

Scite (Assistant) – Matching sources with arguments in the Summary

Argument in the Summary	Evidence from abstracts	Evidence from full text ("Citation statement")	Evaluation
<p>Experimental evidence in humans has shown that inadequate sleep leads to a positive energy balance, resulting in weight gain due to increased energy intake surpassing the additional energy expenditure during wakefulness (Duan et al., 2022).</p>	<p>Duan, D., et al. (2023). Connecting insufficient sleep and insomnia with metabolic dysfunction. <i>Ann N Y Acad Sci</i>, 1519(1), 94-117. https://doi.org/10.1111/nyas.14926 [Review; green OA available]</p> <p>The global epidemic of obesity and type 2 diabetes parallels the rampant state of sleep deprivation in our society. Epidemiological studies consistently show an association between insufficient sleep and metabolic dysfunction. Mechanistically, sleep and circadian rhythm exert considerable influences on hormones involved in appetite regulation and energy metabolism. As such, data from experimental sleep deprivation in humans demonstrate that insufficient sleep induces a positive energy balance with resultant weight gain, due to increased energy intake that far exceeds the additional energy expenditure of nocturnal wakefulness, and adversely impacts glucose metabolism. Conversely, animal models have found that sleep loss-induced energy expenditure exceeds caloric intake resulting in net weight loss. However, animal models have significant limitations, which may diminish the clinical relevance of their metabolic findings. Clinically, insomnia disorder and insomnia symptoms are associated with adverse glucose outcomes, though it remains challenging to isolate the effects of insomnia on metabolic outcomes independent of comorbidities and insufficient sleep durations. Furthermore, both pharmacological and behavioral interventions for insomnia may have direct metabolic effects. The goal of this review is to establish an updated framework for the causal links between insufficient sleep and insomnia and risks for type 2 diabetes and obesity.</p>		<p>Support</p> <p>The evidence directly supports the argument by confirming that insufficient sleep can result in weight gain due to increased food consumption.</p>
<p>Sleep deprivation has been associated with increased energy intake and eating behavior, contributing to weight gain (Parrish & Teske, 2016).</p> <p>Controlled studies have demonstrated that even slight sleep restriction can induce weight gain (Broussard & Klein, 2022).</p>	<p>Parrish, J. B. and J. A. Teske. (2017). Acute partial sleep deprivation due to environmental noise increases weight gain by reducing energy expenditure in rodents. <i>Obesity</i>, 25(1), 141-146. https://doi.org/10.1002/oby.21703 [Article; bronze OA available]</p> <p>OBJECTIVE: Chronic partial sleep deprivation (SD) by environmental noise exposure increases weight gain and feeding in rodents, which contrasts weight loss after acute SD by physical methods. This study tested whether acute environmental noise exposure reduced sleep and its effect on weight gain, food intake, physical activity, and energy expenditure (EE). It was hypothesized that acute exposure would (1) increase weight gain and feeding and (2) reduce sleep, physical activity, and EE (total and individual components); and (3) behavioral changes would persist throughout recovery from SD. METHODS: Three-month old male Sprague-Dawley rats slept ad libitum, were noise exposed (12-h light cycle), and allowed to recover (36 h). Weight gain, food intake, sleep/wake, physical activity, and EE were measured. RESULTS: Acute environmental noise exposure had no effect on feeding, increased weight gain ($P < 0.01$), and reduced sleep ($P < 0.02$), physical activity ($P < 0.03$), total EE ($P < 0.05$), and several components ($P < 0.05$). Reductions in EE and physical activity persisted during recovery. CONCLUSIONS: Reductions in EE during sleep, rest, and physical activity reduce total EE and contribute to weight gain during acute SD and recovery from SD. These data emphasize the importance of increasing physical activity after SD to prevent obesity.</p>	<p>"...While sleeping less than recommended increases risk for weight gain through increases in energy intake and eating behavior, effects of poor sleep on total energy expenditure (EE) and its components are less clear...."</p>	<p>Support</p> <p>The evidence agrees that insufficient sleep can cause increased eating and weight gain. (Though the study's focus was to point out how lack of sleep affects the amount of energy our bodies use remains unclear.)</p>
<p>Additionally, sleep deprivation has been shown to reduce the efficacy of stimulating physical activity and energy expenditure, further promoting weight gain (DePorter et al., 2017).</p>	<p>Broussard, J. L. and S. Klein. (2022). Insufficient sleep and obesity: cause or consequence. <i>Obesity</i>, 30(10), 1914-1916. https://doi.org/10.1002/oby.23539 [Article; gold OA available]</p> <p>Sleep is an ancient and evolutionarily conserved biological process that, when disturbed, increases the risk for a variety of diseases in people, including diabetes, cardiovascular disease, kidney disease, and cancer. Although results from epidemiological studies support the link between insufficient sleep and an increased risk of obesity, the directionality of this link is unknown. Results from short-term controlled clinical studies, conducted almost exclusively in people who are normal weight, demonstrate that sleep restriction increases hunger, appetite, energy intake, and body weight. However, the authors are not aware of any studies that have evaluated the effect of more than 3 weeks of experimental sleep restriction on obesity risk factors, and few studies have been conducted in people with preexisting obesity. This Perspective reviews the link between insufficient sleep and obesity risk and the potential therapeutic effects of sleep extension in people with chronic sleep insufficiency.</p>	<p>"...Controlled studies of slightly longer sleep restriction also demonstrate that sleep loss induces weight gain...."</p>	<p>Support</p> <p>The evidence confirms that controlled studies have found that even brief periods of sleep deprivation can increase feelings of hunger and food consumption, potentially leading to weight gain.</p>
	<p>DePorter, D. P., J. E. Coborn and J. A. Teske. (2017). Partial Sleep Deprivation Reduces the Efficacy of Orexin-A to Stimulate Physical Activity and Energy Expenditure. <i>Obesity</i>, 25(10), 1716-1722. https://doi.org/10.1002/oby.21944 [Article; bronze OA available]</p> <p>OBJECTIVE: Sufficient sleep is required for weight maintenance. Sleep deprivation due to noise exposure stimulates weight gain by increasing hyperphagia and reducing energy expenditure (EE). Yet the mechanistic basis underlying the weight gain response is unclear. Orexin-A promotes arousal and negative energy balance, and orexin terminals project to the ventrolateral preoptic area (VLPO), which is involved in sleep-to-wake transitions. To determine whether sleep deprivation reduces orexin function in VLPO and to test the hypothesis that sleep deprivation would attenuate the orexin-A-stimulated increase in arousal, physical activity (PA), and EE. METHODS: Electroencephalogram, electromyogram, distance traveled, and EE were determined in male Sprague-Dawley rats following orexin-A injections into VLPO both before and after acute (12-h) and chronic (8 h/d, 9 d) sleep deprivation by noise exposure. RESULTS: Orexin-A in the VLPO significantly increased arousal, PA, total EE, and PA-related EE and reduced sleep and respiratory quotient before sleep deprivation. In contrast to after acute sleep deprivation in which orexin-A failed to stimulate EE during PA only, orexin-A failed to significantly increase arousal, PA, fat oxidation, total EE, and PA-related EE after chronic sleep deprivation. CONCLUSIONS: Sleep deprivation may reduce sensitivity to endogenous stimuli that enhance EE due to PA and thus stimulate weight gain.</p>		<p>Support</p> <p>The evidence confirms that lack of sleep, especially when caused by noise, can lead to weight gain. It does this by making people extremely hungry and lowering the amount of energy they burn off.</p>

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<p>The relationship between sleep and weight gain is complex, involving factors such as energy balance, appetite regulation, and metabolic dysfunction. Sleep restriction can lead to an increase in basal energy expenditure, followed by overcompensation in energy intake, ultimately resulting in a positive energy balance and weight gain (Broussard & Cauter, 2016).</p> <p>Poor sleep habits can impact eating behaviors and physical activity, influencing body weight control, especially in adolescents (Chaput & Dutil, 2016).</p> <p>Studies have also highlighted the impact of insufficient sleep on overweight and obesity in children and adolescents (Gong et al., 2018).</p>	<p>Broussard, J. L. and E. Van Cauter. (2016). Disturbances of sleep and circadian rhythms: novel risk factors for obesity. <i>Curr Opin Endocrinol Diabetes Obes</i>, 23(5), 353-359. https://doi.org/10.1097/MED.0000000000000276 [Review; green OA available]</p> <p>PURPOSE OF REVIEW: The purpose of this review is to summarize recent developments linking disturbances of sleep and circadian rhythms to an increased risk for obesity, and to review novel research on potential countermeasures. RECENT FINDINGS: Effective treatments for obesity are limited, with long-term adherence to lifestyle changes proving difficult to maintain. Identifying new preventive strategies based on modifiable risk factors is therefore imperative in the fight against obesity. Disturbances of sleep and circadian rhythms have an adverse impact on food choices, hunger and appetite, and have lifelong deleterious metabolic consequences when they occur during childhood and early adulthood. The upregulation of the endocannabinoid system and abnormalities in the temporal distribution of caloric intake were recently implicated in the link between sleep loss and obesity risk. In addition, alterations in circadian variation in the composition and functionality of the gut microbiome have been identified as potential contributors to metabolic dysfunction during jet lag and shift work. Insufficient sleep and circadian misalignment are thus new modifiable risk factors for obesity. Emerging evidence suggests that novel countermeasures, such as manipulations of the timing of food intake, may be effective strategies in the prevention of obesity. SUMMARY: Four important findings are briefly reviewed: disturbances of sleep and circadian rhythms in children and young adults are risk factors for the development of lifelong obesity; circadian misalignment, as occurs in shift work, has an adverse impact on energy balance and increases the risk of weight gain; the endocannabinoid system, an important regulator of hedonic feeding, could be a potential link between sleep, circadian rhythms, and feeding behavior; and disturbances of the circadian variation in composition of the gut microbiome may be involved in the increased risk of obesity associated with insufficient sleep and circadian misalignment.</p> <p>Chaput, J. P. and C. Dutil. (2016). Lack of sleep as a contributor to obesity in adolescents: impacts on eating and activity behaviors. <i>Int J Behav Nutr Phys Act</i>, 13(1), 103. https://doi.org/10.1186/s12966-016-0428-0 [Article; gold OA available]</p> <p>BACKGROUND: Sleep is an important contributor to physical and mental health; however, chronic sleep deprivation has become common in adolescents, especially on weekdays. Adolescents aged 14-17 years are recommended to sleep between 8 and 10 h per night to maximize overall health and well-being. Although sleep needs may vary between individuals, sleep duration recommendations are important for surveillance and help inform policies, interventions, and the population of healthy sleep behaviors. Long sleepers are very rare among teenagers and sleeping too much is not a problem per se; only insufficient sleep is associated with adverse health outcomes in the pediatric population. Causes of insufficient sleep are numerous and chronic sleep deprivation poses a serious threat to the academic success, health and safety of adolescents. This article focuses on the link between insufficient sleep and obesity in adolescents. DISCUSSION: This "call to action" article argues that sleep should be taken more seriously by the public health community and by our society in general, i.e., given as much attention and resources as nutrition and physical activity. Not only that having a good night's sleep is as important as eating a healthy diet and being regularly physically active for overall health, but sleeping habits also impact eating and screen time behaviors and, therefore, can influence body weight control. Short sleep duration, poor sleep quality, and late bedtimes are all associated with excess food intake, poor diet quality, and obesity in adolescents. Sleep, sedentary behavior, physical activity and diet all interact and influence each other to ultimately impact health. A holistic approach to health (i.e., the whole day matters) targeting all of these behaviors synergistically is needed to optimize the impact of our interventions. Sleep is not a waste of time and sleep hygiene is an important factor to consider in the prevention and treatment of obesity.</p>	<p>"...The extended wakefulness resulting from sleep restriction is associated with an increase in basal energy expenditure and subsequent over-compensation in energy intake, leading to positive energy balance and weight gain...."</p> <p>"...Not only that having a good night's sleep is as important as eating a healthy diet and being regularly physically active for overall health, but sleeping habits also impact eating and screen time behaviors and, therefore, can influence body weight control. Summary Short sleep duration, poor sleep quality, and late bedtimes are all associated with excess food intake, poor diet quality, and obesity in adolescents...."</p>	<p>Support</p> <p>The evidence supports the argument by indicating that poor sleep can lead to unhealthy food choices and increased hunger, which can contribute to long-term metabolic issues and weight gain, especially when sleep loss leads to higher energy use followed by excessive eating.</p> <p>Support</p> <p>The evidence supports the argument by linking short sleep duration, low sleep quality, and late bedtimes with overeating, poor diet, and obesity in adolescents, thus affecting their weight control.</p>
	<p>Gong, Q. H., et al. (2018). Insufficient Sleep Duration and Overweight/Obesity among Adolescents in a Chinese Population. <i>Int J Environ Res Public Health</i>, 15(5). https://doi.org/10.3390/ijerph15050997 [Article; gold OA available]</p> <p>OBJECTIVES: The objective of this study was to investigate the relationship between sleep duration and overweight/obesity among Chinese adolescents. METHODS: A school-based cross-sectional study was conducted among Chinese adolescents in 2016. In total, 2795 school-aged Chinese children aged 12 to 13 years participated in this study. Participants were asked to complete self-administered surveys during a 45-min class period in their classroom. Details of the questionnaire about health-related behaviors included sleep habits, physical activity, screen time, cigarette use, and alcohol use. Height, weight, waist circumference and hip circumference were directly measured. RESULTS: The mean sleep duration was 8.7 h/day. In total, 43.0% of the participants had a sleep duration of less than 9 h/day. Sleep duration was significantly inversely related to BMI, waist circumference, hip circumference and WHtR in multiple linear regression analyses in both genders. Logistic regression models showed that insufficient sleep (<9 h/day) was associated with high odds of overweight/obesity among both young boys and girls. CONCLUSIONS: Insufficient sleep duration was associated with overweight/obesity in Chinese adolescents, and short sleep duration was probably associated with central adiposity, especially among boys.</p>	<p>"...Taken together, these findings support the notion that insufficient sleep is a risk factor for overweight and obesity in preschool and adolescent children...."</p>	<p>Support</p> <p>The evidence supports the claim that not getting enough sleep is linked to a higher risk of being overweight or obese in young people, particularly in Chinese adolescents and more so in boys.</p>

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<p>Furthermore, sleep disturbances interfere with endocrine pathways regulating energy balance, promoting weight gain and obesity (Reyes et al., 2023).</p> <p>Chronic sleep deprivation can lead to fatigue, daytime sleepiness, and weight changes (Sawant & Thakurdesai, 2018).</p> <p>Research has shown a strong positive relationship between weight status and sleep deprivation, emphasizing the need for further investigation into this association (Morrissey et al., 2016).</p>	<p>Reyes, P. A., et al. (2023). The relationship between body mass index and sleep in women with risk factors for gestational diabetes mellitus. <i>Obes Sci Pract</i>, 9(6), 573-580. https://doi.org/10.1002/osp4.689 [Article; gold OA available]</p> <p>BACKGROUND: Both obesity and sleep disorders are common among women during pregnancy. Although prior research has identified a relationship between obesity and sleep disorders, those findings are from women later in pregnancy. OBJECTIVE: To explore the relationships between self-reported sleep duration, insufficient sleep and snoring with body mass index (BMI) among multiethnic women at risk of gestational diabetes mellitus (GDM) in early pregnancy. METHODS: Cross-sectional study of baseline data from women at risk of GDM enrolled in the Treatment of BOoking Gestational diabetes Mellitus (TOBOGM) multicentre trial across 12 Australian/Austrian sites. Participants completed a questionnaire before 20 weeks' gestation to evaluate sleep. BMI <25 kg/m(2) served as the reference group in multivariable logistic regression. RESULTS: Among the 2865 women included, the prevalence of overweight and obesity classes I-III was 28%, 19%, 11% and 12%, respectively. There was no relationship between sleep duration and BMI. The risk of insufficient sleep >5 days/month was higher in class II and class III obesity (1.38 (1.03-1.85) and 1.34 (1.01-1.80), respectively), and the risk of snoring increased as BMI increased (1.59 (1.25-2.02), 2.68 (2.07-3.48), 4.35 (3.21-5.88) to 4.96 (3.65-6.74), respectively). CONCLUSIONS: Obesity is associated with insufficient sleep among pregnant women at risk of GDM. Snoring is more prevalent with increasing BMI.</p>	<p>"...Sleep disturbances interfere with endocrine pathways that regulate energy balance, stimulating weight gain and obesity 17"</p>	<p>Support</p> <p>The evidence supports the argument by showing that sleep disturbances, like not getting enough sleep and snoring, disrupt hormone systems that control energy balance, leading to weight gain and obesity.</p>
<p>In adults with overweight, insufficient sleep during weight loss interventions can lead to a loss of muscle mass instead of adipose tissue mass compared to adequate sleep conditions (Chaput et al., 2022).</p>	<p>Sawant, N. S. and A. Thakurdesai. (2018). Case Report: Sleep Deprivation Presenting as Acute Psychosis. <i>Indian Journal of Case Reports</i>, 4(2), 142-143. https://doi.org/10.32677/IJCR.2018.v04.i02.020 [Case report; gold OA; DOI link dead; not DOAJ-indexed - potential predatory journal]</p> <p>Sleeping is a basic human need and plays a key role in good health and well-being. Sleep deficiency can lead to physical and mental health problems, injuries, loss of productivity, and even a greater risk of death. Sleep deprivation is seen in several psychiatric disorders, and there may be a cause or effect relationship. Sleep-deprived individuals may have trouble making decisions, solving problems, controlling their emotions and behavior, and coping with stress or change. We report a case who started having sleep deprivation over 15 days following a stressor, which resulted in an acute psychosis-like condition with associated disorientation and perplexity. However, the patient responded to benzodiazepine medication given for the restoration of her sleep cycle and did not require any antipsychotics. There was also complete amelioration of her behavioral and thought disturbances.</p>	<p>"...A chronic sleep restricted state can cause fatigue, daytime sleepiness, clumsiness, and weight loss or weight gain [1] and may also adversely affect the brain and cognitive functions [2]...."</p>	<p>Support</p> <p>The evidence directly supports the argument by stating that consistently not getting enough sleep can cause tiredness, a need to sleep during the day, awkwardness, and either loss or gain of weight.</p>
<p>In adults with overweight, insufficient sleep during weight loss interventions can lead to a loss of muscle mass instead of adipose tissue mass compared to adequate sleep conditions (Chaput et al., 2022).</p>	<p>Morrissey, B., et al. (2016). Sleep duration and risk of obesity among a sample of Victorian school children. <i>BMC Public Health</i>, 16, 245. https://doi.org/10.1186/s12889-016-2913-4 [Article; gold OA available]</p> <p>BACKGROUND: Insufficient sleep is potentially an important modifiable risk factor for obesity and poor physical activity and sedentary behaviours among children. However, inconsistencies across studies highlight the need for more objective measures. This paper examines the relationship between sleep duration and objectively measured physical activity, sedentary time and weight status, among a sample of Victorian Primary School children. METHODS: A sub-sample of 298 grades four (n = 157) and six (n = 132) Victorian primary school children (aged 9.2-13.2 years) with complete accelerometry and anthropometry data, from 39 schools, were taken from a pilot study of a larger state based cluster randomized control trial in 2013. Data comprised: researcher measured height and weight; accelerometry derived physical activity and sedentary time; and self-reported sleep duration and hypothesised confounding factors (e.g. age, gender and environmental factors). RESULTS: Compared with sufficient sleepers (67 %), those with insufficient sleep (<10 hrs/day) were significantly more likely to be overweight (OR 1.97, 95 % CI:1.11-3.48) or obese (OR 2.43, 95 % CI:1.26-4.71). No association between sleep and objectively measured physical activity levels or sedentary time was found. CONCLUSION: The strong positive relationship between weight status and sleep deprivation merits further research though PA and sedentary time do not seem to be involved in the relationship. Strategies to improve sleep duration may help obesity prevention initiatives in the future.</p>	<p>"...In adults with overweight, weight loss in response to caloric restriction under conditions of insufficient sleep leads to loss of muscle mass in lieu of adipose tissue mass compared with caloric restriction under conditions of adequate sleep 141"</p>	<p>Support</p> <p>The evidence supports the argument that adults with overweight lose more muscle than fat when they restrict calories without enough sleep, unlike when they get enough sleep.</p>
	<p>Chaput, J. P., et al. (2023). The role of insufficient sleep and circadian misalignment in obesity. <i>Nat Rev Endocrinol</i>, 19(2), 82-97. https://doi.org/10.1038/s41574-022-00747-7 [Review; bronze OA available]</p> <p>Traditional risk factors for obesity and the metabolic syndrome, such as excess energy intake and lack of physical activity, cannot fully explain the high prevalence of these conditions. Insufficient sleep and circadian misalignment predispose individuals to poor metabolic health and promote weight gain and have received increased research attention in the past 10 years. Insufficient sleep is defined as sleeping less than recommended for health benefits, whereas circadian misalignment is defined as wakefulness and food intake occurring when the internal circadian system is promoting sleep. This Review discusses the impact of insufficient sleep and circadian misalignment in humans on appetite hormones (focusing on ghrelin, leptin and peptide-YY), energy expenditure, food intake and choice, and risk of obesity. Some potential strategies to reduce the adverse effects of sleep disruption on metabolic health are provided and future research priorities are highlighted. Millions of individuals worldwide do not obtain sufficient sleep for healthy metabolic functions. Furthermore, modern working patterns, lifestyles and technologies are often not conducive to adequate sleep at times when the internal physiological clock is promoting it (for example, late-night screen time, shift work and nocturnal social activities). Efforts are needed to highlight the importance of optimal sleep and circadian health in the maintenance of metabolic health and body weight regulation.</p>		

Elicit – Matching sources with arguments in the Summary

Argument in the Summary	Evidence from abstracts	Evaluation
<p>Benson (2018) and Bayon (2014) both highlight the potential mechanisms, including changes in metabolic pathways and increased food intake.</p>	<p>Benson, P. J. (2018). How sleep loss leads to weight gain. <i>Science</i>, 361(6404), 763.719-765. https://doi.org/10.1126/science.2018.361.6404.twis [Note; no OA available]</p> <p>Chronic sleep loss can have negative health effects, including weight gain and type 2 diabetes. Underlying molecular processes in key metabolic tissues are thought to be to blame. Cedernaes et al. compared molecular changes such as DNA methylation in fat and skeletal muscle tissue samples taken from 15 young Caucasian males after a night of sleep loss and after a normal night's sleep. The two tissue types responded very differently. In muscle, sleep loss enhanced skeletal muscle breakdown by down-regulating a metabolic pathway. However, the same pathway was up-regulated in fat tissue after disrupted sleep. Thus, sleep loss may reprogram fat tissue to increase fat storage.</p> <p>Bayon, V., et al. (2014). Sleep debt and obesity. <i>Ann Med</i>, 46(5), 264-272. https://doi.org/10.3109/07853890.2014.931103 [Article; bronze OA available]</p> <p>Short sleep duration has been shown to be associated with elevated body mass index (BMI) in many epidemiological studies. Several pathways could link sleep deprivation to weight gain and obesity, including increased food intake, decreased energy expenditure, and changes in levels of appetite-regulating hormones, such as leptin and ghrelin. A relatively new factor that is contributing to sleep deprivation is the use of multimedia (e.g. television viewing, computer, and internet), which may aggravate sedentary behavior and increase caloric intake. In addition, shift-work, long working hours, and increased time commuting to and from work have also been hypothesized to favor weight gain and obesity-related metabolic disorders, because of their strong link to shorter sleep times. This article reviews the epidemiological, biological, and behavioral evidence linking sleep debt and obesity.</p>	<p>Support</p> <p>Benson (2018) backs up the claim that sleep loss can change metabolic pathways, mentioning that muscle tissue breaks down more when a person hasn't slept enough.</p> <p>Bayon (2014) supports the claim that not getting enough sleep can make people eat more, which is mentioned as one of the ways that sleep deprivation could lead to putting on weight.</p> <p>Though the evidence in Benson (2018) supports the claim, is actually a brief summary of another research article, which is not quoted here.</p>
<p>Häusler (2019) and Chaput (2015) further support this, with Häusler finding a robust association between poor sleep quality and weight gain, and Chaput emphasizing the role of sleep duration in obesity in children.</p>	<p>Hausler, N., et al. (2019). Does sleep affect weight gain? Assessing subjective sleep and polysomnography measures in a population-based cohort study (CoLaus/HypnoLous). <i>Sleep</i>, 42(6). https://doi.org/10.1093/sleep/zsz077 [Article; bronze OA available]</p> <p>STUDY OBJECTIVES: Although several studies have linked short and long sleep duration to weight gain, mixed results exist. Contrarily, few studies associated objectively measured sleep characteristics with weight gain. We investigated the association between several sleep characteristics measured by questionnaire and polysomnography with prospective weight gain in a population-based, middle-aged cohort. METHODS: Three samples were analyzed: sample 1 (n = 2551, 47.3% men, 56.9 +/- 10.3 years) had data for subjective sleep characteristics, sample 2 (n = 1422, 49.4% men, 57.6 +/- 10.4 years) had objective sleep assessment (polysomnography), and sample 3 consisting of 1259 subjects included in both samples. Multivariable logistic regressions were performed to assess the relationship between sleep characteristics and >=5 kg weight gain during a median follow-up of 5.3 years. RESULTS: In both study samples, 12% of the subjects gained >=5 kg during follow-up. Multivariable analyses showed poor subjective sleep quality (as assessed by Pittsburgh Sleep Quality Index: odds ratio [95% confidence interval] = 1.54 [1.19 to 1.99]), percentage of sleep spent in stage 2 (1.32 [1.10 to 1.58]), and less than 90% oxygen saturation (SpO2 < 90) (1.23 [1.07 to 1.41]); moderate/severe Oxygen Desaturation Index (1.70 [1.01 to 2.85]) and autonomic arousal duration (1.22 [1.02 to 1.45]) were related to >=5 kg weight gain. Only poor subjective sleep quality was robustly associated with weight gain in all sensitivity analyses, except in female subsamples. CONCLUSIONS: Poor subjective sleep quality, and to some extent moderate to severe oxygen desaturation, but no other sleep characteristics, were robustly associated with weight gain. Future studies should confirm the relationship between sleep quality and weight gain, assess sex differences, and investigate underlying mechanisms.</p> <p>Chaput, J. P. (2016). Is sleep deprivation a contributor to obesity in children? <i>Eat Weight Disord</i>, 21(1), 5-11. https://doi.org/10.1007/s40519-015-0233-9 [Review; no OA available]</p> <p>Chronic lack of sleep (called "sleep deprivation") is common in modern societies with 24/7 availability of commodities. Accumulating evidence supports the role of reduced sleep as contributing to the current obesity epidemic in children and youth. Longitudinal studies have consistently shown that short sleep duration is associated with weight gain and the development of obesity. Recent experimental studies have reported that sleep restriction leads to weight gain in humans. Increased food intake appears to be the main mechanism by which insufficient sleep results in weight gain. Voluntary sleep restriction has been shown to increase snacking, the number of meals eaten per day, and the preference for energy-dense foods. Although the causes of sleep loss in the pediatric population are numerous, more research looking at screen exposure before bedtime and its effects on sleep is needed given the pervasiveness of electronic media devices in today's environment. Health professionals should routinely ask questions about sleep and promote a good night's sleep because insufficient sleep impacts activity and eating behaviors. Future research should examine the clinical benefits of increasing sleep duration on eating behaviors and body weight control and determine the importance of adequate sleep to improve the treatment of obesity.</p>	<p>Support</p> <p>Häusler (2019) confirms the claim by stating a robust association between poor subjective sleep quality and weight gain.</p> <p>Chaput (2015) directly confirms the evidence that support the role of sleep duration in obesity in children.</p>

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<p>However, Yu (2019) presents conflicting evidence, with a meta-analysis finding no significant effect of experimental sleep restriction on adult body weight.</p> <p>Ogilvie (2017) and Chaput (2015) both call for further research to clarify the relationship between sleep and obesity, and to explore the potential for healthy sleep interventions to combat weight gain.</p>	<p>Yu, H., et al. (2019). Experimental sleep restriction effect on adult body weight: a meta-analysis. <i>Sleep Breath</i>, 23(4), 1341-1350. https://doi.org/10.1007/s11325-019-01828-0 [Review; no OA available]</p> <p>BACKGROUND: Sleep is increasingly recognized as a potential risk for overweight and obesity. Observational studies have shown links between short sleep duration with weight gain. However, the findings from longitudinal studies in adults are conflicting. This review aimed to examine the effectiveness of experimental sleep restriction on adult body weight. METHOD: A systematic search was undertaken in MEDLINE, EMBASE, PsycINFO, and CENTRAL (Cochrane center register of controlled trials) to identify experimental studies examining the effectiveness of sleep restriction on body weight, and search period was from January 2005 to June 2018. Meta-analysis was applied by using the random model. RESULTS: A total of 275 adults from six experimental studies were included. The pooled standard mean difference in body weight and body fat was 0.44 (95% CI - 0.13 to 1.02) (Z = 1.51, p > 0.05) and 0.35 kg (95% CI - 0.19 to 0.88) (Z = 1.27, p > 0.05), respectively. The experimental sleep restriction did not result in significant differences in adult body weight or body fat. Subgroup analysis showed that there were differences in weight gain between genders and races. CONCLUSION: The finding from this review cannot support the hypothesis from observational studies that short sleep leads to weight gain.</p> <p>Chaput, J. P. (2016). Is sleep deprivation a contributor to obesity in children? <i>Eat Weight Disord</i>, 21(1), 5-11. https://doi.org/10.1007/s40519-015-0233-9 [Review; no OA available]</p> <p>Chronic lack of sleep (called "sleep deprivation") is common in modern societies with 24/7 availability of commodities. Accumulating evidence supports the role of reduced sleep as contributing to the current obesity epidemic in children and youth. Longitudinal studies have consistently shown that short sleep duration is associated with weight gain and the development of obesity. Recent experimental studies have reported that sleep restriction leads to weight gain in humans. Increased food intake appears to be the main mechanism by which insufficient sleep results in weight gain. Voluntary sleep restriction has been shown to increase snacking, the number of meals eaten per day, and the preference for energy-dense foods. Although the causes of sleep loss in the pediatric population are numerous, more research looking at screen exposure before bedtime and its effects on sleep is needed given the pervasiveness of electronic media devices in today's environment. Health professionals should routinely ask questions about sleep and promote a good night's sleep because insufficient sleep impacts activity and eating behaviors. Future research should examine the clinical benefits of increasing sleep duration on eating behaviors and body weight control and determine the importance of adequate sleep to improve the treatment of obesity.</p> <p>Ogilvie, R. P. and S. R. Patel. (2017). The epidemiology of sleep and obesity. <i>Sleep Health</i>, 3(5), 383-388. https://doi.org/10.1016/j.sleh.2017.07.013 [Review; green OA available]</p> <p>Sleep is a state of consciousness that is preserved across animal species whose exact function is not yet clear but which has a vital impact on health and well-being. Epidemiological evidence suggests sleep duration in both children and adults has been decreasing over the past half-century, while at the same time rates of overweight and obesity have been increasing. Short sleep duration along with other dimensions of poor sleep has been associated with obesity both cross-sectionally and longitudinally. These data suggest a potential causal relationship between poor sleep and greater rates of weight gain that may be related to effects of sleep on dietary intake or physical activity. However, there is also potential for reverse causation as obesity leads to many co-morbidities including sleep apnea that can disrupt sleep. Medium and long term interventional studies are needed to evaluate the potential for healthy sleep interventions to help combat the epidemic of obesity.</p>	<p>Support</p> <p>The evidence directly supports the claim that Yu (2019) found no significant effect of experimental sleep restriction on adult body weight.</p> <p>Support</p> <p>(but not quoting the main findings of the articles)</p> <p>The evidence support the claim that both articles emphasize the need for further research into the role of sleep in weight management and health outcomes, though the main focus of the two articles are to examine the association between sleep deprivation and its potential contribution to the increasing rates of obesity.</p>

Consensus – Matching sources with arguments in the Summary

Argument in the Summary	Evidence from abstracts	Evaluation
Partial sleep deprivation (PSD) is associated with an increase in energy intake without a significant change in energy expenditure, potentially leading to weight gain over time 1 .	<p>1. Al Khatib, H. K., et al. (2017). The effects of partial sleep deprivation on energy balance: a systematic review and meta-analysis. Eur J Clin Nutr, 71(5), 614-624. https://doi.org/10.1038/ejcn.2016.201 [Article; no OA available]</p> <p>BACKGROUND/OBJECTIVES: It is unknown whether short sleep duration causatively contributes to weight gain. Studies investigating effects of partial sleep deprivation (PSD) on energy balance components report conflicting findings. Our objective was to conduct a systematic review and meta-analysis of human intervention studies assessing the effects of PSD on energy intake (EI) and energy expenditure (EE). SUBJECTS/METHODS: EMBASE, Medline, Cochrane CENTRAL, Web of Science and Scopus were searched. Differences in EI and total EE following PSD compared with a control condition were generated using the inverse variance method with random-effects models. Secondary outcomes included macronutrient distribution and resting metabolic rate. Heterogeneity was quantified with the I(2)-statistic. RESULTS: Seventeen studies (n=496) were eligible for inclusion in the systematic review, and 11 studies (n=172) provided sufficient data to be included in meta-analyses. EI was significantly increased by 385 kcal (95% confidence interval: 252, 517; P<0.00001) following PSD compared with the control condition. We found no significant change in total EE or resting metabolic rate as a result of PSD. The observed increase in EI was accompanied by significantly higher fat and lower protein intakes, but no effect on carbohydrate intake. CONCLUSIONS: The pooled effects of the studies with extractable data indicated that PSD resulted in increased EI with no effect on EE, leading to a net positive energy balance, which in the long term may contribute to weight gain.</p>	<p>Support</p> <p>The evidence supports the claim by clearly stating that partial sleep deprivation (PSD) leads to increased energy intake (EI) without changing energy expenditure (EE).</p>
Variability in sleep duration, particularly in males, has been linked to weight gain during the first semester of university, suggesting that inconsistent sleep patterns may contribute to weight gain 2 .	<p>2. Roane, B. M., et al. (2015). What Role Does Sleep Play in Weight Gain in the First Semester of University? Behav Sleep Med, 13(6), 491-505. https://doi.org/10.1080/15402002.2014.940109 [Article; green OA available]</p> <p>We hypothesized that shorter sleep durations and greater variability in sleep patterns are associated with weight gain in the first semester of university. Students (N = 132) completed daily sleep diaries for 9 weeks, completed the MEQ (chronotype) and CES-D (depressed mood) at week 9, and self-reported weight/height (weeks 1 & 9). Mean and variability scores were calculated for sleep duration (TST, TSTv), bedtime (BT, BTv), and wake time (WT, WTV). An initial hierarchical regression evaluated (block 1) sex, ethnicity; (block 2) depressed mood, chronotype; (block 3) TST; (block 4) BT, WT; and (block 5; R(2) change = 0.09, p = 0.005) TSTv, BTv, WTV with weight change. A sex-by-TSTv interaction was found. A final model showed that ethnicity, TST, TSTv, and BTv accounted for 31% of the variance in weight change for males; TSTv was the most significant contributor (R(2) change = 0.21, p < 0.001). Daily variability in sleep duration contributes to males' weight gain. Further investigation needs to examine sex-specific outcomes for sleep and weight.</p>	<p>Support</p> <p>The evidence supports the claim by stating that daily variability in sleep duration contributes to male students' weight gain during their first semester of university.</p>
Sleep disturbances and obesity have a bidirectional relationship, with sleep loss affecting energy balance and obesity increasing the risk of sleep disorders 3 .	<p>3. Rodrigues, G. D., et al. (2021). Obesity and sleep disturbances: The "chicken or the egg" question. Eur J Intern Med, 92, 11-16. https://doi.org/10.1016/j.ejim.2021.04.017 [Review; no OA available]</p> <p>Obesity and sleep disturbances are common conditions in modern societies and accumulating evidence support a close bidirectional causal relationship between these two conditions. Indeed, from one side sleep loss seems to affect energy intake and expenditure through its direct effects on hormone-mediated sensations of satiety and hunger and through the influence on hedonic and psychological aspects of food consumption. Sleep deprived patients have been shown to experiment excessive daytime sleepiness, fatigue, and tiredness that, in a vicious circle, enhances physical inactivity and weight gain. On the other side, obesity is a well-known risk factor for several sleep disorders. This narrative review will discuss the main pathophysiological mechanisms that link sleep loss to obesity and metabolic syndrome with particular attention to the three most common sleep disorders (insomnia, obstructive sleep apnoea syndrome, restless leg syndrome).</p>	<p>Support</p> <p>The evidence supports the claim by indicating a bidirectional relationship between sleep disturbances and obesity, with each affecting the other.</p>
In children treated for obesity, longer sleep duration at baseline is associated with greater weight loss, indicating that adequate sleep may support obesity treatment outcomes 4 .	<p>4. Janson, A. (2022). Sleeping it off? The value of sleep in children treated for obesity. Acta Paediatr, 111(7), 1296-1297. https://doi.org/10.1111/apa.16366 [Editorial; bronze OA available]</p> <p>Full text from Editorial article</p> <p>At baseline, most children slept 9–11 h per night and had more than 2 h of screen time. The authors showed that the children who reported longer sleep duration at baseline had lost more weight at three years.¹⁰</p> <p>This study makes good news for clinicians treating children with obesity. The healthy lifestyle adaptations that are encouraged in treatments of children with obesity should include messages on bedtime routines and adequate hours of sleep. The data from Norway support the clinical observation that sleep is beneficial to children in obesity treatment.</p>	<p>Support</p> <p>The evidence supports the claim by indicating that children with longer sleep durations at baseline experienced more weight loss. However, it's quoting a secondary source (10).</p>

Argument in the Summary	Evidence from abstracts	Evaluation
<p>Clinical intervention studies suggest that sleep restriction hinders weight management, with sleep extension potentially aiding in appetite control and weight loss 5.</p>	<p>5. St-Onge, M. P. (2017). Sleep–obesity relation: underlying mechanisms and consequences for treatment. <i>Obesity Reviews</i>, 18(S1), 34-39. https://doi.org/https://doi.org/10.1111/obr.12499 [Review; no OA available]</p> <p>Summary Short sleep duration has been associated with obesity in numerous epidemiological studies. However, such association studies cannot establish evidence of causality. Clinical intervention studies, on the other hand, can provide information on a causal effect of sleep duration on markers of weight gain: energy intake and energy expenditure. Herein is an overview of the science related to the impact of sleep restriction, in the context of clinical intervention studies, on energy intake, energy expenditure and body weight. Additionally, studies that evaluate the impact of sleep restriction on weight loss and the impact of sleep extension on appetite are discussed. Information to date suggests that weight management is hindered when attempted in the context of sleep restriction, and the public should be made aware of the negative consequences of sleep restriction for weight regulation.</p>	<p>Support</p> <p>The evidence supports the claim by directly indicating that that sleep restriction hinders weight management.</p>
<p>Molecular changes in fat and muscle tissues due to sleep loss may reprogram fat tissue to increase fat storage, providing a physiological explanation for weight gain associated with sleep deprivation 6.</p>	<p>6. Benson, P. J. (2018). How sleep loss leads to weight gain. <i>Science</i>, 361(6404), 763.719-765. https://doi.org/10.1126/science.2018.361.6404.twis</p> <p>Chronic sleep loss can have negative health effects, including weight gain and type 2 diabetes. Underlying molecular processes in key metabolic tissues are thought to be to blame. Cedernaes et al. compared molecular changes such as DNA methylation in fat and skeletal muscle tissue samples taken from 15 young Caucasian males after a night of sleep loss and after a normal night's sleep. The two tissue types responded very differently. In muscle, sleep loss enhanced skeletal muscle breakdown by down-regulating a metabolic pathway. However, the same pathway was up-regulated in fat tissue after disrupted sleep. Thus, sleep loss may reprogram fat tissue to increase fat storage.</p>	<p>Support</p> <p>The evidence directly supports the claim by stating that sleep loss can lead to molecular changes that increase fat storage.</p> <p>Though the evidence in Benson (2018) supports the claim, is actually a brief summary of another research article, which is not quoted here.</p>
<p>Poor subjective sleep quality has been robustly associated with weight gain, with some evidence pointing to oxygen desaturation during sleep as a contributing factor 7.</p>	<p>7. Hausler, N., et al. (2019). Does sleep affect weight gain? Assessing subjective sleep and polysomnography measures in a population-based cohort study (CoLaus/HypnoLaus). <i>Sleep</i>, 42(6). https://doi.org/10.1093/sleep/zsz077 [Article; bronze OA available]</p> <p>STUDY OBJECTIVES: Although several studies have linked short and long sleep duration to weight gain, mixed results exist. Contrarily, few studies associated objectively measured sleep characteristics with weight gain. We investigated the association between several sleep characteristics measured by questionnaire and polysomnography with prospective weight gain in a population-based, middle-aged cohort. METHODS: Three samples were analyzed: sample 1 (n = 2551, 47.3% men, 56.9 +/- 10.3 years) had data for subjective sleep characteristics, sample 2 (n = 1422, 49.4% men, 57.6 +/- 10.4 years) had objective sleep assessment (polysomnography), and sample 3 consisting of 1259 subjects included in both samples. Multivariable logistic regressions were performed to assess the relationship between sleep characteristics and >=5 kg weight gain during a median follow-up of 5.3 years. RESULTS: In both study samples, 12% of the subjects gained >=5 kg during follow-up. Multivariable analyses showed poor subjective sleep quality (as assessed by Pittsburgh Sleep Quality Index: odds ratio [95% confidence interval] = 1.54 [1.19 to 1.99]), percentage of sleep spent in stage 2 (1.32 [1.10 to 1.58]), and less than 90% oxygen saturation (SpO2 < 90) (1.23 [1.07 to 1.41]); moderate/severe Oxygen Desaturation Index (1.70 [1.01 to 2.85]) and autonomic arousal duration (1.22 [1.02 to 1.45]) were related to >=5 kg weight gain. Only poor subjective sleep quality was robustly associated with weight gain in all sensitivity analyses, except in female subsamples. CONCLUSIONS: Poor subjective sleep quality, and to some extent moderate to severe oxygen desaturation, but no other sleep characteristics, were robustly associated with weight gain. Future studies should confirm the relationship between sleep quality and weight gain, assess sex differences, and investigate underlying mechanisms.</p>	<p>Support</p> <p>The evidence supports the claim by highlighting that poor sleep quality is strongly linked to weight gain.</p>

Argument in the Summary	Evidence from abstracts	Evaluation
<p>Increased sleep duration is correlated with modest weight loss, and sleeping more than six hours per night is linked to better success with weight loss compared to less than six hours 8.</p>	<p>8. Thacker, B. and S. Daly. (2021). Is increased sleep duration effective for weight loss? Evidence-Based Practice, 24(8), 26-27. https://doi.org/10.1097/ebp.0000000000001122 [Article; no OA available]</p> <p>A 2015 meta-analysis of 16 randomized controlled trials (RCTs; N=728) examined the effect of sleep duration on body weight and energy balance.1 Four studies evaluated the effect on body weight. Average age, when provided, was 49 and 51 years old for adults, and in one trial of children was 9.6 years old. Patients were 19–87% female. When stated, patients were overweight or obese. Trials were excluded if they enrolled patients with chronic diseases associated with obesity, patients on any therapy which influenced body weight, those having bariatric surgery, or treated for sleep apnea. Interventions included small-group cognitive behavioral therapy to improve sleep duration, increased or decreased time in bed (by about 1.5 hours per week), an education curriculum to improve sleep, diet and exercise, or breathing training on the didgeridoo to improve daytime sleepiness. The interventions ranged in duration from 2 to 16 weeks. There was a modest reduction in body weight associated with increased sleep duration (4 studies, n=117; standardized mean difference –0.54; 95% CI, –1.01 to –0.07; I2=35%). Limitations of the analysis included the short duration of interventions (only 2 of the trials lasted at least 4 weeks) and the small number of studies available for comparison, as well as risk of bias due to lack of blinding personnel in two of the four studies.</p> <p>A 2020 cohort study evaluated the association between sleep duration and weight loss in 1,202 patients from a prior RCT who already achieved clinically significant weight loss.2 Patients, 69% women, were adults who lost greater than or equal to 5% of their body weight in the previous 12 months and who had a body mass index (BMI) of at least 25 kg/m2 prior to their weight loss. Patients' average age was 45 years old and average BMI 30 kg/m2. Patients lost on average 12 kg of body weight prior to entering the study. Only 8.5% of the cohort were current smokers and 53% were never smokers. Patients who were pregnant or breastfeeding, previously diagnosed with an eating disorder, unable to exercise, or who were new-onset type 1 diabetics were excluded. Sleep duration was measured using a wearable FitBit® device. Patients were grouped into sleep duration categories: <6 hours, 6 to <7 hours, 7 to < 8 hours, 8 to <9 hours, and ≥9 hours averaged over 14 nights of sleep. Patients with less than eight days of sleep data were excluded. When adjusted for covariates, patients with the shortest sleep duration (<6 hours) had significantly higher BMI compared to the other sleep durations (34 kg/m2 vs 29 to 31 kg/m2; P<.001). BMIs were similar between sleep durations 6 to <7, 7 to <8, 8 to <9, and ≥9 hours duration (31, 30, 29, and 30 kg/m2; values extrapolated from a figure). There were no reported harms. The study was limited by inability to blind participants to their sleep being measured and researchers did not have access to patients' sleep duration prior to their enrollment in the study.</p>	<p>Support</p> <p>The evidence supports the claim by stating that increased sleep duration is correlated with a modest reduction in body weight.</p>
<p>Insufficient sleep in children is consistently associated with weight gain and obesity, with increased food intake being a primary mechanism 9.</p>	<p>9. Chaput, J. P. (2016). Is sleep deprivation a contributor to obesity in children? Eat Weight Disord, 21(1), 5-11. https://doi.org/10.1007/s40519-015-0233-9 [Review; no OA available]</p> <p>Chronic lack of sleep (called "sleep deprivation") is common in modern societies with 24/7 availability of commodities. Accumulating evidence supports the role of reduced sleep as contributing to the current obesity epidemic in children and youth. Longitudinal studies have consistently shown that short sleep duration is associated with weight gain and the development of obesity. Recent experimental studies have reported that sleep restriction leads to weight gain in humans. Increased food intake appears to be the main mechanism by which insufficient sleep results in weight gain. Voluntary sleep restriction has been shown to increase snacking, the number of meals eaten per day, and the preference for energy-dense foods. Although the causes of sleep loss in the pediatric population are numerous, more research looking at screen exposure before bedtime and its effects on sleep is needed given the pervasiveness of electronic media devices in today's environment. Health professionals should routinely ask questions about sleep and promote a good night's sleep because insufficient sleep impacts activity and eating behaviors. Future research should examine the clinical benefits of increasing sleep duration on eating behaviors and body weight control and determine the importance of adequate sleep to improve the treatment of obesity.</p>	<p>Support</p> <p>The evidence supports the claim by explicitly connecting insufficient sleep with weight gain through increased food intake in children.</p>
<p>Stress and poor sleep may enhance appetite and cravings, decrease motivation for physical activity, and reduce the efficacy of weight loss interventions, suggesting a complex interplay between stress, sleep, and weight 10.</p>	<p>10. Geiker, N. R. W., et al. (2018). Does stress influence sleep patterns, food intake, weight gain, abdominal obesity and weight loss interventions and vice versa? Obes Rev, 19(1), 81-97. https://doi.org/10.1111/obr.12603 [Review; no OA available]</p> <p>Decades of research have reported only weak associations between the intakes of specific foods or drinks and weight gain and obesity. Randomized controlled dietary intervention trials have only shown very modest effects of changes in nutrient intake and diet composition on body weight in obese subjects. This review summarizes the scientific evidence on the role mental stress (either in or not in association with impaired sleep) may play in poor sleep, enhanced appetite, cravings and decreased motivation for physical activity. All these factors contribute to weight gain and obesity, possibly via decreasing the efficacy of weight loss interventions. We also review evidence for the role that lifestyle and stress management may play in achieving weight loss in stress-vulnerable individuals with overweight.</p>	<p>Support</p> <p>The evidence supports the claim by stating how stress and poor sleep can adversely affect appetite, activity levels, and the success of wei.</p>

Scopus AI – Matching sources with arguments in the Summary

Argument in the Summary	Evidence from abstracts	Evaluation
<p>- Sleep duration and weight gain: Multiple studies have shown an association between short sleep duration and weight gain 12345.</p>	<p>1. Atar, M., Ö. Pirgon and A. Buyukgebiz. (2019). Sleep Disorders and Obesity in Childhood: A New Component in Solving Obesity. <i>Pediatric Endocrinology Reviews: PER</i>, 16(4), 441-451. https://doi.org/10.17458/per.vol16.2019.apb.sleepdisordersobesitychildhood [Article; no OA available]</p> <p>Sleep disorders have been widely reported in obese individuals. Previous studies have shown that together with an increase in obesity prevalence, so does sleep duration in children and adolescents decrease. By contributing to energy imbalances, hormonal changes occurring with reduced sleep quality may cause weight gain and obesity. Current evidence shows that short sleep duration has effects on body weight and weight gain. Compared to individuals sleeping for a normal duration, insulin sensitivity is lower in those who sleep less. Lack of sleep increases the desire for food and has a direct effect on physical activity. Further studies are required to determine the contribution of sufficient sleep to obesity treatment.</p> <p>2. Xiao, Q., et al. (2013). A large prospective investigation of sleep duration, weight change, and obesity in the NIH-AARP diet and health study cohort. <i>American Journal of Epidemiology</i>, 178(11), 1600-1610. https://doi.org/10.1093/aje/kwt180 [Article; bronze OA available]</p> <p>The relationship between sleep and obesity or weight gain in adults, particularly older populations, remains unclear. In a cohort of 83,377 US men and women aged 51-72 years, we prospectively investigated the association between self-reported sleep duration and weight change over an average of 7.5 years of follow-up (1995-2004). Participants were free of cancer, heart disease, and stroke at baseline and throughout the follow-up. We observed an inverse association between sleep duration per night and weight gain in both men (P for trend = 0.02) and women (P for trend < 0.001). Compared with 7-8 hours of sleep, shorter sleep (<5 hours or 5-6 hours) was associated with more weight gain (in kilograms; men: For <5 hours, \hat{a} = 0.66, 95% confidence interval (CI): 0.19, 1.13, and for 5-6 hours, \hat{a} = 0.12, 95% CI: .02, 0.26; women: For <5 hours, \hat{a} = 0.43, 95% CI: 0.00, 0.86, and for 5-6 hours, \hat{a} = 0.23, 95% CI: 0.08, 0.37). Among men and women who were not obese at baseline, participants who reported less than 5 hours of sleep per night had an approximately 40% higher risk of developing obesity than did those who reported 7-8 hours of sleep (for men, odds ratio = 1.45, 95% CI: 1.06, 1.99; for women, odds ratio = 1.37, 95% CI: 1.04, 1.79). The association between short sleep and excess weight gain was generally consistent across different categories of age, educational level, smoking status, baseline body mass index, and physical activity level.</p> <p>3. Papatriantafyllou, E., et al. (2022). Sleep Deprivation: Effects on Weight Loss and Weight Loss Maintenance. <i>Nutrients</i>, 14(8), Article 1549. https://doi.org/10.3390/nu14081549 [Review; gold OA available]</p> <p>This narrative review presents the findings from intervention studies on the effects of sleep deprivation on eating habits, metabolic rate, and the hormones regulating metabolism, and discusses their relevance to weight loss efforts. Disturbed sleeping patterns lead to increased energy intake, partly from excessive snacking, mainly on foods high in fat and carbohydrates. The studies focused mainly on the effects of sleep duration, but also of sleep quality, on dietary intake during weight loss trials, and on weight loss maintenance. It is important to explore sleep routines that could enhance the efforts of obese and overweight people to lose weight, maintain their weight loss, and improve their overall health.</p> <p>4. Spaeth, A. M. (2019). Insufficient sleep and obesity. In <i>Sleep and Health</i> (pp. 189-201). https://doi.org/10.1016/B978-0-12-815373-4.00015-0 [Book chapter; no OA available]</p> <p>The high prevalence of obesity and its associated diseases have prompted calls for the evaluation of innovative approaches to decrease obesity risk and promote healthy weight management. Emerging evidence suggests that sleep plays an important role in energy balance and metabolism. Habitual short sleep associates with an increased risk for obesity in children, adolescents and adults. Experimental studies demonstrate that sleep restriction leads to weight gain, increased daily caloric intake, greater consumption of unhealthy food and drink, and delayed meal timing as well as alterations in appetite-regulating hormones and brain activity that promote positive energy balance and weight gain over time. Addressing sleep issues with individuals who are at risk for uncontrolled weight gain improves daytime functioning and may increase the likelihood of weight-loss success. Pilot studies examining the use of sleep extension as a behavioral approach for healthy weight management have shown promising results.</p> <p>5. Bayon, V., et al. (2014). Sleep debt and obesity. <i>Annals of Medicine</i>, 46(5), 264-272. https://doi.org/10.3109/07853890.2014.931103 [Article; bronze OA available]</p> <p>Short sleep duration has been shown to be associated with elevated body mass index (BMI) in many epidemiological studies. Several pathways could link sleep deprivation to weight gain and obesity, including increased food intake, decreased energy expenditure, and changes in levels of appetite-regulating hormones, such as leptin and ghrelin. A relatively new factor that is contributing to sleep deprivation is the use of multimedia (e.g. television viewing, computer, and internet), which may aggravate sedentary behavior and increase caloric intake. In addition, shift-work, long working hours, and increased time commuting to and from work have also been hypothesized to favor weight gain and obesity-related metabolic disorders, because of their strong link to shorter sleep times. This article reviews the epidemiological, biological, and behavioral evidence linking sleep debt and obesity.</p>	<p>Support</p> <p>All references provide evidence that support the association between short sleep duration and weight gain.</p>

Argument in the Summary	Evidence from abstracts	Evaluation
<p>- Mechanisms: The impact of sleep on weight gain is attributed to hormonal changes affecting energy balance, leading to increased food intake, decreased energy expenditure, and alterations in appetite-regulating hormones 1235.</p>	<p>1. Atar, M., Ö. Pirgon and A. Buyukgebiz. (2019). Sleep Disorders and Obesity in Childhood: A New Component in Solving Obesity. <i>Pediatric Endocrinology Reviews: PER</i>, 16(4), 441-451. https://doi.org/10.17458/per.vol16.2019.apb.sleepdisordersobesitychildhood [Article; no OA available]</p> <p>Sleep disorders have been widely reported in obese individuals. Previous studies have shown that together with an increase in obesity prevalence, so does sleep duration in children and adolescents decrease. By contributing to energy imbalances, hormonal changes occurring with reduced sleep quality may cause weight gain and obesity. Current evidence shows that short sleep duration has effects on body weight and weight gain. Compared to individuals sleeping for a normal duration, insulin sensitivity is lower in those who sleep less. Lack of sleep increases the desire for food and has a direct effect on physical activity. Further studies are required to determine the contribution of sufficient sleep to obesity treatment.</p> <p>2. Xiao, Q., et al. (2013). A large prospective investigation of sleep duration, weight change, and obesity in the NIH-AARP diet and health study cohort. <i>American Journal of Epidemiology</i>, 178(11), 1600-1610. https://doi.org/10.1093/aje/kwt180 [Article; bronze OA available]</p> <p>The relationship between sleep and obesity or weight gain in adults, particularly older populations, remains unclear. In a cohort of 83,377 US men and women aged 51-72 years, we prospectively investigated the association between self-reported sleep duration and weight change over an average of 7.5 years of follow-up (1995-2004). Participants were free of cancer, heart disease, and stroke at baseline and throughout the follow-up. We observed an inverse association between sleep duration per night and weight gain in both men (P for trend = 0.02) and women (P for trend < 0.001). Compared with 7-8 hours of sleep, shorter sleep (<5 hours or 5-6 hours) was associated with more weight gain (in kilograms; men: For <5 hours, $\hat{\alpha}$ = 0.66, 95% confidence interval (CI): 0.19, 1.13, and for 5-6 hours, $\hat{\alpha}$ = 0.12, 95% CI: .02, 0.26; women: For <5 hours, $\hat{\alpha}$ = 0.43, 95% CI: 0.00, 0.86, and for 5-6 hours, $\hat{\alpha}$ = 0.23, 95% CI: 0.08, 0.37). Among men and women who were not obese at baseline, participants who reported less than 5 hours of sleep per night had an approximately 40% higher risk of developing obesity than did those who reported 7-8 hours of sleep (for men, odds ratio = 1.45, 95% CI: 1.06, 1.99; for women, odds ratio = 1.37, 95% CI: 1.04, 1.79). The association between short sleep and excess weight gain was generally consistent across different categories of age, educational level, smoking status, baseline body mass index, and physical activity level.</p> <p>3. Papatrifiantayllou, E., et al. (2022). Sleep Deprivation: Effects on Weight Loss and Weight Loss Maintenance. <i>Nutrients</i>, 14(8), Article 1549. https://doi.org/10.3390/nu14081549 [Review; gold OA available]</p> <p>This narrative review presents the findings from intervention studies on the effects of sleep deprivation on eating habits, metabolic rate, and the hormones regulating metabolism, and discusses their relevance to weight loss efforts. Disturbed sleeping patterns lead to increased energy intake, partly from excessive snacking, mainly on foods high in fat and carbohydrates. The studies focused mainly on the effects of sleep duration, but also of sleep quality, on dietary intake during weight loss trials, and on weight loss maintenance. It is important to explore sleep routines that could enhance the efforts of obese and overweight people to lose weight, maintain their weight loss, and improve their overall health.</p> <p>5. Bayon, V., et al. (2014). Sleep debt and obesity. <i>Annals of Medicine</i>, 46(5), 264-272. https://doi.org/10.3109/07853890.2014.931103 [Article; bronze OA available]</p> <p>Short sleep duration has been shown to be associated with elevated body mass index (BMI) in many epidemiological studies. Several pathways could link sleep deprivation to weight gain and obesity, including increased food intake, decreased energy expenditure, and changes in levels of appetite-regulating hormones, such as leptin and ghrelin. A relatively new factor that is contributing to sleep deprivation is the use of multimedia (e.g. television viewing, computer, and internet), which may aggravate sedentary behavior and increase caloric intake. In addition, shift-work, long working hours, and increased time commuting to and from work have also been hypothesized to favor weight gain and obesity-related metabolic disorders, because of their strong link to shorter sleep times. This article reviews the epidemiological, biological, and behavioral evidence linking sleep debt and obesity.</p>	<p>3 out of 4 do not support</p> <p>Only Ref 4 explicitly supports the statement by detailing hormonal alterations and their effects on energy balance, food intake, and energy expenditure due to sleep deprivation.</p> <p>Ref 1 suggests that hormonal changes “may cause weight gain”.</p> <p>Ref 3 aligns with the statement by discussing increased energy intake due to sleep disruption but does not explicitly connect this to hormonal changes.</p> <p>Ref 2 correlates short sleep with weight gain but does not address the specific hormonal mechanisms involved.</p>
<p>- Experimental evidence: Experimental studies have demonstrated that sleep restriction leads to weight gain, increased caloric intake, and greater consumption of unhealthy food and drink 4.</p>	<p>4. Spaeth, A. M. (2019). Insufficient sleep and obesity. In <i>Sleep and Health</i> (pp. 189-201). https://doi.org/10.1016/B978-0-12-815373-4.00015-0 [Book chapter; no OA available]</p> <p>The high prevalence of obesity and its associated diseases have prompted calls for the evaluation of innovative approaches to decrease obesity risk and promote healthy weight management. Emerging evidence suggests that sleep plays an important role in energy balance and metabolism. Habitual short sleep associates with an increased risk for obesity in children, adolescents and adults. Experimental studies demonstrate that sleep restriction leads to weight gain, increased daily caloric intake, greater consumption of unhealthy food and drink, and delayed meal timing as well as alterations in appetite-regulating hormones and brain activity that promote positive energy balance and weight gain over time. Addressing sleep issues with individuals who are at risk for uncontrolled weight gain improves daytime functioning and may increase the likelihood of weight-loss success. Pilot studies examining the use of sleep extension as a behavioral approach for healthy weight management have shown promising results.</p>	<p>Support, but almost word for word copying</p>

Argument in the Summary	Evidence from abstracts	Evaluation
<p>- Risk of obesity: Individuals reporting less than 5 hours of sleep per night had a higher risk of developing obesity compared to those reporting 7-8 hours of sleep 2.</p>	<p>2. Xiao, Q., et al. (2013). A large prospective investigation of sleep duration, weight change, and obesity in the NIH-AARP diet and health study cohort. <i>American Journal of Epidemiology</i>, 178(11), 1600-1610. https://doi.org/10.1093/aje/kwt180 [Article; bronze OA available]</p> <p>The relationship between sleep and obesity or weight gain in adults, particularly older populations, remains unclear. In a cohort of 83,377 US men and women aged 51-72 years, we prospectively investigated the association between self-reported sleep duration and weight change over an average of 7.5 years of follow-up (1995-2004). Participants were free of cancer, heart disease, and stroke at baseline and throughout the follow-up. We observed an inverse association between sleep duration per night and weight gain in both men (P for trend = 0.02) and women (P for trend < 0.001). Compared with 7-8 hours of sleep, shorter sleep (<5 hours or 5-6 hours) was associated with more weight gain (in kilograms; men: For <5 hours, \hat{a} = 0.66, 95% confidence interval (CI): 0.19, 1.13, and for 5-6 hours, \hat{a} = 0.12, 95% CI: .02, 0.26; women: For <5 hours, \hat{a} = 0.43, 95% CI: 0.00, 0.86, and for 5-6 hours, \hat{a} = 0.23, 95% CI: 0.08, 0.37). Among men and women who were not obese at baseline, participants who reported less than 5 hours of sleep per night had an approximately 40% higher risk of developing obesity than did those who reported 7-8 hours of sleep (for men, odds ratio = 1.45, 95% CI: 1.06, 1.99; for women, odds ratio = 1.37, 95% CI: 1.04, 1.79). The association between short sleep and excess weight gain was generally consistent across different categories of age, educational level, smoking status, baseline body mass index, and physical activity level.</p>	<p>Support</p> <p>The evidence clearly states that people sleeping less than 5 hours gained more weight and had a 40% higher risk of becoming obese than those who slept 7-8 hours.</p>
<p>- Gender and race differences: Subgroup analysis revealed differences in weight gain between genders and races 6.</p> <p>However, it's important to note that not all studies have found a significant association between sleep restriction and weight gain 6.</p>	<p>6. Yu, H., et al. (2019). Experimental sleep restriction effect on adult body weight: a meta-analysis. <i>Sleep and Breathing</i>, 23(4), 1341-1350. https://doi.org/10.1007/s11325-019-01828-0 [Review; no OA available]</p> <p>Background: Sleep is increasingly recognized as a potential risk for overweight and obesity. Observational studies have shown links between short sleep duration with weight gain. However, the findings from longitudinal studies in adults are conflicting. This review aimed to examine the effectiveness of experimental sleep restriction on adult body weight. Method: A systematic search was undertaken in MEDLINE, EMBASE, PsycINFO, and CENTRAL (Cochrane center register of controlled trials) to identify experimental studies examining the effectiveness of sleep restriction on body weight, and search period was from January 2005 to June 2018. Meta-analysis was applied by using the random model. Results: A total of 275 adults from six experimental studies were included. The pooled standard mean difference in body weight and body fat was 0.44 (95% CI - 0.13 to 1.02) (Z = 1.51, p > 0.05) and 0.35 kg (95% CI - 0.19 to 0.88) (Z = 1.27, p > 0.05), respectively. The experimental sleep restriction did not result in significant differences in adult body weight or body fat. Subgroup analysis showed that there were differences in weight gain between genders and races. Conclusion: The finding from this review cannot support the hypothesis from observational studies that short sleep leads to weight gain.</p>	<p>Support</p> <p>The evidence confirms the differences in weight gain across genders and races, and serves as one proof that not all studies showed significant correlation between short sleep and weight gain.</p>