From SLEEP CENTER
to SPORTS CENTER:

Sleep as the Next Performance Enhancer for Athletes

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St. Louis University School of Medicine
Objectives:

• Become familiar with differences in sleep in elite athletes versus the general population
• Learn the effects poor sleep and sleep disorders can have on athletic performance
• Learn about circadian physiology and methods to combat jet lag
Looking for the Edge!

"You're disqualifying me for using steroids?... just you wait until I tell my husband!..."
Sleeping giants

Research shows that getting enough sleep is a "magic pill"

By Peter Keating | ESPN The Magazine

Updated: April 5, 2012, 5:24 PM ET
• The U.S. Olympic Committee began taking the issue of adequate sleep seriously in 2005, when it consulted with sleep specialist Mark Rosekind, a former NASA scientist, to help redo rooms at the Olympic Training Center in Colorado Springs and at the 2006 Torino Olympics. Out went twin beds; in came plush-top mattresses, blackout curtains, thermostats set to cool temperatures and reliable alarm clocks. Rosekind and his colleagues pushed for the Olympians to get nine to 10 hours of sleep a night, not the five to seven most young adults manage.
When the Celtics need their Z's, they call the Sleep Doctor

By Kelly Dwyer

NBA fans try to consider the inhibitions a tough day-to-day schedule places on their favorite teams, but usually such sympathy goes out the window the moment the starting power forward fails to box out.

sports.yahoo.com/nba/blog/ball_dont_lie/post/when-the-celtics-need-their-zs-they-call-the-sleep-doctor?urn=nba_wp2056
WHY study athletes and sleep?

May provide an ethical, legal, and safe performance enhancer.
Why study athletes?

• Athletes who have their sleep disorders treated may act as good ambassadors for sleep medicine. (Katie Couric effect?)
• Athletic performance is already tracked in detail with statistics.
Why study athletes?

• Whatever we find helps athletes perform better will likely help others perform better in society.

• Professional athletics/teams may provide funding for research since they do well economically.
What Sleep Disorders Do Athletes suffer from?
INSOMNIA IN TIGER WOODS
THE BARCLAYS

Furyk Oversleeps, DQed From Barclays

Jim Furyk’s chances for Player of the Year took a hit on Wednesday when he missed his pro-am time and was disqualified from the Barclays.

Furyk is No. 3 in the FedEx Cup standings, but will drop after his disqualification from the Barclays.
Percy Harvin treating sleep apnea to help with migraines

Vikings wide receiver wearing device while he sleeps ★ Brad Biggs

SEPTEMBER 11, 2010, 03:56 PM EST

Percy Harvin’s migraine issue is related to sleep apnea, according to the wide receiver.

Harvin told NBC sideline reporter Andrea Kremer that recent tests to determine the nature of his migraine headaches showed that sleep apnea may be at the root of the issue.

The Minnesota Vikings wide receiver missed nearly all of training camp and preseason as he battled migraine issues. The time away showed in the season opener at New Orleans. He and quarterback Brett Favre were clearly not on the same page at various points during the game.

Per Kremer’s report, was passed along in the Minneapolis Star Tribune, Harvin wears a device that pumps air into his nose while he sleeps. He is not on any medication as it’s believed medicine led to his collapse at practice last month.
JULY 28, 2010

College coach says narcolepsy might have caused Kindle's fall

University of Texas coach Mack Brown said Sergio Kindle's recent fall down two flights of stairs might have been the result of narcolepsy, according to Orangebloods.com's Chip Brown.

Kindle, the Ravens' second-round pick who has been hospitalized with a fractured skull, played under Brown at Texas. Brown made his comments at the Big 12 media day Wednesday.

Ravens coach John Harbaugh explained that Kindle fell when he turned the wrong way after waking up in the middle of the night at a friend's house.

Before the Ravens drafted Kindle, there was a report that said he takes medication for narcolepsy (there are reports that he fell asleep during team meetings) and Attention Deficit Disorder.

After they drafted Kindle, the Ravens were asked about the report that Kindle takes medication for narcolepsy and ADD. At that point, Ravens general manager Ozzie Newsome and director of player personnel Eric DeCosta looked at each other before laughing. "If it was a concern, we probably wouldn't have picked him," DeCosta said at the time.

Narcolepsy is a neurological disorder that affects the control of sleep and wakefulness. Some researchers believe there might be a link between narcolepsy and sleepwalking.
What sleep disorders do athletes suffer from?

- Sleep Deprivation
- Obstructive Sleep Apnea
- Circadian Rhythm Disorders/Jet lag
- Parasomnias
- Insomnia
SLEEP DEPRIVATION:

• **UNKNOWN** how common, but likely very common in athletes given their schedules.
• Athletes use many drugs or substances to help with alertness, including stimulants (amphetamines), modafinil, ephedrine, and caffeine.
Poor Quality Sleep:

• 46 high school athletes completed the Pittsburgh Sleep Quality Index (PSQI).
• 85% had scores of 5 or higher
• 27% had scores of 8 or higher
Young adults (21-36yo)

• 78% had scores of 5 or higher
• 26% had scores of 8 or higher

SAMUELS C, NEUROLOGY CLINICAL 
FEB 12, 2008
Elite Athletes

- Wrist Actigraphy of Olympic Athletes showed:
  - more sleep fragmentation (36 vs 30)
  - Worse sleep efficiency (80.6 vs 88.7%)
Use of stimulants

• One study of college hockey players showed that 51.8% reported using ephedrine before a game at least once.
• 18% reported using ephedrine within 30 days of the questionnaire
• This substance is banned (since 1997)
Importance of Sleep for Memory

• Sleep is needed to help with memory consolidation, and sleep disruption may be associated with decreased ability to learn and improve skills necessary for team performance.
Sleep extension and napping?

• Dement and Carskadon showed improved alertness if subjects spent 10 hours in bed over 4 days (*Sleep Res*, 1979)

• 2007-Cheri Mah and Dr. William Dement performed studies on 6 Stanford basketball players.

• They allowed them to sleep as much as they could and compared their sprint times and free throw shooting percentages to their baseline that was measured 2 weeks previous.
Mah and Dement

- Sprint times improved from **16.3** seconds to **15.3** (p<0.05)
- Free throw % went from **79%** to **88%** (p<0.05)
- Epworth scores decreased from **9.2** to **2.8** (p<0.05) and energy and fatigue scales improved.

*Mah C, Mah K, Dement. Sleep, 2011*
Sleep 2008 (Balitimore) Poster Presentation

• Mah and Dement also looked at swimmers in 2008:
• Sleep extension (10 hours of sleep) showed improvements: (all with p<.05)
  – 15m sprint times (6.98 vs 6.47)
  – reaction times (0.88 vs 0.73)
  – kick strokes (26.2 vs. 31.2)
  – ESS 11 to 2.4
Naps

• Naps, including long naps (over an hour), can be used at the risk of sleep inertia persisting.

• Naps are used by some professional baseball (MLB) pitchers between 2-3pm on the day of the game they pitch (wake up at 3:15pm).
Post-lunch napping

• A thirty minute nap showed improvements in alertness, reaction time, short-term memory, and sprint times.
Tennis and Sleep

• Serving accuracy worse in group that was sleep restricted (women worse than men)
• Not improved with caffeine
  – Reyner LA. Horne JA. Sleep restriction and serving accuracy in performance tennis players, and effects of caffeine. Physiol Behav
OBSTRUCTIVE SLEEP APNEA
OBSTRUCTIVE SLEEP APNEA

• Large neck circumference and high BMI would put them at risk. (football players, wrestlers, boxers)

• Physically fit, strong muscles (increased pharyngeal tone?) could decrease risk compared to age matched controls.
Famous Cases:

• In 2004, Reggie White died in his sleep at age 43 and untreated obstructive sleep apnea was mentioned as a contributor.

• Sara White, his wife, said “If Reggie would have known about oral appliances, he might still be alive today.”

BRETT FAVRE SPEAKS OUT ON HOW CPAP CHANGED HIS LIFE p.43

"My CPAP makes me feel like a man."
Brett Favre

Michael Vick makes amends by starting pro-bono dog walking service.
p.52

The CPAP Review
thecpapreview.blogspot.com

SLUCare® The Physicians of Saint Louis University
• Kevin Mitchell, defensive lineman, of the San Francisco 49ers, died in his sleep at age 36 in 2002. No cause of death found, but sleep apnea was mentioned as a possible contributor.

Matthews M, Sleep Review, Sep 2007
Others published in media:

- Dr. Allan Levy, team physician of the New York Giants reports 5 patients with sleep apnea that use CPAP on the team.

*Matthews M, Sleep Review, Sep 2007*
Houston Texans

• Coach and two players all diagnosed with sleep apnea and underwent surgery for treatment.
Education of athletes/coaches/trainers

• Living Heart Foundation
• Dr. Arthur Roberts, former NFL QB, and heart surgeon, founded this organization to screen players (active and retired) for cardiovascular disease and sleep apnea.

www.livingheartfoundation.org
Sleep Apnea in the NFL

• They screened 8 NFL teams and 302 players.
• 52 underwent formal PSG
  – 38 high risk and 14 low risk
• 34%(n=13) of the high risk group (linemen) were found to have OSA, 7%(n=1) of the low risk group.
• They estimated that 14% of all NFL players have AHI>10, but higher in linemen.
Another Article

- Reported lower rates of sleep apnea
- 19% had mild OSA (RDI over 5)
- 4.4% had moderate OSA (RDI over 15)

RICE TB, SLEEP, JUNE 2010
Does having sleep apnea make a difference?:

- Untreated sleep apnea affects performance
  - Psychomotor vigilance task (PVT), alertness, and reaction times are slower.
  - Fine motor skills and dexterity are worse
  - Mood can change
  - Snoring can affect bedpartner (roommate)
BENGALS STAR, ANTWAN ODOM, BATTLES SLEEP ISSUES

Tuesday, August 24, 2010 at 4:29PM

After a slew of injuries and health problems, Antwan Odom is back in the starting lineup for the Bengals and attributes his newfound health to better sleep.
Antwan Odom

• Diagnosed with OSA and put on CPAP after a car accident from EDS.
• 7 sacks in one month as compared to 15.5 in previous five seasons
• “The extra rest I get from being able to sleep all the way through the night cannot be underestimated. It’s been a major thing for me”
CIRCADIAN RHYTHM DISORDERS AND JET LAG
CIRCADIAN RHYTHM D/O-JET LAG

• Insomnia, sleepiness secondary to time zone change from travel
  – Can cause malaise, bowel irregularities, headaches, poor concentration, and irritability.

• Coaches and players frequently speak of this when discussing road trips or away games.
49ers-Broncos: The Jet Lag Factor

by David Fucillo (Fooch) on Oct 25, 2010 2:00 PM PDT in News

I'll admit that it's kind of hard to discuss things that can affect winning a football game when your team does so much to try and NOT win football games. I mention this because the primary talking point of the week has landed in our laps courtesy of Josh McDaniels travel plans. The Denver Broncos apparently won't be leaving for London until Thursday, with their arrival press conference scheduled for Friday at lunch time in London.

The 49ers have a whole lot of issues to deal with, so it's hard to get excited for something potentially benefitting the team in a given game. However, the jet lag factor would seem to be an issue. It seems like the Broncos figure the less time they spend in London, the less chance for distractions getting in the way of their preparation. Getting a chance to prepare in your own city and sleep in your own bed would seem to be a plus in their mind.

On the other side of things the 49ers left for London last night and arrived this morning. This is counted as a home game on their schedule, and it would seem like this travel itinerary would be the closest to giving this a home town sort of feel. The team is staying just outside London, although public transportation does make downtown London readily accessible to the players. Will this lead to distractions? How long until we get a picture of Vernon Davis standing next to the Buckingham Palace guards? Speaking of which, I definitely think we'll need a picture of one of those guards with somebody holding a 49ers jersey in front of him.
• Olympic athletes plan for this.
• Greg Louganis, best known for his head injury while diving, blamed the incident on jet lag. (WebMd)
• Maurice Green blames jet lag for losing 100 meter race by .08 seconds. “I only arrived here two days ago. My body is very tired.”

(Gecker, Associated Press, 7/23/04)
Some basics of circadian rhythms.

- Circadian “peak performance” would be late afternoon, whereas “nadir” would be late night (prior to sleep onset) or possibly early afternoon (1-3pm)
• Peak force leg and back muscles, arm muscles, and performance in broad and vertical jumps all follow a circadian rhythm.
  – Coldwells A *Ergonomics*, 1994
Does jet lag make a difference?
Monday Night Football

• Retrospectively looked at 25 years of MNF games. They start at 9PM EST regardless of location.

• West coast (WC) teams would play during their peak (late afternoon) and East coast (EC) teams would play closer to their nadir (late night).

• Used the Las Vegas sports spread.

Results

- WC teams won 63.5% of the time, EC teams 36.5%.
- WC teams won by an avg of 14.7 pts/game versus EC teams of 9.0 pts/game.
Results

• WC teams won 59.3% of their home games, and 71% of their MNF home games.

• EC teams won 56.5% of home games and only 43.8% MNF home games.

• WC teams were winner vs point spread 67.9% of the time on MNF.
Winning Percentages in the National Football League

<table>
<thead>
<tr>
<th>Category</th>
<th>West Coast Teams</th>
<th>East Coast Teams</th>
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</thead>
<tbody>
<tr>
<td>All-Time Home</td>
<td>59.3</td>
<td>56.5</td>
</tr>
<tr>
<td>All-Time Away</td>
<td>47.5</td>
<td>42.7</td>
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<tr>
<td>MNF W/E</td>
<td>63.5</td>
<td>36.5</td>
</tr>
<tr>
<td>MNF W/E H</td>
<td>71</td>
<td>43.8</td>
</tr>
<tr>
<td>MNF W/E A</td>
<td>56.3</td>
<td>29</td>
</tr>
</tbody>
</table>
Other sports:

• NBA basketball games
  – (Steenland K, Sleep 1997)

• MLB baseball games
Chronobiology Consult

• Why do upsets happen?
• What is being “in the zone”?
• **Morningness** vs. **eveningness** of person?
• Each athlete has their own time of peak performance (wake maintenance zone) and nadirs (sleep gates).
Peak performance

- World records are usually broken by athletes competing in the later afternoon or evening hours in runners and swimmers.
Goals of Chronobiology Consult

- Avoid or reduce potential decrements in performance related to circadian, menstrual, or seasonal adversity.
- Prevent or minimize the effects of less than optimal quantity or quality of sleep.
- Align the endogenous circadian peak in athletic performance with the timing of the competitive event.
Unique rhythm for each athlete

- Questionnaire
- Identify Temperature minimum or dim light melatonin onset. This is usually 4-5 A.M.
- Modify light exposure and use of melatonin.
- Sometimes the change in time actually helps.
Athlete's Morningness-Eveningness Scale (AMES)

Directions: This Scale is designed to help you identify your chronotype, that is, your tendency toward a morning ("lark"), mid-range or evening ("owl") performance pattern. To complete this Scale, first print out the document. Then, read each question and consider all of the responses carefully. Then, complete each of the six items on this Scale as accurately as you can; circle only one response per item.

1. At what time in the evening do you usually start feeling tired and in need of sleep?
   
   (7) A. 8:00 PM - 9:30 PM
   (6) B. 9:31 PM - 10:45 PM
   (5) C. 10:46 PM - 12:30 AM
   (4) D. 12:31 AM - 1:45 AM
   (3) E. 1:46 AM - 3:00 AM

2. Suppose that you were able to choose your own competition hours. For some athletes, it might be useful to think about the 3-hour block when there would be a greater chance of feeling "in the zone," or performing "at peak." Which one of the following 3-hour blocks would be your most preferred time?
   
   (8) A. 6:00 AM - 9:00 a.m.
   (7) B. 9:00 AM - Noon
   (6) C. Noon - 3:00 PM
   (5) D. 3:00 PM - 6:00 PM
   (4) E. 6:00 PM - 9:00 PM.
   (3) F. 9:00 PM - Midnight

3. One sometimes hears about "feeling best in the morning" or "feeling best in the evening" types of people. Which type do you consider yourself?
   
   (8) A. Definitely a "morning" type
   (7) B. More a "morning" than an "evening" type
   (6) C. More an "evening" than a "morning" type
   (3) E. Definitely an "evening" type

4. Suppose that you were able to choose your own training (practice) hours, and organize all other daily routines to protect those hours. Which one of the following 3-hour blocks would be your most preferred time?
   
   (8) A. 6:00 AM - 9:00 AM
   (7) B. 9:00 AM - Noon
   (6) C. Noon - 3:00 PM
   (5) D. 3:00 PM - 6:00 PM
   (4) E. 6:00 PM - 9:00 PM
   (3) F. 9:00 PM - Midnight

Calculate your sleep score by adding the values in parentheses beside your circled answers.

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Chronotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 to 12</td>
<td>Extreme Evening Type</td>
</tr>
<tr>
<td>13 to 17</td>
<td>Moderate Evening Type</td>
</tr>
<tr>
<td>18 to 23</td>
<td>Mid range</td>
</tr>
<tr>
<td>24 to 28</td>
<td>Moderate Morning Type</td>
</tr>
<tr>
<td>29 to 31</td>
<td>Extreme Morning Type</td>
</tr>
</tbody>
</table>

Total Score:
Sleep Preference Can Predict Performance of Major League Baseball Pitchers

ScienceDaily (June 11, 2010) — A Major League Baseball pitcher’s natural sleep preference might affect how he performs in day and night games, according to a research abstract presented June 9, 2010, in San Antonio, Texas, at SLEEP 2010, the 24th annual meeting of the Associated Professional Sleep Societies LLC.

See Also:
- Health & Medicine
  - Sleep Disorder Research
  - Insomnia Research
- Mind & Brain
  - Sleep Disorders
  - Insomnia
- Science & Society
  - Sports
  - Public Health

Results indicate that pitchers who were morning types performed statistically better overall than those who were evening types. In early games that started before 7 p.m., the earned run average (ERA) of pitchers who were morning types (3.06) was lower than the average ERA of pitchers who were evening types (3.49); however, in games that started at 7 p.m. or later, pitchers who were evening types performed slightly better (4.07 ERA) than morning types (4.15 ERA).

“We were surprised to see that chronotype did affect pitching,” said principal investigator and lead author W. Christopher Winter, MD, medical director of the Martha Jefferson Hospital Sleep Medicine Center in Charlottesville, Va. “We were also surprised to see that pitchers who were more ‘morning type’ seemed to do better overall.”

Individual pitchers showed a trend toward higher ERAs in the late games. According to Winter, this supports previous research showing that the peak performance time for most...
PARASOMNIAS
PARASOMNIAS

• Undesirable motor behaviors during sleep or from sleep
• No published reports of incidence, but with known poor sleep hygiene, use of drugs and steroids, athletes likely have a higher incidence
Wainwright Shutdown, Cy Young Unlikely

Wednesday, September 29 2010
GolfTalkCentral

G-Mac: Freak hand injury due to sleepwalking

By Ryan Laverne  Dec 10, 2012 10:45 AM ET

Remember when Graeme McDowell
accidently caught his right hand in a
hotel door and nearly had to withdraw from
the WGC-HSBC Champions?

Well, it didn’t happen exactly like that.

He was sleepwalking.

“I actually don’t know what happened to my hand,” McDowell said Monday on Golf Channel. “I
was sleepwalking. I woke up out of this dream, standing in a hotel-room door, in my boxer
shorts, and three seconds later I had the most searing pain in my right hand. I have no idea
what happened.”

Was he up late, tipping back a few Guinness? Not quite. G-Mac said he went to sleep early
that night, around 9 p.m. local time. “That was my first sleepwalking experience,” he said, “and
believe me, it wasn’t a good one for me.”

At the time, he posted this picture and said that he had sustained no broken bones, just
bruising and swelling. He played the second round using a 10-finger baseball grip but was
able to finish the tournament, eventually tying for 42nd. A month later, he won the World
Golf Championships-Accenture Match Play.
Examples of Parasomnias

• **1990**- Blue Jays OF Glenallen Hill dreamed he was being attacked by spiders. He cut his toes, feet, and elbows bad enough to be put on the 15 day disabled list.

• **2004**- Bryce Florie, MLB pitcher, needed 15 stitches after slicing his chin when he sleep-walked through a sliding glass door.
• **2006**- 17 yo Peter Polansky (pro tennis player) fell three stories after he sleepwalked out of a window of his Mexico City hotel.

• Practices 6 hours/day along with going to high school.

• History of sleepwalking as a child.
Treatment of parasomnias

- Look for underlying sleep apnea
- Stress sleep hygiene
- Avoid certain substances, medications
- clonazepam
INSOMNIA

• Incidence in athletes *unknown*. (Case reports)
• It could be high:
  – anxiety, stress preceding a game or the night after a game
  – Muscle pain or other injury could disrupt sleep
  – Concussions/head injuries can disrupt sleep
Insomnia in Athletes

• 65.8% reported poor sleep before competition
• Worse in athletes of individual vs. team sports
• Most did not feel it affected them the next day
RLS in Runners

• 13% by one report using a IRLSS

Fagundes SB, et al, Sleep Med 2012 June
Treatment of Insomnia for the Athlete:

• CBT has been reported to be helpful in athletes with insomnia
• Many athletes reportedly use hypnotics, though there are concerns regarding decreased psychomotor skills in the morning and/or tolerance

GROBLER, LA, J CLIN SPORT MED, 2000
Future Directions/Questions

• Does sleep affect recovery from TBI, concussions, fractures, surgery?

• Do stimulants or hypnotics help or hurt?

• Does exercise help or hurt sleep? Timing?
Barriers

• Players and coaches don’t believe it
• Players and coaches may not want to know
• Most sports medicine physicians have no sleep medicine background or training
• Players and coaches are very busy
Questions or comments?