is also quick to caution that energy expenditure during sleep deprivation is neither a safe nor effective strategy for weight loss as other studies have shown that chronic sleep deprivation is associated with impaired cognition and weight gain. He hopes recently initiated research in his lab will shed further light on this relationship and generate useful findings for 'at risk' members of the public.

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