

Importance of Sleep for Mental and Physical Health

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Conflicts of Interest

None to disclose

CLINICAL REVIEW

In search of lost sleep: Secular trends in the sleep time of school-aged children and adolescents

Lisa Matricciani^{a,c,*}, Timothy Olds^{a,b,c}, John Petkov^a

Sleep Med Rev (2012)

- 690,747 children from 20 countries
- 1905 to 2008

“A reduction of more than 1 hour
of sleep over the last century”



The Great Sleep Recession: Changes in Sleep Duration Among US Adolescents, 1991–2012

Katherine M. Keyes, PhD^a, Julie Maslowsky, PhD^b, Ava Hamilton, BA^a, John Schulenberg, PhD^{c,d}

Pediatrics (2015)

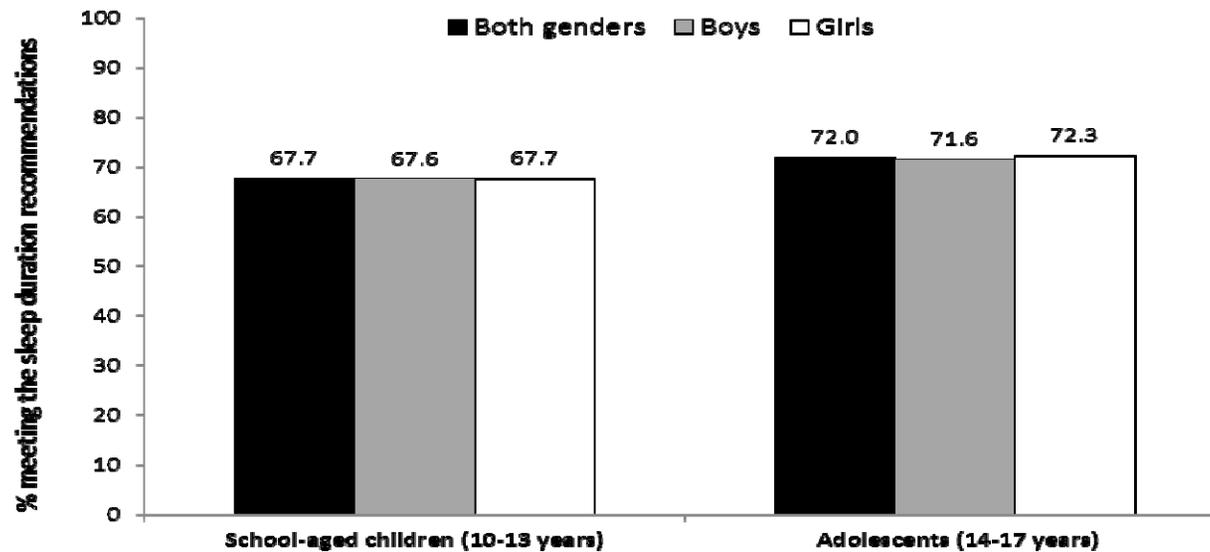
- >270,000 adolescents in the USA

“Declines in adolescent sleep across the last 20 years are concerning, particularly in girls, racial/ethnic minorities, and those from low SES backgrounds”



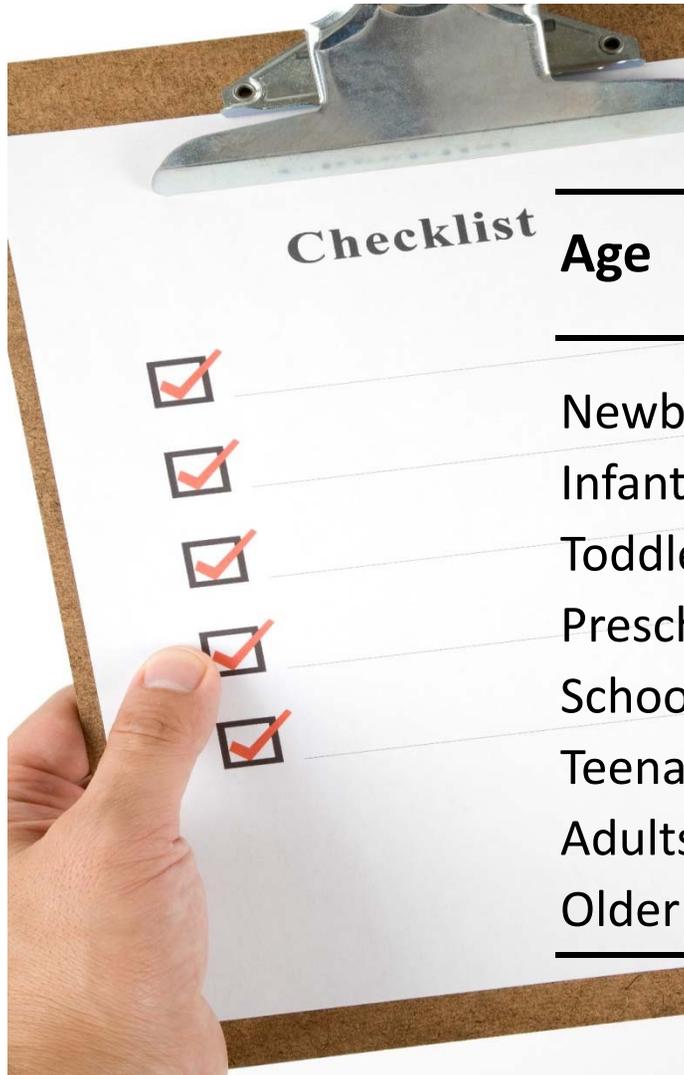
Are Canadian kids sleep deprived?

N=24,896 participants (HBSC)



Chaput and Janssen. J Sleep Res (2016)

Sleep recommendations



Age

Recommendation

Newborns (0-3 months)

14-17 h

Infants (4-11 months)

12-15 h

Toddlers (1-2 years)

11-14 h

Preschoolers (3-5 years)

10-13 h

School-aged children (6-13 years)

9-11 h

Teenagers (14-17 years)

8-10 h

Adults (18-64 years)

7-9 h

Older adults (65 and over)

7-8 h

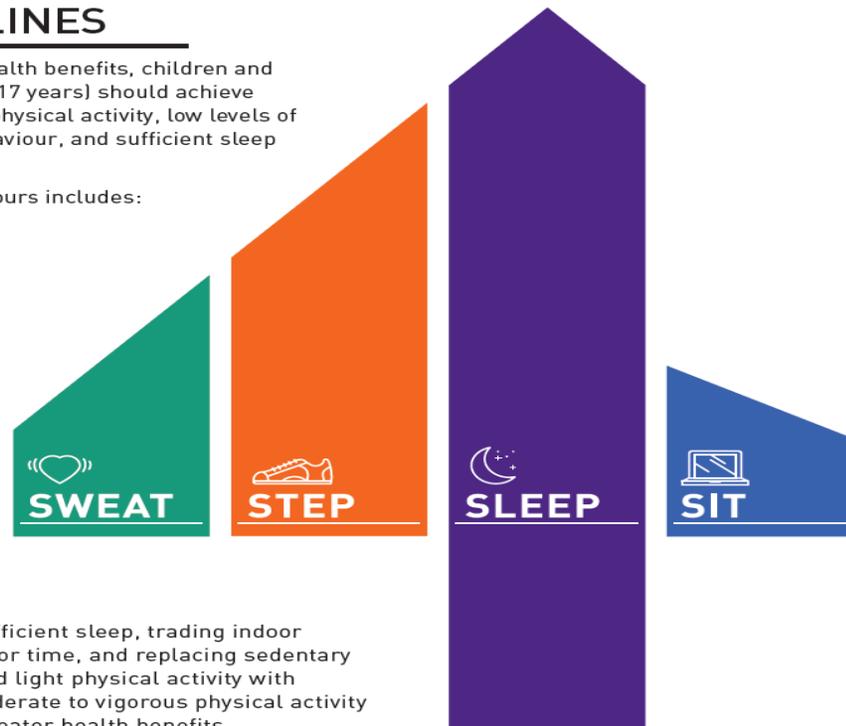
www.sleepfoundation.org

Canadian 24-Hour Movement Guidelines for Children and Youth: An Integration of Physical Activity, Sedentary Behaviour, and Sleep

GUIDELINES

For optimal health benefits, children and youth (aged 5–17 years) should achieve high levels of physical activity, low levels of sedentary behaviour, and sufficient sleep each day.

A healthy 24 hours includes:



Preserving sufficient sleep, trading indoor time for outdoor time, and replacing sedentary behaviours and light physical activity with additional moderate to vigorous physical activity can provide greater health benefits.

SWEAT

MODERATE TO VIGOROUS PHYSICAL ACTIVITY

An accumulation of at least 60 minutes per day of moderate to vigorous physical activity involving a variety of aerobic activities. Vigorous physical activities, and muscle and bone strengthening activities should each be incorporated at least 3 days per week;

STEP

LIGHT PHYSICAL ACTIVITY

Several hours of a variety of structured and unstructured light physical activities;

SLEEP

SLEEP

Uninterrupted 9 to 11 hours of sleep per night for those aged 5–13 years and 8 to 10 hours per night for those aged 14–17 years, with consistent bed and wake-up times;

SIT

SEDENTARY BEHAVIOUR

No more than 2 hours per day of recreational screen time;
Limited sitting for extended periods.

Factors explaining sleep loss



And we don't take sleep seriously!!!



Screens and sleep hygiene

Dim Light at Night Disrupts Molecular Circadian Rhythms and Affects Metabolism

Laura K. Fonken[†], Taryn G. Aubrecht, O. Hecmarie Meléndez-Fernández, Zachary M. Weil, and Randy J. Nelson

- Bright light of screens suppresses melatonin secretion, which may delay sleep onset
- Screen exposure before bedtime decreases sleep quality

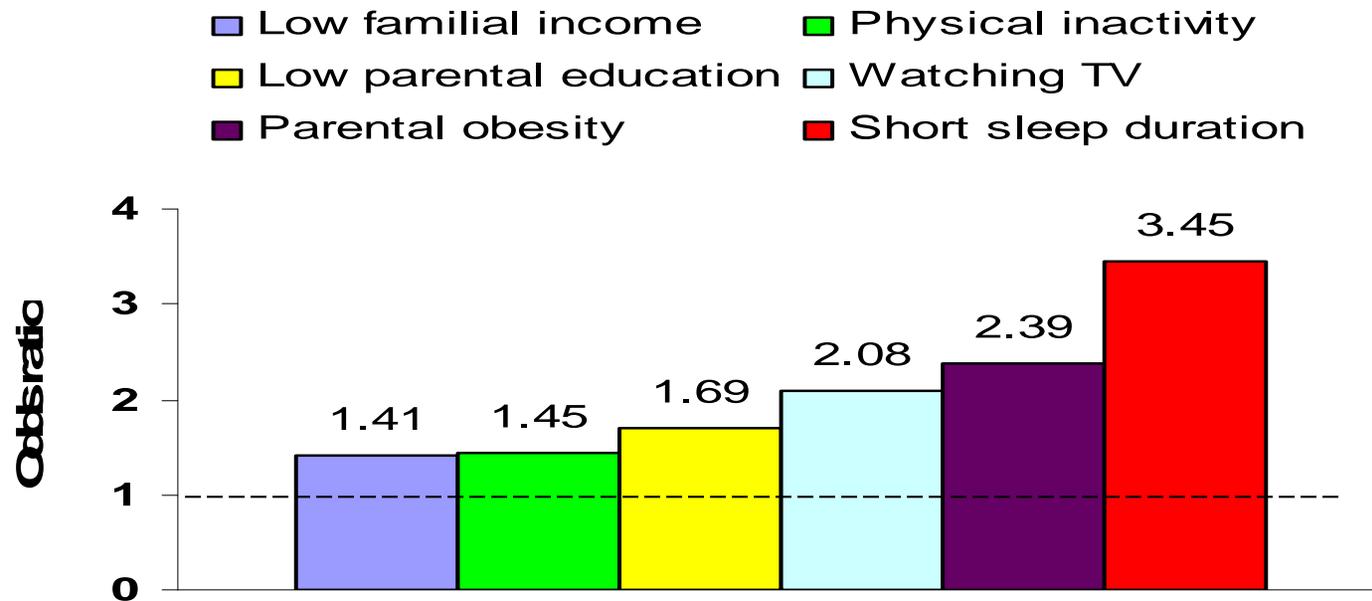


Is insufficient sleep
a contributor to obesity?

Observational evidence



Relationship between risk factors and childhood overweight/obesity



Chaput JP *et al.* Int J Obes (2006)

SLEEP DURATION AND WEIGHT

Meta-Analysis of Short Sleep Duration and Obesity in Children and Adults

Francesco P. Cappuccio, MD, FRCP¹; Frances M. Taggart, PhD¹; Ngianga-Bakwin Kandala, PhD¹; Andrew Currie, MB ChB¹; Ed Peile, FRCP²; Saverio Stranges, MD, PhD¹; Michelle A. Miller, PhD¹

Sleep (2008)

N = 634,511 participants

Adults sleeping ≤ 5 h/night are **55%** more likely to be obese than those sleeping > 5 h/night

Children sleeping < 10 h/night are **89%** more likely to be obese than those sleeping ≥ 10 h/night

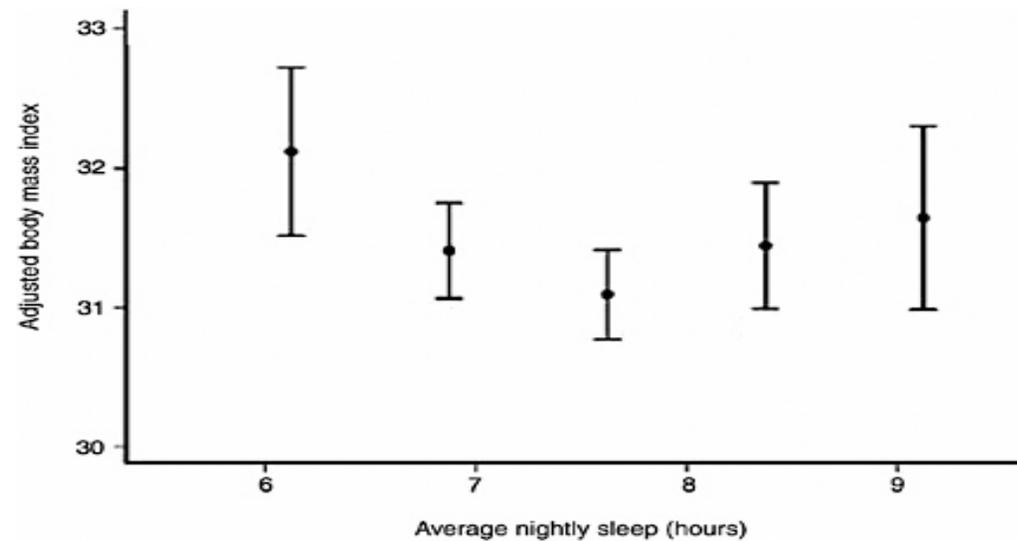
Longitudinal impact of sleep on overweight and obesity in children and adolescents: a systematic review and bias-adjusted meta-analysis

Y. Fatima, S. A. R. Doi and A. A. Mamun

Obes Rev (2015)

“Meta-analysis of 11 longitudinal studies, comprising 24,821 participants, revealed that subjects sleeping for short duration had twice the risk of being overweight/obese, compared with subjects sleeping for long duration (OR 2.15; 95% CI 1.64-2.81)”

Sleep duration and health outcomes: U-shaped association?



Bidirectional relationships between sleep and obesity



Insufficient sleep is associated with:

- Obesity, T2D, CVD, mortality
- Unhealthy behaviours (inactivity, screen time, unhealthy eating behaviours, alcohol consumption,...)
- Anxiety and depression
- Risky behaviours and injuries
- Weaker immune system
- Poorer academic achievement
- Lower quality of life/well-being
- ...

Is insufficient sleep
a contributor to obesity?

Experimental evidence



Seminal study by Van Cauter *et al.*

Sleep restriction (2 nights of 4 h in bed) was associated with:

- ↓ leptin levels
- ↑ ghrelin levels
- ↑ cortisol levels
- ↑ sympathetic tone
- ↑ hunger and appetite, especially for calorie-dense foods
- ↓ glucose tolerance

Spiegel K *et al.* Lancet (1999)

Spiegel K *et al.* Ann Intern Med (2004)



Effects of Experimental Sleep Restriction on Weight Gain, Caloric Intake, and Meal Timing in Healthy Adults

Andrea M. Spaeth, MA¹; David F. Dinges, PhD²; Namni Goel, PhD²

Sleep (2013)

- 5 nights of 4 h time in bed
- 225 healthy adults (controlled laboratory conditions)

Findings:

- Sleep-restricted participants gained 1 kg more than controls ($P=0.007$)
- They consumed extra calories (130% of daily caloric requirements)
- Increased daily energy intake was due to more meals eaten and the consumption of about 550 additional calories during late-night hours

Impact of insufficient sleep on total daily energy expenditure, food intake, and weight gain

Rachel R. Markwald^{a,b,1}, Edward L. Melanson^{b,c}, Mark R. Smith^a, Janine Higgins^d, Leigh Perreault^b, Robert H. Eckel^b and Kenneth P. Wright, Jr.^{a,b,2}

Proc Natl Acad Sci USA (2013)

- 5 nights of 5 h time in bed
- 16 adults (controlled laboratory conditions)

Findings:

- Insufficient sleep led to a 0.82 kg weight gain ($P < 0.05$)
- Energy intake (especially at night after dinner) was in excess of energy needed to maintain energy balance



Changes in Children's Sleep Duration on Food Intake, Weight, and Leptin

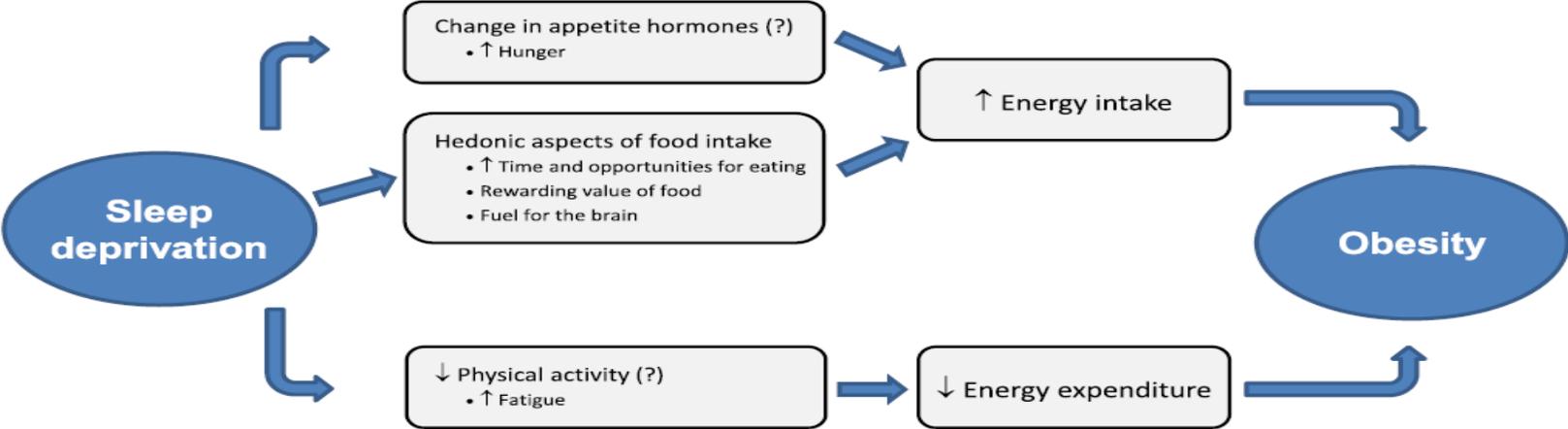
Hart CN. Pediatrics (2013)

- Randomized crossover trial
- N=37 children (8-11 years)
- 3-week study



WHAT THIS STUDY ADDS: This controlled experimental study demonstrates that compared to sleeping less, when children increase sleep, they report decreased caloric intake, have lower fasting leptin levels, and weigh less. Such changes, if maintained, could help prevent excess weight gain over time.

Mechanisms by which sleep deprivation may lead to weight gain and obesity



Influence of sleep timing (bedtime) on obesity risk



Lark vs. night owl



PEDIATRIC ORIGINAL ARTICLE

Sleep duration or bedtime? Exploring the association between sleep timing behaviour, diet and BMI in children and adolescents

RK Golley¹, CA Maher², L Matricciani² and TS Olds²

Int J Obes (2013)

DOI: 10.5665/SLEEP.1

Sleep Duration or Bedtime? Exploring the Relationship between Sleep Habits and Weight Status and Activity Patterns

Tim S. Olds, PhD^{1,2}; Carol A. Maher, PhD^{1,2}; Lisa Matricciani, BA²

Sleep (2011)

Later bedtimes and later wake-up times are associated with poorer diet quality, lower MVPA, greater screen time and a higher risk of obesity independent of sleep duration



Influence of sleep in the treatment of obesity

Adequate sleep to improve the treatment of obesity

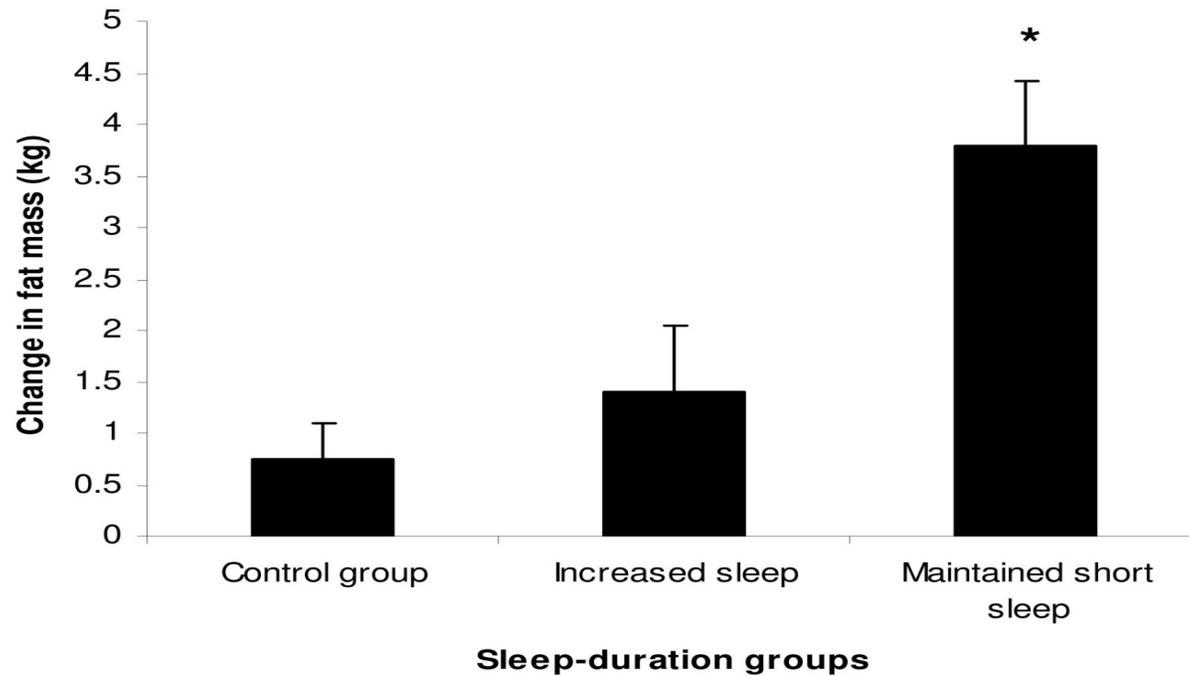
Jean-Philippe Chaput PhD, Angelo Tremblay PhD

CMAJ (2012)



Addressing sleep for weight management has been endorsed by the Canadian Obesity Network

You snooze, you lose weight?



Chaput JP *et al.* Int J Obes (2012)

There is minimal risk in taking a pragmatic approach and encouraging a good night's sleep as an adjunct to other health promotion measures



The “big three”



Health professionals should ask questions about sleep

Table 1 Examples of sleep questions that can be included in the assessment

Sample questions	Desired answers
1. What time do you go to bed every night and wake up every morning?	Consistent (even on weekends)
2. How many hours do you sleep on an average night?	10–13 h (preschoolers), 9–11 h (school-aged children), 8–10 h (adolescents)
3. Do you have difficulty falling asleep once in bed?	No, usually I fall asleep within 30 min
4. How many times do you wake up each night?	Never or once per night
5. Do you feel refreshed upon waking in the morning?	Yes
6. How often do you feel sleepy during the day?	Never or rarely

Chaput JP. Eat Weight Disord (2016)



GENERAL TIPS FOR HAVING HEALTHY SLEEP HYGIENE¹⁴²



Go to bed and wake up at the same time every day (even on the weekends!)



Don't go to bed feeling hungry, but also don't eat a heavy meal right before bed



Avoid caffeine consumption (e.g., coffee, soft drinks, chocolate) starting in the late afternoon



Develop a relaxing routine before bedtime – ideas include bathing, music, and reading



Expose yourself to bright light in the morning – sunlight helps the biological clock to reset itself each day



Reserve your bedroom for sleeping only – keep cell phones, computers, televisions and video games out of your bedroom



Make sure your bedroom is conducive to sleep – it should be dark, quiet, comfortable, and cool



Exercise regularly during the day



Sleep on a comfortable mattress and pillow



Don't have pets in your bedroom

One of the best strategies to improve your sleep is to be active

Research Article

Open Access

Effect of Different Doses of Exercise on Sleep Duration, Sleep Efficiency and Sleep Quality in Sedentary, Overweight Men

Jonas S. Kjeldsen^{1,2}, Mads Rosenkilde², Signe W. Nielsen¹, Michala Reichkender², Pernille Auerbach², Thorkil Ploug², Bente Stallknecht², Anders M. Sjödin¹ and Jean-Philippe Chaput^{3*}

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³Healthy Active Living and Obesity Research Group, Children's Hospital of Eastern Ontario Research Institute, Ottawa, Canada.

Bioenergetics (2013)



Conclusions

- ✓ Sleep is not a waste of time
- ✓ Short sleep duration, poor sleep quality, and late bedtimes are all associated with increased food intake, poor diet quality, and obesity
- ✓ Sleep hygiene is an important factor to consider in the prevention and treatment of obesity
- ✓ The “right” amount of sleep should be individualized



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