

Does Sleep Loss Cause Weight Gain?

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We've become a society that sleeps less and weighs more. Researchers are beginning to believe that these two coinciding states are not a coincidence since science is beginning to unravel a link between sleep loss and weight gain. Furthermore, this trend for shorter sleep duration has developed over the same time period as the dramatic increase in the prevalence of obesity and diabetes.¹

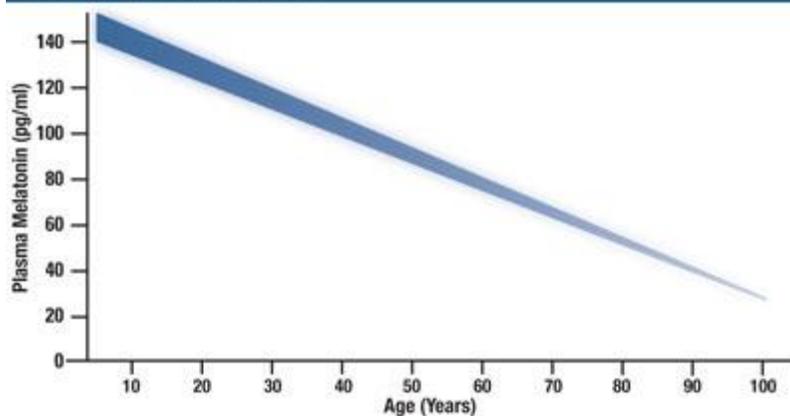
Sleep is involved in the optimal health of many bodily systems, including the digestive, immune and cardiovascular systems. Yet, in the hectic pace of modern-day society, where we feel as if we don't have enough hours in the day, many people have come to consider sleep almost optional. Others suffer from sleep disorders such as insomnia—difficulty in falling or staying asleep—and sleep apnea, a disorder characterized by the cessation of breathing or in some cases underbreathing during periods throughout sleep. Apnea results in the afflicted individual suffering from reduced oxygen levels (hypoxia). I describe to my patients the importance of sleep with the simple observation that the first four letters of the word "Restoration" are REST. When one "restores" something, they bring it into its original pristine state; it is sleep (rest) that allows the body to heal and maintain wellness.

Based on population-based studies, approximately 30 percent of adults around the world report one or more of the symptoms of insomnia: difficulty initiating sleep, difficulty maintaining sleep, waking up too early, and in some cases, nonrestorative or poor quality of sleep.² According to stricter diagnostic criteria from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV),³ the additional requirements that insomnia symptoms persist for at least 1 month and do not exclusively occur in the presence of another sleep disorder, mental disorder, or the direct effects of a medical condition, yields current prevalence estimates of approximately 6 percent.

One of the causes of insomnia as well as non-restorative sleep is sleep apnea. The National Institutes of Health estimates 12 million Americans have overt sleep apnea,⁴ including 1 out of 25 middle-aged men and 1 out of 50 middle-aged women. The incidence also increases with age, with at least 1 out of 10 people over the age of 65 developing the disorder. Women are much more likely to develop sleep apnea after menopause,⁴ which is a time of life also associated with weight gain in many women.

It is thought that the occurrence of sleep apnea is much more widespread than the estimates show since many people who have the disorder go undiagnosed.⁵

FIG 1. Age-related decrease of melatonin in humans (Nair, et al., *Biol Psychiatry*. 1986;21:141-150.).



Staying up later or getting up earlier, or a combination of both, literally violates our natural hormonal circadian rhythm. It is like swimming up stream and expecting the journey to be smooth and uneventful. Melatonin (highest in the night), cortisol (highest in the a.m.), testosterone (highest in the a.m., especially in men) are all time-based hormones. The statistics, trends and research indicate that our chaotic schedules are harming our health.

The prevalence of sleep apnea and other sleep disorders is particularly alarming due to the link between sleep loss and obesity and obesity's known role in predisposing an individual to a number of diseases.

Lose Sleep, Gain Weight

Evidence is mounting that lack of sleep is related to obesity and the development of impaired blood sugar metabolism and type 2 diabetes. Insulin resistance and blood sugar disturbances are linked to weight gain, creating what some researchers have called "diabesity." A recent sample of U.S. adults found that self-reported insufficient rest/sleep was associated with diabetes mellitus and obesity as well as cardiovascular disease, coronary heart disease and stroke. Furthermore, carefully controlled studies have shown that two nights of insufficient sleep are linked to a decrease in disposition index, the most commonly used predictor of an individual's diabetes risk, as well as impairments in glucose tolerance and insulin sensitivity.⁶⁻⁷

Experimentally induced sleep loss in healthy volunteers decreases insulin sensitivity without adequate compensation in beta-cell function. Insulin sensitivity decreases rapidly and markedly without adequate compensation in beta cell function, resulting in an elevated risk of diabetes.⁵

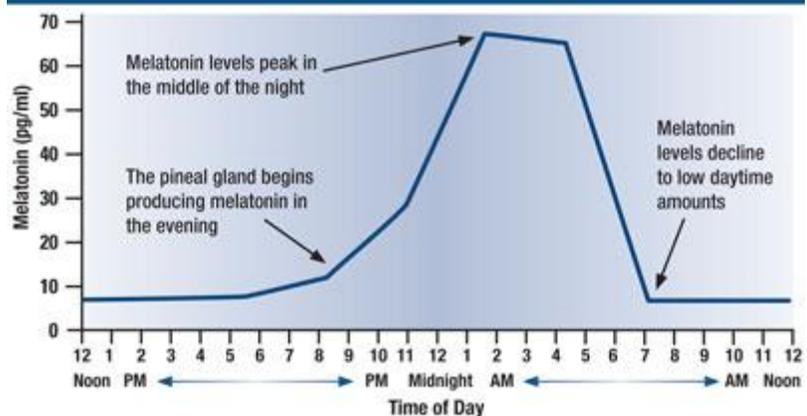
This led one group of researchers to conclude, "Taken together with the epidemiologic evidence for an association between short sleep and the prevalence or incidence of diabetes mellitus and/or obesity, these results support a role for reduced sleep duration in the current epidemic of these metabolic disorders."⁸

Reductions in sleep quantity or quality are also known to lead to increased hunger and appetite,⁷ and in sleep apnea patients insulin resistance is made worse by nocturnal hypoxemia due to apnea severity.⁹

Hunger Hormones And Sleep

One of the ways in which sleep loss may be linked to obesity is through appetite-regulating hormones. Lack of sleep has down-regulated the satiety hormone leptin in numerous studies and up-regulated the appetite-stimulating hormone ghrelin, thus increasing hunger and food intake.⁸

FIG 2. Fluctuation in melatonin levels over a 24-hour period.



Two nights of sleep restricted to four hours, compared to two nights of ten hours in bed, results in a reduction of the satiety hormone leptin, accompanied by increased hunger and increased serum concentrations of ghrelin, which might add to the risk of developing obesity.¹⁰

The hypoxic (low oxygen) stress that occurs in sleep apnea causes nocturnal falls in circulating concentrations of another hormone tied to fat regulation—adiponectin.¹¹ Studies link proper levels of this adipocytokine to normal insulin sensitivity and weight control.¹² Lower levels of adiponectin, on the other hand, are associated with metabolic, cholesterol, blood pressure and blood sugar imbalances.¹³⁻¹⁴

Caucasian women seem to be the most susceptible to falls in adiponectin levels after sleep deprivation.¹⁵

Another hormone impacted by sleep loss is melatonin. A number of animal studies have shown that melatonin plays a role in maintaining healthy weight. In one study, researchers investigated the effects of melatonin on obesity and obesity-associated systolic hypertension and lipid problems in diabetic fatty rats, an experimental model of the metabolic syndrome. Thirty diabetic rats and an equivalent number of lean littermates were subdivided into three groups: One group served as a control, another group was given a placebo and the third group was given melatonin (10 mg/kg/day) for 6 weeks. The results indicate that melatonin reduced mean weight gain without food intake differences. Melatonin-supplemented rats also showed a significant improvement in lipids, with a reduction in high triglyceride levels from 580 to 420.6 mg/dL. Melatonin supplementation raised levels of high-density-lipoprotein (HDL) cholesterol (“the good cholesterol”) in both the diabetic fatty rats and the lean rats and significantly reduced low-density-lipoprotein (LDL) cholesterol in the diabetic fatty rats from 5.20 to 4.14 mg/dL.¹⁶

The researchers wrote, “To our knowledge, this is the first evidence of a positive effect of melatonin on overweight and lipid pattern of obese Zucker diabetic rats, supporting the proposition that melatonin administration may ameliorate overweight and lipid metabolism in humans. Because these benefits occurred in youth, before advanced metabolic and vascular complications, melatonin might help to prevent cardiovascular disease associated with obesity and dyslipidemia.”

Melatonin also plays an important role in the regulation of glucose metabolism as evidenced by the fact that when the melatonin receptor type 1 is removed in mice, it significantly impairs the ability of the animals to metabolize glucose. This inability is likely due to increased insulin resistance in the rodents and indicates that these melatonin receptors are implicated in the pathogenesis of type 2 diabetes.¹⁷

It is also interesting to note that fragmented sleep disrupts testosterone rhythm in men and prevents the normal rise in testosterone that normally occurs during sleep.¹⁸

Sleep Support and Weight Management Strategies

As the aforementioned research shows, receiving a good night’s sleep is essential to maintaining a healthy weight. Consequently, if any signs of sleep apnea are present, it’s prudent for one’s health care practitioner to test for the condition. Although people who have sleep apnea may not have any of the specific symptoms, common symptoms of sleep apnea include fatigue, excessive daytime sleepiness, headache (especially in the morning), restless leg syndrome symptoms, impaired thinking, chronic

snoring, waking up abruptly with shortness of breath, episodes of breathing cessation during sleep, sore or dry mouth upon awakening, insomnia, depression and personality changes.

Regardless of whether sleep issues are caused by sleep apnea or other causes, melatonin supplementation can assist in obtaining a restorative night's sleep while also helping to promote healthy weight.¹⁹⁻²¹

The second step in ensuring a good night's sleep is to supplement with the sleep-supporting botanicals Seditol® (proprietary blend of extracts of *Magnolia officinalis* bark and *Ziziphus spinosa* seed), hops (*Humulus lupulus*) strobiles extract, lemon balm (*Melissa officinalis*) leaf extract, passion flower (*Passiflora incarnata*) extract, and valerian root extract, all found in Herbal Sleep.

The Seditol blend and its principal ingredient were shown to bind to several important receptors that promote relaxation and sleep²² and reduce the fatigue typically associated with poor sleep.²³ Hops contains compounds that promote sleep and relaxation.²⁴ Lemon balm induces sleep and shortens the time required to fall asleep, according to animal studies.²⁵ Lemon balm has also been shown to reduce the stress response and induce "calmness" while simultaneously improving mood and cognitive performance.²⁶ Valerian, in addition to its anxiety-reducing properties, has been shown in numerous clinical trials to enhance sleep quality and reduce the time to sleep onset.²⁷⁻²⁸ Passion flower also is an effective herb to support sleep.²⁹

As discussed above, Leptin plays a crucial role in maintaining a healthy weight and balanced energy metabolism and its levels are affected by sleep deprivation. Adiponectin, another fat-regulating hormone, declines with lack of sleep, resulting in impaired insulin sensitivity and reduced weight control.

A patented combination of high viscosity polysaccharides from acacia gum and esterified fatty acids (found in LeptinX™) can be used to balance leptin and adiponectin. A study was conducted to evaluate the effect of this unique blend of high viscosity polysaccharides and esterified fatty acids on leptin and adiponectin concentrations. In this placebo-controlled, double-blind study, 22 women were supplemented with high viscosity polysaccharides and esterified fatty acids or a placebo for 8 weeks while on a caloric restricted diet and performing cardiovascular exercise. The women were evaluated for serum leptin, adiponectin and insulin levels at the beginning of the study, during the study and after the 8 weeks of treatment. The study showed that the treatment group experienced significant reduction in leptin and insulin and an increase in adiponectin, as well as favorable changes in weight and percent body fat. Thus, high viscosity polysaccharides and cetylated (esterified) fatty acids effectively modified these hormones.³⁰

Conclusion

In numerous studies, sleep loss has been linked to weight gain and disrupted levels of the hormones that control appetite and weight gain. Insulin resistance and blood sugar disturbances are also linked to lack of sleep. Sleep equates to RESToration of the human body. All solid wellness programs put special emphasis on healthy sleep practices and sleep efficiency. Testing for sleep apnea as well as supplementing with melatonin, key botanicals, high viscosity polysaccharides and esterified fatty acids can help address an overlooked reason for unwanted pounds.

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