Sleep: the young athlete's ultimate performance-enhancing drug

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Today's objectives:

- Describe the parameters of healthy sleep in children and adolescents
- Discuss the effects of sleep on athletic performance
- Discuss adaptive and maladaptive sleep habits
- Identify recommendations to improve the sleep of the student athlete

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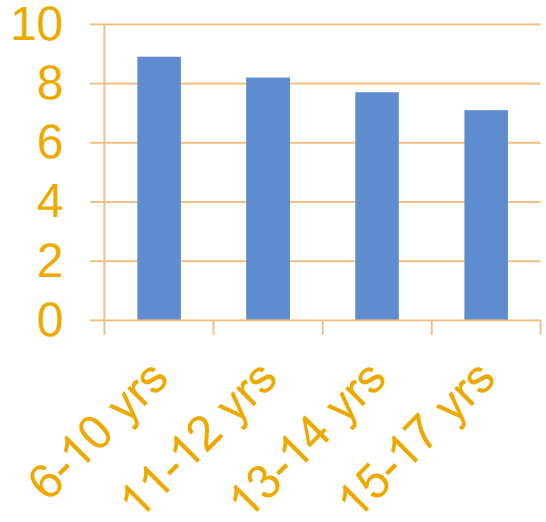
How much sleep are children getting?



Parent report: National Sleep Foundation's 2014 *Sleep in America* Poll

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Contributors to teen sleep deprivation

- Personal electronics usage
  - Teens using electronic devices for 1 hour a day:
    - 35 percent slept fewer than seven hours.
  - Teens using electronic devices for five-plus hours a day:
    - 52 percent slept fewer than seven hours
    - 50 percent more likely to sleep less than teens who only use electronics 1 hour a day.

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Twenge, J. M., Krizan, Z., & Hisler, G. (2017)

Contributors to teen sleep deprivation

- Caffeine usage
  - Three-quarters of adolescents report drinking at least one caffeinated beverage daily, and nearly one-third (31%) consume two or more such drinks each day.
  - Not surprisingly, teens who drink caffeinated beverages get less sleep than those who don't.
- Overscheduling/school schedules
- Stress
- Medical/psychological issues

National Sleep Foundation 2006, 2011 Sleep in America Poll

Non-restorative sleep and medical/mental health disorders

- Feeling unrefreshed after getting up in the morning (≥ 3x week) associated with greater frequency of:
  - upper airway inflammatory diseases, digestive (GERD) systems
  - mental health problems
  - metabolic (diabetes mellitus)
  - dermatological and immune/inflammatory (eczema and upper airway inflammatory diseases)
  - musculoskeletal (arthritis), ophthalmological (eye diseases)

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Zhang et al, Sleep Medicine, 2012

Prevalence rates

- "Poor sleepers"
  - University students: 60%
  - *General population: 10-60%; insomnia diagnosis: 2-3%
  - Elite (adult) athletes: 33-50%
    - Most vulnerable prior to major competitive events, during periods of high-intensity training and following longhaul travel to competitions
  - Student (college) athletes: 66%

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Bhaskar et al., 2016; Gupta et. al., 2017;

Prevalence rates

- Student athletes
  - High level of fatigue: 23%
  - Less than 7 hours of sleep: 43%
  - More than 30 minutes to fall asleep: 29%
  - Mild insomnia: 32%
  - Moderate insomnia: 12%

Brown et al., 2014; “Sleep and Health in Student Athletes” NCAA

Teen athletes have additional unique sleep deprivation risks

- Training schedules/games
  - Both before school and late night
- Traveling across time zones
  - Jet lag (mental/physical fatigue, altered appetite, irritability, constipation)
  - Can affect athletic performance

(Copenhaver & Diamond, 2017; Watson, 2017)

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Teen athletes have additional unique sleep deprivation risks

- Psychological impact of athletic competition; Concomitant academic pressures; stress
  - May be =/> detrimental to sleep than decreased sleep from practices, games
- Increased risk for some medical sleep issues
  - Sleep disordered breathing
    - general population=4%; football players=14%; young-adult rugby players=43%
  - Restless leg syndrome

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(Copenhaver & Diamond, 2017; Watson, 2017; Yoshitaka et al., 2019)

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Sleep is a performance enhancer

- Accuracy/reaction time
  - 1 night of <=5 hours of sleep
    - Serving accuracy (tennis) decreased 53%
    - Decrease in dart throwing accuracy
  - Accumulated sleep debt=worsening end of week reaction time in student athletes
- (Watson, 2017)

Sleep is a performance enhancer

- Accuracy/reaction time
  - Increase in sleep of collegiate male basketball players
    - 2 hrs per night over several weeks
      - 9% increase in free throw and field goal percentages
  - 1.6 hr increase in sleep for tennis players
    - 36-41% increase in serving accuracy
  - Consistent findings across studies

(Watson, 2017)

Sleep is a performance enhancer

- Endurance
  - Sleep deprivation (24-30 hrs, minimal sleep per night):
    - Decreased performance in treadmill trails, time trials (cyclists), volleyball player exhaustion, maximal weights lifted
  - Increase of 2 hrs of sleep in collegiate basketball players
    - Improved sprint times, self report of performances in game, practice

(Watson, 2017)

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Sleep is a performance enhancer

- Endurance
  - Mechanism(s) may be:
    - an increase in perceived exertion
    - Impaired recovery between bouts of strenuous exercise
    - Decrease levels of preexercise muscle glycogen stores
  - Results are mixed; May be more impactful during prolonged submaximal or progressive efforts

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(Watson, 2017)

Sleep is a performance enhancer

- Injury prevention
  - Teens who sleep fewer than 8 hours
    - 1.7x more likely to have an injury
  - Injuries rates in youth athletes increase in games the day after <6 hours of sleep
  - Fatigue can increase decision-making errors which may increase risk of injury

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(Copenhaver & Diamond, 2017)

Sleep is a performance enhancer

- Learning/executive function
  - attention and working memory, long-term memory and decision-making influenced by sleep deprivation
  - skills acquisition
    - Teen soccer players have steeper learning curves after habitual sleep versus period of sleep deprivation

(Watson, 2017)

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Recommendations to improve adolescent athletes' sleep

- Screen for sleep problems during your outpatient visits
  - BEARS measure of sleep
    - Public domain (free)
    - Empirical support
    - Brief

(Owens and Dalzell, 2005)

	Preschool (2–5 y)	School-age (6–12 y)	Adolescent (13–18 y)
Bedtime issues	**To parent:** Does your child have any problems going to bed? Falling asleep?	**To parent:** Does your child have any problems at bedtime? **To child:** Do you have any problems going to bed?	**To child:** Do you have any problems falling asleep at bedtime?
Excessive daytime sleepiness	**To parent:** Does your child seem overtired or sleepy a lot during the day? Does he/she still take naps?	**To parent:** Does your child have difficulty waking in the morning, seem sleepy during the day or take naps? **To child:** Do you feel tired a lot?	**To child:** Do you feel sleepy a lot during the day? In school? While driving?
Awakenings during the night	**To parent:** Does your child wake up a lot at night?	**To parent:** Does your child seem to wake up a lot at night? Any sleepwalking or nightmares? **To child:** Do you wake up a lot at night? Have trouble getting back to sleep?	**To child:** Do you wake up a lot at night? Have trouble getting back to sleep?
Regularity and duration of sleep	**To parent:** Does your child have a regular bedtime and wake time? What are they?	**To parent:** What time does your child go to bed and get up on school days? Weekends? Do you think he/she is getting enough sleep?	**To child:** What time do you usually go to bed on school nights? Weekends? How much sleep do you usually get?
Sleep-disordered breathing	**To parent:** Does your child snore a lot or have difficulty breathing at night?	**To parent:** Does your child have loud or nightly snoring or any breathing difficulties at night?	**To parent:** Does your teenager snore loudly or nightly?

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(Owens and Dalzell, 2005)

Pediatric Insomnia Severity Index

Use the following scale when answering the questions:

0=Never 1=Once in a while 2=Sometimes 3=Quite Often 4=Frequently 5=Always

- (0 nights) (1-2 nights) (2-3 nights) (4-5 nights) (5-6 nights) (7 nights)
- 1) My child takes longer than 30 minutes to fall asleep after going to bed 0 1 2 3 4 5
- 2) My child has trouble falling asleep at bedtime. 0 1 2 3 4 5
- 3) My child awakes more than once during the night 0 1 2 3 4 5
- 4) After waking during the night may child has trouble returning to sleep 0 1 2 3 4 5

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Pediatric Insomnia Severity Index

- 5) My child appears sleepy during the day 0 1 2 3 4 5

Number of hours per night

0=11-13 1=9-11 2=8-9 3=7-8 4=5-7 5=less than 5

- 6) How many hours of sleep does your child get on most nights? 0 1 2 3 4 5

No clinical cutoff, useful to track improvement over time

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Recommendations to improve adolescent athletes' sleep

- Personal sleep monitors (e.g. fitbit)
  - Accessible, relatively inexpensive
  - Accuracy="OK", can identify trends, gets teens talking about their sleep
  - Sleep diaries work too (and they are free)*
  - If your clients/patients have sleep monitor, great, but not necessary

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Recommendations to improve adolescent athletes' sleep

- Make sleep referrals as needed
  - Physical sleep concerns? Patient tired even after adequate amount of sleep OR never feels rested?
    - PCP/PNP, sleep specialist as needed
  - Insomnia, severe sleep habits, sleep environment, and/or sleep scheduling challenges?
    - Behavioral sleep psychologist/specialist, mental health specialist

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Teen sleep tips

- At least 9 hours in bed
- Regular sleep schedule (weekday and weekend)
- Avoid caffeine. OR at least after 2PM.
- Break from electronics 30-60 min before bed

Teen sleep tips

- Create a bedroom environment conducive to sleep
  - Dark, quiet, comfortable temperature, comfortable bed
- Napping:
  - Short naps (<45 minutes) can be effective
    - Insomnia at night? No naps

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Recommendations to improve adolescent athletes' sleep

- Use sports figures as sleep role models
  - Huffington Post professional sports figures' interviews about sleep
    - Kevin Durant, Larry Fitzgerald, Michelle Wii, LeBron James, Roger Federer, Lindsey Vonn

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Recommendations to improve adolescent athletes' sleep: practice and games

- Afternoon training (versus before school/late night)
  - Allows for delayed wake time
  - Fewer circadian rhythm disruptions
- Traveling for games: Allow one day of recovery for each time zone crossed
- Practice and competition schedules that allow for rest and recovery between sessions

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(Copenhaver & Diamond, 2017; Watson, 2017)

Resources

- How important is sleep for my young athlete?
  - http://nyshsi.org/wp-content/uploads/2012/08/NYSHSI-SLEEP.pdf
- Huffington post athletes' sleep
  - https://www.huffingtonpost.com/2014/08/13/these-famous-athletes-rely-on-sleep_n_5659345.html

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Resources

- Sleep diary for kids sleepforkids
  - http://www.sleepforkids.org/pdf/SleepDiary.pdf
- Sleep and Athletes Gatorade sports science https://www.gssiweb.org/sports-science-exchange/article/sse-167-sleep-and-athletes
- Technology impacts sleep quality sleep.org
  - https://www.sleep.org/articles/ways-technology-affects-sleep/

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Resources

- Teen sleep tips written for parents
  - https://www.sleepfoundation.org/sites/default/files/inline-files/teenstips.pdf
  - https://www.nhs.uk/live-well/sleep-and-tiredness/sleep-tips-for-teenagers/
- Sleep tips written for teens Washington.edu
  - https://depts.washington.edu/hcsats/PDF/TF-%20CBT/pages/4%20Coping%20Skills/Sleep/Sleep%20Tips%20for%20Teens.pdf

- BEARS sleep screening algorithm
  - https://www.google.com/search?rlz=1C1GGRV_enUS784US784&ei=uiudXP7zBqi0jwTF8KSwCA&q=BEARS+sleep+screening+algorithm&oq=BEARS+sleep+screening+algorithm&gs_l=psy-ab.3..0.33694.49420..49876...1.0..0.86.1993.32.....0....1..gws-wiz.....0i71j0i67j0i131j0i131i67j0i13j0i13i30j0i22i30j0i22i10i30.JRp2ewR6eJU
- Pediatric Insomnia Severity Index
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