



Sleep Hygiene for Optimizing Recovery

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Synopsis

- Along with diet and exercise, sleep is one of the “3 pillars of health”
- Sleep is arguably one of the most important recovery tools
- Yet most of us ignore it, and don’t get enough of it
- Kids & teenagers often have poor sleep patterns
- With fast-paced lifestyles & modern technology, our sleep hygiene is further declining
- Sleep is even more important in those who exercise intensely e.g. soccer
- This session presents the research on sleep deprivation and sleep extension in athletes, and a how-to for improving sleep hygiene

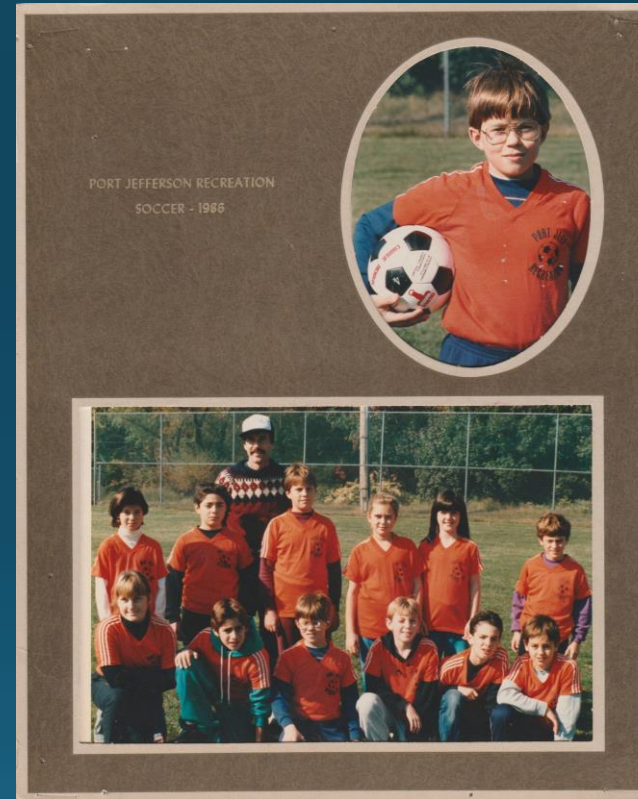
Outline

1. Introduction
2. Negative Effects of Sleep Deprivation
 1. Circadian Rhythm
 2. Mitigating Jet Lag
 3. Exercise Timing
3. Positive Effects of Sleep Extension
4. Sleep Hygiene Strategies
5. Getting Evaluated



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- None



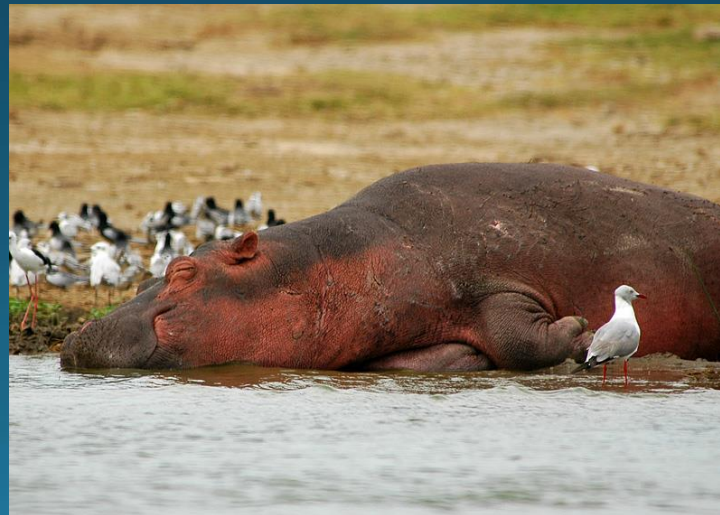


Sleep Hygiene

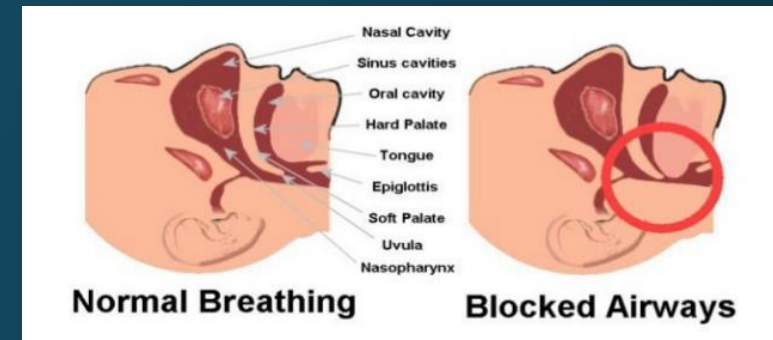
1. Introduction

Introduction

- Sleep is an essential body function that does not get sufficient attention
- Many sleep disorders exist
- Many people remain undiagnosed and untreated
- Even athletes may be unaware of a sleep disorder unless specifically evaluated



Introduction



- **Sleep apnea:**

- Common condition that affects roughly 10% of the US population
- Signs including snoring or daytime sleepiness
- Often considered a disease of obese men
- However many lean individuals including athletes may suffer from this

- **Insomnia:**

- Also common and can be effectively treated if problem is recognized and appropriately addressed

- **Insufficient sleep duration:**

- Even without a defined sleep disorder, many athletes simply do not prioritize sleep
- Lack of enough sleep has negative health effects
- Clear negative effects on performance
- Can impact all aspects of an individual's well-being

Sleep Hygiene for Optimizing Recovery in Olympic/Paralympic Athletes

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The 3 Pillars of Health

- We consider the 3 '*pillars of health*' to be diet, exercise, sleep
- We argue that ignoring one makes the other two suffer
 - People who are sleep deprived tend to perform poorly in peak exercise, and tend to crave unhealthy foods that can promote weight gain
 - Dietary indiscretions can yield poor sleep, and may impair athletic performance as well
- We believe optimizing all 3 pillars is by far the most important to overall health and recovery
 - Much more so than any 'quick fix' supplement or recovery technique commonly tried when feeling fatigued



 National Sleep Foundation

**Sleep: As Important as
Diet and Exercise
(Only Easier!)**

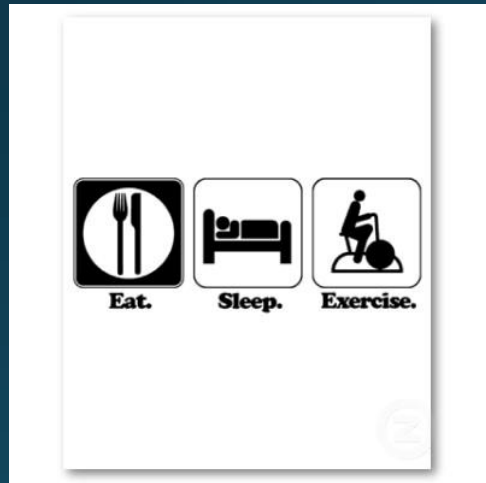


Make sleep your foundation for good health.

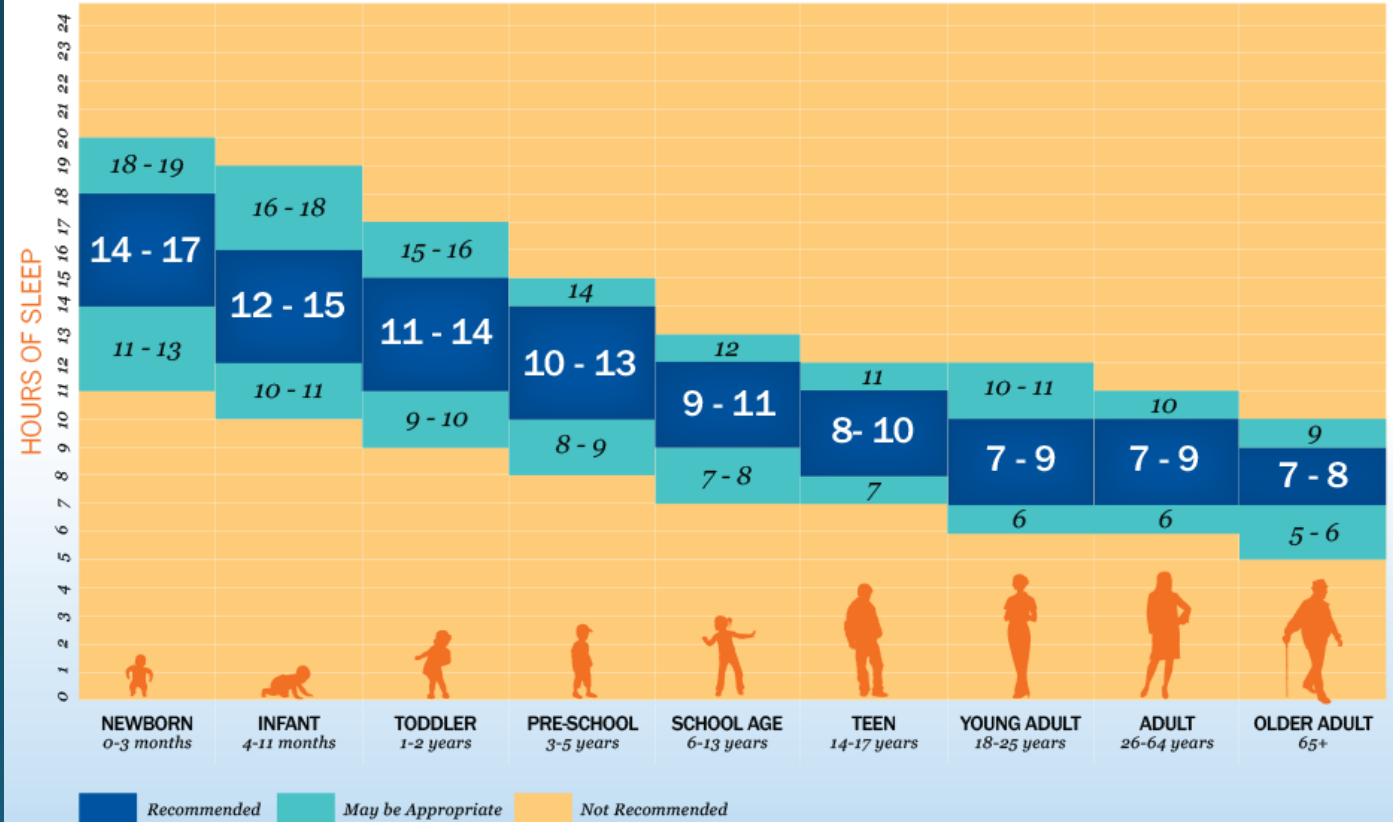
Get healthy sleep tips at www.sleepfoundation.org

How much sleep?

- Most adults require 7-9 hours of sleep per night
- Athletes however may need more due to increased stress of intensive exercise



SLEEP DURATION RECOMMENDATIONS



Age considerations:

6-13 years= 9-11 (10)

14-17 years= 8-10 (9)

18-64 years= 7-9 (8)

• If intensely exercising, may need more



Penn Schoen Berland Study 2015

- Conducted a study among 409 Pac-12 student-athletes from 9 different universities
- Number one thing student-athletes report that their athletic time commitments prevents them from doing, ultimately hindering their athletic and academic performance:
 - #2 Studying abroad (70%)
 - #1 Sleep (71%)
- What they would dedicate an additional daily hour to:
 - 55% report sleep
- Many say what they would use a hypothetical 2-3 week break to do:
 - Sleep and physically rest as their bodies and minds are exhausted from non-stop stress during the competitive season

*Lastella M, Roach GD, Halson SL, et al. Sleep/wake behaviours of elite athletes from individual and team sports. Eur J Sport Sci 2015;15:94-100.
Leeder J, Glaister M, Pizzoferro K, et al. Sleep duration and quality in elite athletes measured using wristwatch actigraphy. J Sports Sci 2012;30:541-5.*



Sleep Deprivation & Sleep Disorders in Athletes

- Studies have shown elite athletes have less total sleep time than non-athletes
- Not limited to any one sport, and present with both individual and team sports in multiple disciplines (*e.g. canoeing, diving, rowing, speed skating, endurance cyclists*)
- Some Olympic athletes sleep approximately 6.5 to 6.8 hours, much less than the traditional 8-hour recommendation
- Furthermore, even when Olympic athletes report at least 8 hours:
 - Have longer **sleep latency** (time it takes to fall asleep)
 - Have lower **sleep efficiency** (lower quality of sleep)
 - Than non-athletes, resulting in a lower total time asleep of 6.5 hours



Why? Numerous reasons

- Athletes have rigorous and strict training schedules
- Travel obligations & time zone changes
- Historically, athletes downplay importance of sleep, considering it 'optional' compared to other aspects of training



Halson S. Stealing sleep: is sport or society to blame? Br J Sports Med published online November 26, 2015

Why? Numerous reasons

- Ever-growing prevalence of smartphones and other devices can further disrupt sleep
- Athletes (and non-athletes alike) report being “glued” to their phone, checking messages, playing games/apps, communicating via social media
- All of this commonly done at night and disrupts good sleep hygiene
- Blue-light emission from the screens further disrupts body’s natural melatonin production
 - Melatonin helps regulate one’s circadian rhythm
 - Can affect next-morning alertness



Why? Numerous reasons

- Many athletes do focus on a good night's sleep, but only the night before competition
- Unfortunately the natural stress & 'revved up' feeling athletes report before important competition can impair healthy sleep
- Focusing on healthy sleep throughout training is thus important
 - Not just the night before competition when sleep may be the most difficult and the 'damage already done'





2. Negative Effects of Sleep Deprivation

1. Circadian Aspects
2. Mitigating Jet Lag
3. A Note on Exercise Timing

Negative Effects of Sleep Deprivation

- Inadequate sleep duration associated with a myriad of negative health effects: neurocognitive, metabolic, immunologic and cardiovascular dysfunction
 - Impaired brain function that can affect judgment and/or decision-making during athletic performance
 - Sleep-deprived individuals crave unhealthy foods
 - Impairments in glucose sensitivity, which may impair glycogen repletion and potentially affect appetite, food intake, and protein synthesis (all important for athletic performance)
 - From a metabolic standpoint, sleep deprivation has been associated with obesity and diabetes
 - Impaired sleep also negatively affects growth hormone and cortisol secretion



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Negative Effects of Sleep Deprivation

- Numerous other studies shown further negative effects:
 - Increased pro-inflammatory cytokines (impairing immune system function)
 - Impaired muscle damage recovery & repair
 - Autonomic nervous system imbalance (simulating overtraining symptoms)
 - Slower/less accurate cognitive performance
 - Altered pain perception



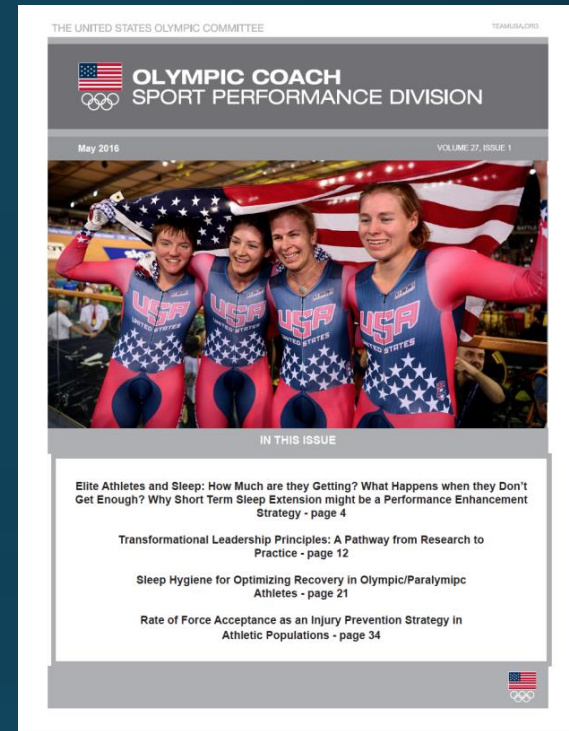
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Negative Effects of Sleep Deprivation

- Sleep deprivation in athletes has extensively been studied
- Numerous examples of how less sleep can negatively affect performance in following Tables
- Multiple sports, both power and endurance, team and individual, male and female
- Some studies used rather extreme examples such as 24 hours without sleep (and up to 64 hours!)
- However many show negative effects with just 2 hours of less sleep per night
- Some basic motor functions (brief bouts of strength and anaerobic power) may be relatively preserved
- However, prolonged/endurance exercise and submaximal performance can decline (soccer)



Negative Effects of Sleep Deprivation

- Possibly more important, reaction time and many cognitive functions such as judgment and decision-making significantly suffered
 - This is a crucial area in elite sports
 - All athletes are on a similar level of fitness
 - High-level cognitive function is often what 'makes or breaks' a competition outcome



Study	Population/Activity	Sleep Deprivation	Effect
Reilly and Deykin 1983 ¹²	Exercise trained men	2.5hr total sleep/night over 3 nights	Multiple psychomotor functions negatively affected. Gross motor function (strength, lung power, endurance running) unaffected
Takeuchi et al 1985 ¹³	40m dash; leg extension exercise	64hr sleep deprivation	No effect on 40m dash, isometric strength, or peak torque; authors conclude brief anaerobic performance may be maintained with sleep deprivation
Reilly and Hales 1988 ¹⁴	Women	2.5hr total sleep/night over 3 nights	Similar findings in women as above study; more notable negative effects on reaction time than gross motor function
Sinnerton & Reilly 1992 ¹⁵	Swimmers	2.5hr less sleep /night over 4 nights	No effect on gross motor function (back & grip strength, lung function) or swimming performance. Depression, tension, confusion, fatigue, anger all increased, vigor decreased
Reilly and Percy 1994 ¹⁶	Weightlifting; bench press, leg press, deadlift, bicep curl	3hr total sleep/night over 3 nights	Significant decrease in submaximal lifts on all tasks, and decrease in max bench press, leg press, deadlift
Bulbulian et al. 1996 ¹⁷	Exercise-trained men; isokinetic knee extension & knee flexion exercise	30hr sleep deprivation (1 night of no sleep)	Isokinetic peak torque significantly impaired
Souissi et al. 2003 ¹⁸	Cycling; max, peak, & mean power	24hr & 36hr sleep deprivation	Anaerobic power (max, peak, mean) unaffected at 24h but decreased at 36h of no sleep
Blumert et al. 2007 ¹⁹	Collegiate weightlifters; snatch, clean, jerk, front squat	24hr sleep deprivation	Mood suffered; increased confusion, fatigue total mood disturbance, less vigor, however no difference in snatch, clean, jerk, front squat, total volume or training intensity
Souissi et al 2008 ²⁰	Male students majoring in physical education; Wingate test	4hr delayed bedtime vs earlier rising time, with 4hr sleep deprivation (either at beginning or end of night)	4hr sleep deprivation at end of night affects peak, mean, & max power more than sleep deprivation at beginning of night; authors conclude early rising more detrimental than late bedtime

Azboy and Kaygisiz 2009 ²¹	Male runners and volleyball players; incremental ergometer exercise test	One night (25-30hr) sleep deprivation	Decreased exercise minute ventilation and faster time to exhaustion; seen more in volleyball than runners
Oliver et al. 2009 ²²	Recreationally active healthy males; 30min treadmill run at 60% VO2max	24hr sleep deprivation	Less total running distance covered (6,037m vs 6,224m); authors suggested reduced performance due to increased rate of perceived exertion
Skein et al. 2011 ²³	Male team-sport athletes; 15m sprint times, double leg bounds, max knee extension	30hr sleep deprivation	Decreases mean and total sprint times, altered sprint pacing strategies, decreased muscle glycogen, decreased peak force, increased perceptual strain
Taheri and Arabameri 2011 ²⁴	Male collegiate athletes; Wingate test & reaction time task	24hr sleep deprivation	Decreased reaction time; no difference in anaerobic power (peak & mean)
Reyner and Horne 2013 ²⁵	Semi-professional tennis players; tennis serve accuracy	5hr total sleep/night, tested with and without caffeine following day	Tennis serve accuracy decreased after sleep deprivation; caffeine had no beneficial effect
Souissi et al 2013 ²⁶	Judo athletes; maximal voluntary contraction, grip strength, and Wingate tests before and after judo competition	4hr sleep deprivation either at the beginning or end of the night	Sleep deprivation at the end of the night decreased muscle strength and power on following day, more so in the afternoon than morning; authors conclude early rising more detrimental than late bedtime
Mejri et al. 2016 ²⁷	Male Taekwondo athletes; Intermittent running recovery test (Yo-Yo)	4hr sleep deprivation at beginning of night vs end of night	Both types of sleep deprivation affects running performance (sleep deprivation at end of night more so than beginning); Lactate levels affected only with deprivation at end of night. Peak HR and rate of perceived exertion unaffected

Sleep Deprivation and Injury Risk

- 2014 study:
 - Athletes who slept <8 hours per night were 1.7 times more likely to have an injury compared to those who slept ≥ 8 hours
- 2016 study:
 - Athletes sleeping >8 h reduced odds of injury 61%



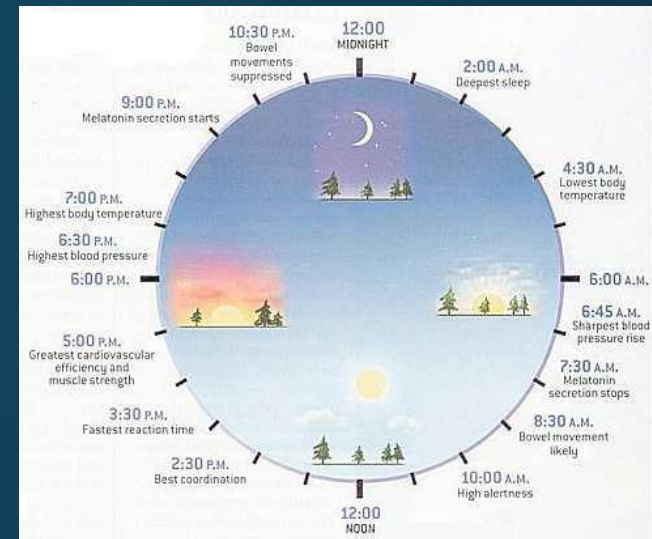
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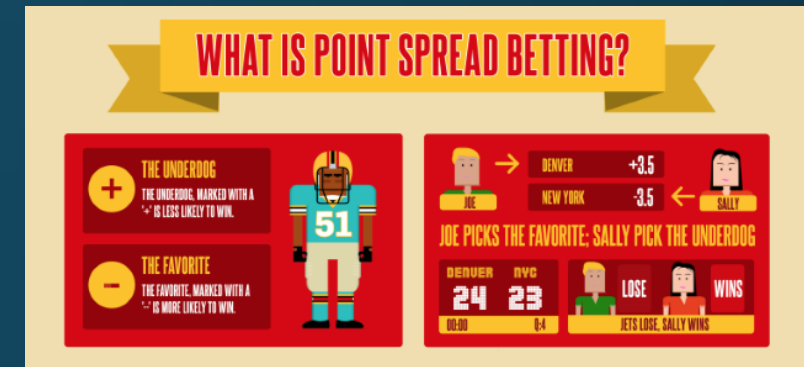
Circadian Aspects

- The body clock, or *circadian rhythm*, is an important factor in optimizing sleep duration
- Many people sleep poorly if they attempt to do so when they are “out of phase” (their circadian phase)
- Commonly occurs in individuals with jet lag or frequently crossing time zones
- Similarly, circadian factors may have a role in peak performance of athletes



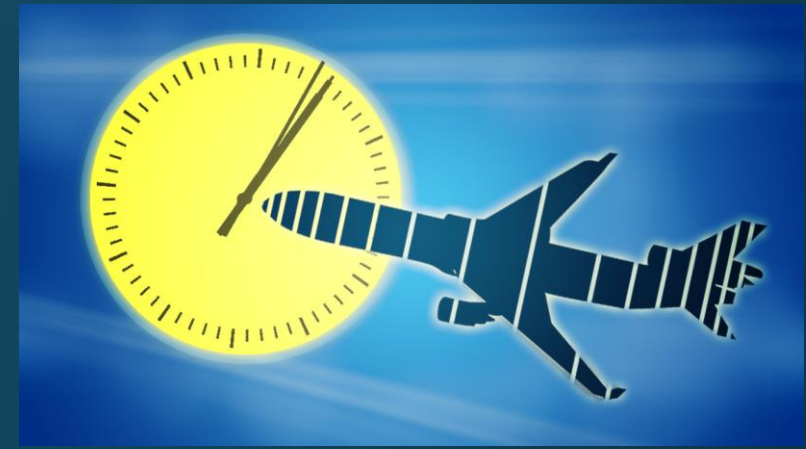
Circadian Aspects

- Outcomes of NFL football games compared:
 - East coast teams playing on west coast
 - West coast teams playing on east coast
- Study accounted for point spread:
 - Many known external factors can influence outcomes of games (e.g. better teams, home field advantage, team injury reports, etc.)
- For afternoon games, no difference in outcome was observed
 - Athletes performed similarly in a 1pm vs. 4pm game regardless of time zone
- For evening games however:
 - East coast teams consistently performed poorly on west coast; did not beat point spread
 - For an east coast athlete playing a west coast night game, the game may end at close to 2am from the standpoint of their body clock
 - This disadvantage was consistent across four *decades* of NFL games
 - Suggests a major impact of circadian factors above and beyond known sources of variance



Mitigating Jet Lag

- The more east-west time zones crossed, the more difficult it may be to adapt
- Rough guide:
 - Jet lag symptoms may last for ~1 day/time zone crossed when travelling eastward
 - ½ day/time zone crossed when travelling westward
- Jet lag with north-south flights is not as well understood
- May not technically change time zones
- But may be a change in ratio of light to darkness as you move away from/to the equator



Mitigating Jet Lag



- The sun is a powerful regulator of circadian rhythm
- Once in a new time zone, a simple option would be to get as much sun exposure during daylight hours
- Avoid being indoors if possible
- This is especially important in the morning to “reset” the body’s clock to the sun’s new rise/set times
- For those seeking an individualized travel plan according to destination, a more complex light exposure schedule can be created (e.g. <http://www.jetlagrooster.com>)

National Sleep Foundation. <https://sleepfoundation.org/>. Accessed March 9, 2016.
<http://www.jetlagrooster.com>. Accessed March 9, 2016.

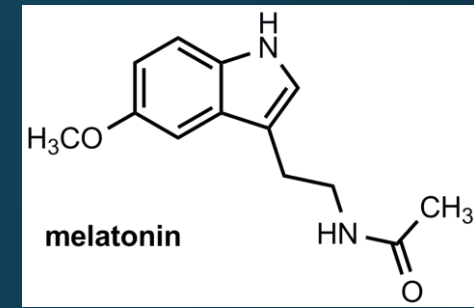


Mitigating Jet Lag

- The 'first night effect' is a well-known phenomenon that can disrupt sleep, as your body adjusts to a new sleep environment
- Bringing objects from the home sleep/wake environment (pillows, blankets, photos, favorite coffee mug) can ease the transition
- Resetting your watch/phone's clock to the destination time while in-flight can help with the adjustment



Melatonin

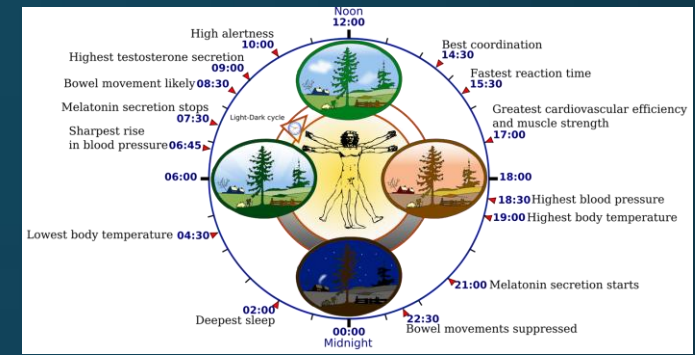


- Many turn to sleep aids such as supplements and medications
 - However side effects can be significant, and they do not actually reset the body clock
- Melatonin is a body hormone that regulates sleep
 - Turned off by bright sun in the morning
 - Increases in production at night resulting in sleepiness
 - Blue light from smartphones and computers also turn off melatonin
 - Melatonin supplements are not FDA-regulated
 - They have variable potency, may have side effects, may contain contaminants resulting in a positive drug test
 - Therefore, getting natural sun outdoors early in the morning and avoiding artificial bright light at night (including phones & computers) may be the best strategy
 - If really want a supplement, consider tart cherry juice



Exercise Timing

- Athletes also try changing exercise timing to “reset” their circadian rhythm if in jet lag
- Many anecdotal reports that athletes tend to perform better in early to late afternoon
 - May coincide with diurnal/circadian changes in the body
 - In afternoon, core temperature reaching its peak, which is known to speed everything from enzymatic reactions, metabolic processes, and nerve conduction in the body
 - Cardiovascular function and VO_2 max also appear to peak in the afternoon
 - Gene signaling factors for muscle hypertrophy also appear to peak at this time
 - Some contend since testosterone production is higher in the morning, that strength exercise may be optimal in the AM
 - However, ratio of testosterone to cortisol (the body’s stress/catabolic hormone) appear to be better in the afternoon
- For endurance athletes, excessive rise in body temperature with prolonged endurance exercise can be detrimental, so sometimes suggested to do endurance activities early in the day
 - Resting heart rate also may be lower here, resulting in a larger net “reserve” HR



Exercise Timing

- Therefore, may be advantage to scheduling practice or competition at a time of day when daily physiological changes seem to be maximized for exercise
- Since the timing of competitions is outside of an athlete's control, suggested for coaches to schedule practices and team meetings appropriately to maximize athletes' sleep potential





Sleep Hygiene

3. Positive Effects of Sleep Extension



Positive Effects of Sleep Extension

- Increasing sleep duration among those sleep deprived has been shown to improve multiple measurements of function
- If we disrupt our natural circadian rhythm, cortisol levels (our stress hormone) rise and athletes go into a catabolic state
 - Athletes may turn to illegal substances such as anabolic steroids and growth hormone to stop this catabolism and improve recovery
 - However if athletes restore natural sleep patterns, these hormone levels may naturally improve
- There are numerous cognitive performance improvements with increased sleep as well
- Therefore, athletes who sleep adequately prior to competition are likely to benefit from the standpoint of peak performance



Positive Effects of Sleep Extension

- Following tables illustrate various examples of how better sleep can improve cognitive and physical performance
- Overall, it shows that restoring adequate sleep can result in:
 - Better reaction times
 - Improved energy (vigor) & mood
 - Faster sprint times
 - Better tennis serve accuracy
 - Higher swim turn & kick stroke efficiency
 - Improved free throw and 3-point accuracy
- Even if an athlete cannot get an adequate night's sleep, studies show that at least a nap the following day may be beneficial

Study	Population/Activity	Sleep Extension	Effect
Gillberg et al. 1996 ³³	Healthy volunteers	Midday ½ hr nap following night of sleep deprivation (4hr total sleep)	Nap after restricted sleep brought performance on psychomotor vigilance tasks back to baseline; alertness improved, sleepiness decreased
Kamdar et al. 2004 ³⁴	Healthy college students	sleep as much as possible/night over 7 nights (~2hr more sleep/night, from ~7 to 9hr)	Reaction time improved; daytime alertness, vigor, mood improved; fatigue decreased
Hayashi et al. 2005 ³⁵	Healthy university students	Midday nap following sleep deprivation (1.5hr less total sleep)	Alertness and performance on psychomotor vigilance tasks improved after nap, more so with stage 2 sleep vs stage 1
Brooks and Lack 2006 ³⁶	Healthy young adults	Afternoon nap following night of sleep deprivation (5hr total sleep)	Nap improved cognitive performance tasks, sleepiness, fatigue, vigor, alertness
Waterhouse et al. 2007 ³⁷	Healthy males	Midday ½ hr nap or sit quietly following night of sleep deprivation (4hr total sleep)	Reaction time accuracy improved, 2m & 20m sprint times improved; alertness & short-term memory improved; sleepiness decreased
Mah 2008 ³⁸	Men's and women's collegiate swimming teams	Increase to minimum 10hr in bed/night over 5-7 weeks (~2hr more sleep/night)	15-meter sprint swim improved, faster reaction times off the blocks, improved turn times, increased kick strokes; daytime sleepiness decreased mood & vigor improved, fatigue decreased
Mah et al. 2011 ³⁹	Men's collegiate varsity basketball team	Increase to minimum 10hr in bed/night over 5-7 weeks (~2hr more sleep/night)	Half-court & full-court sprints improved, shooting accuracy improved (free throw and 3-point field goal percentage 9-9.2%); vigor & mood improved; sleepiness & fatigue decreased
Schwartz and Simon 2015 ⁴⁰	Collegiate varsity tennis players	Increase to at least 9hr sleep/night over 1 week (~2hr more sleep/night)	Tennis serve accuracy improved (35.7% to 41.8%), sleepiness levels (Epworth & Stanford Scales) decreased

Banking sleep? New in 2016



- Studied 6 nights of sleep extension (increase sleep duration above the usual sleep “need”) before a planned one night of total sleep deprivation
 - i.e., can you put sleep in the bank, in preparation for lack of sleep?
- Assessed motor performance and neuromuscular function prior to and after sleep deprivation (Do and D₁)
- Usual sleep 8.2h time in bed
- Extended sleep 9.8h time in bed





Banking sleep? New in 2016

- Time to exhaustion (isometric knee extensions) increased by 3.9% at D0 and 8.1% at D1
- Maximal voluntary activation was no different in groups
- Rate of perceived exertion was lower by 7.2% at D1
- Likely improvement partly due to the reduced perceived exertion
- Therefore, “banking” sleep may improve motor performance, mediated by perceptual and cognitive factors
- Authors suggest the longer the exercise (endurance) activity, the more beneficial sleep extension may be; even more notably in sport where sleep deprivation tends to prevail

Positive Effects of Sleep Extension



- Sleep extension research in athletes is still in early stages, however many studies typically recommend:
 - Initial goal to increase sleep by 2 hours from your baseline
 - Ultimate goal of at least 9 hours of sleep
- May seem excessive to athletes, but given the absolute importance of sleep to performance, the 3 pillars of health cannot be understated
- To athletes, sleep must be emphasized and made top priority



4. Sleep Hygiene Strategies

Sleep Hygiene Strategies



- Athletes often forced to adhere to strict competition and travel schedules, must maintain rigorous training that may interfere with ability to get good sleep
- Although making sleep a priority is an important recommendation, some individuals have difficulty initiating and maintaining sleep
- These athletes may benefit from improved *sleep hygiene*
- Healthy sleep can be trained and improved upon by utilizing regular routines, creating a healthy sleep hygiene, the optimal environment for sleep
- There are well-established and researched healthy sleep hygiene recommendations, and additional (less traditional) options in following tables
- Athletes may not be able to adopt all sleep hygiene recommendations, but should attempt to integrate as many as possible to maximize this vital body function

Well-established and researched healthy sleep hygiene recommendations

Healthy Sleep Hygiene ‘Top Ten’ Recommendations (reference: UCSD Center for Pulmonary and Sleep Medicine)

- 1. Don't go to bed until you are sleepy. If you aren't sleepy, get out of bed and do something else until you become sleepy.*
- 2. Regular bedtime routines/rituals help you relax and prepare your body for bed (reading, warm bath, etc.).*
- 3. Try to get up at the same time every morning (including weekends and holidays).*
- 4. Try to get a full night's sleep every night, and avoid naps during day if possible (if you must nap avoid after 3pm and limit to 1 hour).*
- 5. Use the bed for sleep and intimacy only; not any other activities such as watching TV, smartphone use, etc.*
- 6. Avoid caffeine if possible (if must use caffeine, avoid after lunch).*
- 7. Avoid alcohol if possible (if must use alcohol, avoid right before bed).*
- 8. Do not smoke cigarettes or use nicotine, at all.*
- 9. Consider avoiding high-intensity exercise right before bed (extremely intense exercise may raise cortisol which impairs sleep).*
- 10. Make sure bedroom is quiet, as dark as possible, and a little on the cool side rather than warm (in a way, like a cave).*

Additional (less traditional) options

Other 'Tips & Tricks'

1. *Avoid 'blue light' emitted from screens at least 2 hours before bed (smartphones, laptop, monitors). Blue light suppresses melatonin production which is needed to induce sleep. Avoid text messaging, social media, games, app use; i.e., "Put down that phone."*
2. *Get bright, natural light (the sun) upon awakening (the sun is ideal, but some suggest at least a 10,000 lux lamp if artificial)*
3. *Don't hit the snooze button. It does not improve sleep quality.*
4. *If you have difficulty getting up, some suggest a dawn-simulator alarm clock.*
5. *If you must use your computer at night, consider installing color-adjusting and blue-light reducing software. Some have even utilized blue-light blocking glasses at night.*
6. *Meditation may be helpful. Brainwave entrainment (e.g. binaural beats) is considered experimental.*
7. *Higher carbohydrate (namely high glycemic index foods) at night may improve sleep, as well as high protein including tryptophan. High fat intake at night may disrupt sleep. Inadequate total caloric intake during the day may impair sleep at night.*
8. *Topical magnesium (e.g. Epsom salt bath, mineral oil during massage treatments) may possibly help, if you are deficient in magnesium (the hot bath or massage itself however may be giving more of the actual effect).*
9. *Melatonin naturally occurring in foods (e.g. tart cherry juice, raspberries, goji berries, walnuts, almonds, tomatoes) may improve sleep.*
10. *Don't fall asleep to the TV. Sleep studies show you frequently wake up during the night and have poor quality sleep.*
11. *Herbal supplements are largely unknown with potential serious side effects, and may be on WADA-prohibited list. May even result in positive banned substance test.*
12. *Consider reducing your fluid intake before bed so you don't get up to go to the bathroom (only if you can maintain enough hydration during the day).*
13. *Cooling your body temperature may improve sleep. Some suggest keeping room between 60-70 degrees; however, keep hands and feet warm (consider socks and gloves, e.g. if have Raynaud's phenomenon).*
14. *Check that mattress- chances are it is already too old (mattresses last a maximum of 9 to 10 years), and may have allergens.*
15. *Recovery methods from exercise should not only focus on muscle recovery. Reducing/minimizing brain fatigue is just as important. Reduce external stressors in your life.*

Getting Evaluated



- Athletes who can't fall asleep or stay asleep may have *sleep apnea, insomnia, or insufficient sleep duration*
- It is difficult to self-diagnose however, as often we do not know if we are snoring or having disrupted sleep
- Athletes who are sleepy during the day may not “just be tired,” they may have a sleep condition
- If an athlete believes he or she may have a sleep problem, it can be addressed by medical experts
- For example, Shaquille O’Neal once participated in a video to increase awareness about sleep apnea in athletes (<https://www.youtube.com/watch?v=4JkiWvWn2aU>)

Conclusion

- Sleep serves an absolutely vital physiological function, and is arguably the single most important factor in recovery
- Many in the strength & conditioning and exercise science worlds talk about “quality exercise,” “quality movement patterns,” and “quality training programs”
- However above them all, adequate restorative “quality sleep” should be the foundation of an elite athlete’s training
- Simply put, elite athletes need to get an elite level of sleep
- Building this vital function into an athlete’s routine must be emphasized
- Athletes can train themselves to improve their sleep if they have deficits, which by all measures should translate into improved performance in competition
- Therefore, the old saying, “you snooze, you lose” should actually read, “you snooze (more), you win”

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