

# Why Sleep Deprivation Makes You Stupid, Slow and Dangerous

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Sleep deprivation is commonplace in today's society, and its effects on cognitive function, health, and mood are beginning to be understood scientifically. The National Institutes of Health estimate the cost of accidents, injuries and illnesses associated with a lack of sleep at \$14.2 billion, which does not include another \$51 billion for lack of productivity, employee turnover and retraining (National Institutes of Health, 1995). Another \$11 billion expense in our country is related to treatment of sleep disorders, particularly among the elderly where as many as 60% of those age 65 and older report sleep disturbances. Falls are the leading cause of death among the elderly, and sleep disturbances are the biggest contributor to falls (Mellinger et al., 1985).

A National Academy of Sciences (2006) study found interns who worked just three hours more per shift committed 22% more critical errors (errors that result in increased morbidity and mortality) than their counterparts. The explosion of the space shuttle Challenger and the Exxon Valdez Alaskan oil spill have both been blamed on lack of sleep on the part of their crews who had been working 20 hour and 30 hour shifts, respectively, before each of those disasters (Hassen, 2008).

There is broad consensus that insufficient sleep leads to general slowing of reaction time, lack of alertness, attention and vigilance, less is agreed-upon about the effects of sleep deprivation on higher level cognitive functions related to perception, memory and executive functioning. But, even most non-experts would agree that "without sleep, nearly every aspect of life becomes more effortful and less emotionally fulfilling. When sleep deprived, most of us feel sleepy and physically drained, our mood is flattened, and our thinking feels sluggish and unfocused" (Killgore, 2010).

The consequences of slowed response times, greater variability in performance, attentional lapses, and increased errors of both omission and commission become evident both by restricting sleep by only two hours each night (6 hours of sleep) or by extending periods of wakefulness beyond 17 hours (awake from 6am to 11pm, for example). Inhibiting sleep by only two hours per night for an extended period of time (two weeks) results in the same cognitive abilities as two nights of total sleep deprivation (Van Dongen et al., 2003). Equally alarming are the results of Dawson and Reid's 1997 study in which they found that 24-hour wakefulness produces the same performance on a hand-eye coordination task as when those same subjects had a blood alcohol concentration of 0.10%, the legal limit for intoxication in all 50 states.

It is also known that a lack of sleep negatively effects mood, patience, and impulse control. Studies show that even a single night of sleep deprivation results in self-reported decline in mood, increased irritability, emotional volatility, and self-esteem (Tempesta et al., 2010). Objective observations indicate that sleep deprived individuals demonstrate frustration intolerance, lack of empathy and moral judgment, impulse control and inability to delay gratification (Killgore, et al., 2007). With this information, one must consider how lack of sleep might contribute to communication and behavioral problems among students, faculty and within families. Even at a sub-clinical level, lack of sleep appears to create significant interactional problems among people, but sleep deprivation also results in as much as a 25% increase in several dimensions of psychopathology such as clinical depression, anxiety, paranoia, mania, and borderline personality disorder (Kahn-Greene et al., 2007).

It has now been demonstrated that lack of sleep causes increases in serum norepinephrine (Zhong, et al., 2005), the neurotransmitter responsible for the fight-or-flight stress response that results in increases in blood pressure and inflammation within blood vessel walls, commonly associated with heart attacks. Sleep less than seven hours per night has also been associated with reduced leptin levels and decreased ghrelin levels which both stimulate appetite. Reduced sleep conditions result in a failure of these appetite regulating hormones to function normally, resulting in an

increased body mass index and resultant obesity (Taheri, et al., 2004). Lack of sleep also results in glucose intolerance, the body's ability to utilize consumed carbohydrates for energy instead of storing the calories as adipose tissue (Knutson, Spiegel, Penev, & Cauter, 2007). A fascinating find of these studies is that obesity indicators as a result of sleep deprivation have been found in both acute and chronic sleep deprivation conditions, in children, adolescents and adults, and in both laboratory settings and more real-life conditions of sleep deprivation.

A number of studies have been devoted to sleep deprivation and school performance. Despite knowing that school-aged children need 10-11 hours of sleep daily, teens need 8.5-9.5 hours daily, and adults need 7-9 hours daily, only 31% of high school students report getting at least 8 hours of sleep on an average school night (Centers for Disease Control, 2009). Sleep time decreases with age and culture. African-American males most frequently get the least amount of sleep as 70% get fewer than 7 hours per night of sleep (Centers for Disease Control, 2009). In a study comparing sleep patterns of American to Chinese school children, the Chinese children were found to get one hour less sleep per day, even taking into account that naps are common among Chinese children as the school lunch period is often two hours long to provide for a 30-60 minute nap during the school day. The authors attributed these sleep deficits to an increased focus on homework in Chinese culture. Chinese children were also found to have more sleep disturbances, which was theorized to be a result of Chinese children more likely to co-sleep with parents.

Given the negative cognitive, health, and psychosocial effects of sleep deprivation, it is easy to see how learning, the classroom and workplace environment, and patient safety might be compromised. **Consider the following for further discussion:**

1. What strategies could we employ (or are you familiar with) to get teens and adults to get enough sleep, given our 24-hour society and prevalence of technology?
2. As educators, administrators and parents and healthcare practitioners, what practices do we [unintentionally] employ that place productivity on a pedestal over sleep, good health, and a balanced lifestyle?
3. What evidence (even if anecdotal) do you have that sleep has impaired your own performance or health?

#### **References:**

As you I hope you can tell, I am fascinated by this topic and loved researching it for all of us. If you have time to review only two articles for yourself, I suggest the following as the most comprehensive and compelling:

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The other articles used in my presentation include:

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