

## The Price of Sleep Deprivation

Chin-Lung Kuo M.D., PhD<sup>\*123</sup><sup>1</sup>*Institute of Brain Science, National Yang-Ming University, Taipei, Taiwan, R.O.C.*<sup>2</sup>*Department of Otolaryngology, Hsinchu Armed Force Hospital, Hsinchu, Taiwan, R.O.C.*<sup>3</sup>*Department of Otolaryngology, Taoyuan Armed Forces General Hospital, Taoyuan, Taiwan, R.O.C.*

*\*Corresponding author: Dr. Chin-Lung Kuo, M.D., PhD, No.108, Minquan 10th St, Guiren Dist, Tainan City 71148, Taiwan, ROC, Tel: +886-9-19681078; E-mail: drkuochinlung@gmail.com*

*Received: 05-11-2015**Accepted: 06-11-2015**Published: 01-07-2016**Copyright: © 2016 Chin-Lung Kuo*

### Does this describe you?

One of the following scenarios may describe your current situation: working nonstop around the clock, working through meals, endless meetings and reports, constant overtime, bringing your work home, and working sometimes more than ten hours a day. By the time you get to bed, it's already two or three in the morning. You sleep for less than five hours every day, and you can't wake up without your coffee fix. Having finally managed to hang on until the weekend, you don't feel like leaving the house at all; you just want to sleep in. You think you'll feel better when you wake up, but instead, the more you sleep, the more tired you feel. Then it's Monday again, and you're yawning at work and still not getting adequate sleep. You can't concentrate, and your work efficiency leaves something to be desired.

### Lack of sleep is much worse than you think

Although sleep is crucial to human physiological and cognitive function, [1] sleep is frequently sacrificed in order to excel at work, in particular in a busy world where working hours are continuously increasing. However, evidence indicates that the cognitive psychomotor performance of an individual who has gone 17 hours without sleep is no different from that of a person with a blood alcohol concentration of 0.05%, which is the drunk driving standard adopted in many countries [2]. A 22-year longitudinal study involving 21,268 individuals found that sleeping for less than 7 hours per 24 hour period can increase the probability of death by 26% in males and 21% in females [3]. The *Lancet* has recently published a large scale study investigating the effects of longer working hours on cardiovascular health. The study, led by

researchers at University College London, used cumulative random-effects meta-analysis to combine effect estimates from published and unpublished data for 603 838 individuals. The study reveals that people who work more than 55 hours/week have a 33% increased risk of stroke ( $p=0.002$ ) as well as a 13% increased risk of coronary heart disease ( $p=0.02$ ), compared with those who had standard working hours (35-40 hours per week) [4]. The above evidence reflects a need to weigh up the costs and benefits of sacrificing sleep for work.

### The price of sleep deprivation

Studies show that a person needs a minimum of 7 to 8 hours of sleep a day [5]. However, stress and competition in the workplace and fast-paced lifestyles, all byproducts of modern society, have shortened the amount of sleep people get. Epidemiological statistics in the US show that in 1910, a person slept for an average of 9 hours a day. This figure dropped to 7.5 hours in 1975 and further declined to 6.9 hours in 2000 [6].

Poor sleep quality can have adverse effects, both mental and physical. It can lead to tightness in the chest, heart palpitations, headaches, dizziness, muscle aches, and trembling hands. Over the long term, it can cause listlessness, affect interpersonal relationships, and even result in mental illnesses, including depression and bipolar disorder [7]. Other effects include memory loss, slowness in understanding, and inability to concentrate, all of which impair judgment, decrease work efficiency, and affect work performance [8,9]. In particular, a chronic sleep-restricted state may be a crisis for the ill people as well as for their families [10].

Sleep deprivation is also a common factor in accidents. In 1997, a study in *Nature* revealed that after 17 hours of sustained wakefulness cognitive psychomotor performance decreased to a level equivalent to the performance deficit observed at a blood alcohol concentration of 0.05%, which is the drunk driving standard adopted in many countries. This study further established that after 24 hours without sleep, an individual is no more aware than a drunk driver with a higher blood alcohol concentration of 0.10% [2].

A study conducted at the University of New South Wales, Australia, also obtained similar results. Researchers found that after 17 to 19 hours without sleep, subjects displayed significantly weakened states of consciousness, reflexes, concentration, memory, and judgment. In some tests, these individuals even performed worse than subjects with a blood alcohol concentration of 0.05% [11].

Severe, long-term sleep deprivation can even cause reduced immunity and digestive and metabolic disorders, thereby affecting several physiological systems and leading to various complications such as digestive dysfunction, increased appetite, obesity, high cholesterol, diabetes, hypertension, and heart disease [6,12,13]. Research has also proven that not getting enough sleep affects the activity of various immune cells, such as white blood cells, lymphocytes, and natural killer cells. This in turn severely affects the body's ability to fight against foreign viruses and bacteria [14-17]. Studies at the University of California and the San Diego Veterans Affairs Medical Center found that if the average person gets 45% less sleep, the activity levels of their killer cells can be reduced by as much as 30%.<sup>14</sup> Researchers have established that natural killer cell activity is correlated to malignant tumor recurrence [18,19].

### Treat yourself to a good night's sleep

These above-mentioned studies show that the bodily stress accumulated from not getting sufficient sleep can lower your immunity, adversely affect all the organs in your body, cause various disorders, and even shorten your lifespan. Lack of sleep is much worse than you think, and this issue has escaped the attention of the public. It is important to bear in mind that sacrificing sleep for work is absolutely a bad trade, and that the relaxation is for a high quality life. Now it is time that you should relax a bit and treat yourself to a good night's sleep.

### References

1. Fullagar HH, Skorski S, Duffield R, Hammes D, Coutts AJ, Meyer T. Sleep and athletic performance: the effects of sleep loss on exercise performance, and physiological and cognitive responses to exercise. *Sports medicine*. 2015, 45(2): 161-186.
2. Dawson D, Reid K. Fatigue, alcohol and performance impairment. *Nature*. 1997, 388: 235.

3. Hublin C, Partinen M, Koskenvuo M, Kaprio J. Sleep and mortality: a population-based 22-year follow-up study. *Sleep*. 2007, 30(10): 1245-1253.
4. Kivimäki M, Jokela M, Nyberg ST, Singh-Manoux A, Fransson EI et al. Long working hours and risk of coronary heart disease and stroke: a systematic review and meta-analysis of published and unpublished data for 603 838 individuals. *Lancet*. 2015, 386(10005): 1739-1756.
5. St-Onge MP. The role of sleep duration in the regulation of energy balance: effects on energy intakes and expenditure. *J Clin Sleep Med*. 2013, 9(1): 73-80.
6. Bopsy-Westphal A, Hinrichs S, Jauch-Chara K, Hitze B, Later W et al. Influence of partial sleep deprivation on energy balance and insulin sensitivity in healthy women. *Obes Facts*. 2008, 1(5): 266-273.
7. Adrien J. Neurobiological bases for the relation between sleep and depression. *Sleep Med Rev*. 2002, 6(5): 341-351.
8. Walker MP, Stickgold R, Alsup D, Gaab N, Schlaug G. Sleep-dependent motor memory plasticity in the human brain. *Neuroscience*. 2005, 133(4): 911-917.
9. Alhola P, Polo-Kantola P. Sleep deprivation: Impact on cognitive performance. *Neuropsychiatr Dis Treat*. 2007, 3(5): 553-567.
10. Rokach A. Illness, Hospitalization and Loneliness. *Jacobs Journal of Nursing and Care*. 2015, 1(1): 004.
11. Williamson AM, Feyer AM. Moderate sleep deprivation produces impairments in cognitive and motor performance equivalent to legally prescribed levels of alcohol intoxication. *Occup Environ Med*. 2000, 57(10): 649-655.
12. Spiegel K, Leproult R, Van Cauter E. Impact of sleep debt on metabolic and endocrine function. *Lancet*. 1999, 354(9188): 1435-1439.
13. Vgontzas AN, Mastorakos G, Bixler EO, Kales A, Gold PW et al. Sleep deprivation effects on the activity of the hypothalamic-pituitary-adrenal and growth axes: potential clinical implications. *Clin Endocrinol (Oxf)*. 1999, 51(2): 205-215.
14. Irwin M, Mascovich A, Gillin JC, Willoughby R, Pike J et al. Partial sleep deprivation reduces natural killer cell activity in humans. *Psychosom Med*. 1994, 56(6): 493-498.
15. DF Dinges, SD Douglas, L Zaugg, DE Campbell, JM McMann et al. Leukocytosis and natural killer cell function parallel neurobehavioral fatigue induced by 64 hours of sleep deprivation. *J Clin Invest*. 1994, 93(5): 1930-1939.

16. Palmblad J, Petrini B, Wasserman J, Akerstedt T. Lymphocyte and granulocyte reactions during sleep deprivation. *Psychosom Med.* 1979, 41(4): 273-278.
17. Palmblad J, Cantell K, Strander H, Fröberg J, Karlsson CG et al. Stressor exposure and immunological response in man: interferon-producing capacity and phagocytosis. *J Psychosom Res.* 1976, 20(3): 193-199.
18. Fawzy FI, Fawzy NW, Hyun CS, Elashoff R, Guthrie D et al. Malignant melanoma. Effects of an early structured psychiatric intervention, coping, and affective state on recurrence and survival 6 years later. *Arch Gen Psychiatry.* 1993, 50(9): 681-689.
19. Whiteside TL, Herberman RB. The role of natural killer cells in human disease. *Clin Immunol Immunopathol.* 1989, 53(1): 1-23.