

TEST 2:
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Chronic Sleep Restriction Is a Risk Factor for Obesity

Improved sleep habits can help keep weight down.

Magee, C.A., et al. 2010. Examining the pathways linking chronic sleep restriction to obesity. Journal of Obesity, 2010, doi:10.1155/2010/821710.

Obesity is a pervasive and soaring health problem that has become a decisive medical, psychosocial and economic obstacle for developing and developed countries alike. It is associated with coronary heart disease, diabetes, osteoarthritis, gout, hypertension, stroke, certain types of cancer (colon, endometrial, breast, kidney and esophagus), gallbladder disease, abnormal cholesterol levels and some pulmonary diseases (Hainer, Toplak & Mitrakou 2008; Haslam & James 2005).

According to Magee and colleagues, the major reason for the epidemic rise in overweight/obesity rates is progressively more sedentary lifestyles combined with high-calorie (and high-fat) diets. One other factor that is emerging as a consequential contributor to weight gain is chronic sleep restriction. However, neither the sequence through which continual sleep restriction contributes to obesity nor the magnitude of the effect has been fully explained. This research column will highlight findings from a recent scientific review article examin-

ing the link between chronic sleep restriction and obesity.

Research Directions and Constraints

Scientists suggest that sleep fulfills the following three major functions: (1) it serves as the energy restoration (recharg-

ing) period from daytime activities; (2) it affords bodily protection at night when sensory capacities are down-regulated; and (3) it affords the brain needed time to consolidate important experiences and memories for learning (Gerber et al. 2010). The causes of chronic sleep debt are multifaceted, and not all the factors

Sleep Action Plan

Chronic sleep restriction is a consequential risk factor for weight gain and obesity, and thus it is imperative for exercise professionals to discuss it with clients seeking weight loss goals. Share the following sleep hygiene tips—from the University of California, Berkeley, *Wellness Letter* (2008)—with clients reporting chronic sleep restriction and/or sleep disorder problems (i.e., insomnia).

1. Cut down on caffeine consumption in the late afternoon and evening.
2. Do not smoke or use any other products with nicotine before bed, as nicotine keeps many people awake. Encourage clients who smoke to quit.
3. Create a "noise-free" sleeping environment.
4. Create a sleep-friendly bedroom by doing the following—use comfortable linens and pillows, put up darker shades, replace a worn-out mattress and keep the bedroom cool during sleep hours.
5. Drink fewer fluids after dinner, to minimize trips to the restroom.
6. Attempt to deal with stressful issues during the day and put them away at night (seek professional consultation as necessary).
7. Set a regular time to go to bed and a consistent time to wake up. Keep to this schedule.
8. Avoid bringing work projects and personal paperwork to bed.
9. Avoid bringing food to bed.
10. Limit naps to a maximum of 30 minutes and try to take the naps earlier in the day.

are fully understood, say Magee and colleagues. Moreover, they note that obesity may negatively impact sleep quality and duration (as well as the other way around). Acknowledging these constraints, the review article by these authors integrates the most contemporary research findings on chronic sleep restriction with three potential pathways to obesity.

Determinants of Sleep Duration and Chronic Sleep Restriction

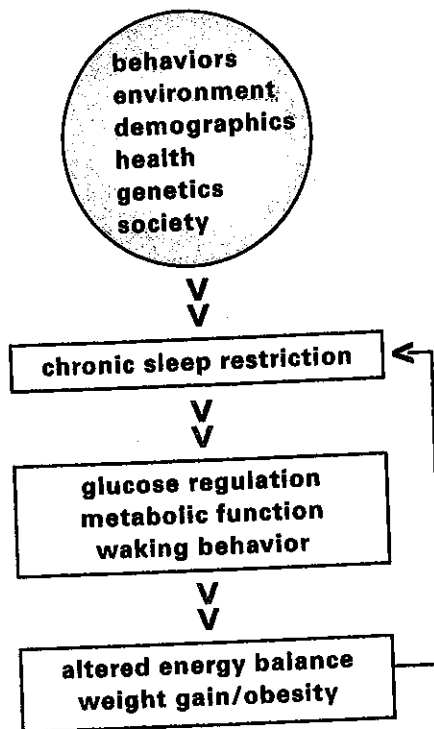
Sleep duration is affected by a cluster of behavioral, environmental, sociological, demographic, health and genetic factors, all of which may also contribute to chronic sleep restriction (Magee et al. 2010). Most men and women need 7–8 hours of sleep a night, and Magee et al. note that chronic sleep debt is commonly defined as sleeping more than 4 but less than 7 hours a night. Chronic sleep debt is different from acute sleep deficit, which refers to an uncommon (not chronic) loss of sleep during a 24-hour period.

Krueger and Friedman (2009) summarize some notable predictors of sleep duration. For instance, supportive marriages foster healthy behaviors and satisfactory sleep. Parenting and pregnancy also promote healthier lifestyles and suitable sleep, although caring for young children may disrupt sleep duration. Low economic status may limit a person's financial resources, thus affecting health and in turn impairing sleep duration. Krueger and Friedman point out that smoking and alcohol consumption often lead to persistent sleep reduction. Also, men and women aged 40–55 tend to sleep less than younger (< 40 years) and older (> 55 years) adults. Last, Krueger and Friedman acknowledge that some individuals voluntarily limit the amount of sleep they get in order to meet family, work or social responsibilities.

Processes Linking Chronic Sleep Restriction to Obesity

The three major processes linking chronic sleep restriction to obesity are **metabolic and neuroendocrine function, glucose regulation and waking behavior** (Magee et al. 2010). A schematic of this association is shown in Figure 1.

Figure 1. Pathways Linking Chronic Sleep Restriction to Obesity



Source: Adapted from Magee et al. 2010.

Metabolic and Neuroendocrine Function

Spiegel, Leproult and Van Cauter (1999) specify that consecutive sleep restriction (4 hours per night in their study) elevates

the sympathetic nervous system (the autonomic nervous system that speeds up physiological processes) and increases evening cortisol production, which has been shown to increase food intake and the accumulation of abdominal fat. Copinschi (2005) adds that sleep debt is associated with lower levels of leptin secretion. Leptin is secreted from fat cells and transmits energy (i.e., fat energy) balance messages to the hypothalamus (the brain center for hunger). As leptin levels decrease, the hypothalamus interprets the message that the fat cells need more food and directs the body to eat more.

Magee and colleagues underscore that sleep restriction also leads to a significant increase in ghrelin, a hunger hormone produced and secreted from the stomach. Higher (than normal) circulating ghrelin levels stimulate hunger and food intake (once again, the hypothalamus processes the message). Last, peptide tyrosine-tyrosine (often referred to as PYY) is a protein secreted from the gastrointestinal tract in response to ingested foodstuffs. Magee and colleagues note that PYY levels decrease with sleep debt, triggering the hypothalamus to prompt the body to eat more.

Glucose Regulation Processes

Another meaningful link between chronic sleep restriction and obesity is the interference in glucose metabolism, an effect that establishes a high association between

10 Facts About Sleep Restriction

It is well established in the scientific literature that long-term sleep deprivation and disturbances negatively influence a person's health and well-being (Gerber et al. 2010). Below are some dispiriting facts about sleep restriction:

1. Since 1960, chronic sleep restriction has more than doubled in the U.S.
2. One-third of U.S. adults report chronic sleep restriction.
3. Chronic sleep restriction is particularly connected to motor vehicle accidents.
4. Sleeping more on weekends to make up for loss of sleep during the workweek is not good sleep hygiene, as it disturbs normal sleep-wake cycles.
5. Constant sleep restriction is highly associated with industrial and workplace accidents.
6. Women of all age groups suffer more insomnia than their male counterparts, and menopause may often intensify insomnia.
7. Continual sleep restriction is linked to diabetes, depression, hypertension and cardiovascular disease.
8. Although alcohol can help some people fall asleep, it may disrupt sleep in the latter part of the night.
9. Persistent sleep restriction is related to elevated mortality rates.
10. Everpresent sleep restriction is associated with learning and memory loss.

Sources: Magee et al. (2010); Krueger & Friedman (2008); the American Academy of Sleep Medicine, www.sleepeducation.com.

How Much Sleep Should Children Get?

Below are age-specific sleep recommendations for children, provided by the American Academy of Sleep Medicine (www.sleepeducation.com):

- infants (3–11 months): 14–15 hours
- toddlers: 12–14 hours
- preschoolers: 11–13 hours
- school-age children: 10–11 hours

sleep debt and diabetes (Magee et al. 2010). Magee and colleagues state that impaired regulation of glucose is often coupled with weight gain, because glucose plays an important role in regulating appetite. Essentially, chronic sleep restriction induces impaired glucose utilization in parts of the brain, promoting the hunger response and increasing food intake. Magee et al. hypothesize that the increase in the sympathetic nervous system from chronic sleep debt may lower levels of in-

sulin secretion (from the pancreas) and thus impair optimal glucose utilization.

Waking Behavior Correlation

Magee et al. suggest that there is a third feasible connection between sleep restriction and obesity: increased waking time during the day has been linked with television watching and other sedentary behaviors, such as snacking. Thus, less daily sleep time provides more opportunities to eat. In addition, the authors note that lack of sleep is associated with sleepiness during the day. To combat their weariness, many people begin to consume more high-energy foods and drinks (the latter often supercaffeinated). Feelings of fatigue during the day also inhibit individuals from doing more physical activity, thus promoting increased sedentary behavior—and the unhealthful cycle continues.

The final message is that short sleepers are very likely to become obese. Helping clients target and/or improve the amount of sleep they get is therefore a most consequential health intervention and one that exercise professionals can provide. ■

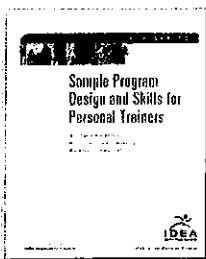
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