Alumni Exchange
SLEEP 101

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Objectives

Describe the societal influences on obtaining optimal sleep
Identify the 5 stages of sleep
Articulate the impact of sleep on health and functioning
Discuss sleep hygiene and other approaches to improving sleep
Societal Sleep Deprivation – Chronic & Pervasive

• Joanne Gonzalez, a suburban Dallas stay-at-home mother and Martha Stewart--like domestic perfectionist

• She starts her days at 5:30 a.m. and ends them ... well, when the stimulants wear off.

• Immediately after waking, she starts the first of several loads of laundry, sees her husband off to work, fixes breakfast for her kids and then herds them into her Volvo station wagon for a long day of lessons, camps

• At night, she makes dinner for the family but not for herself. She says she’s just too harried.

• Not until 10 p.m. or so, when the children are in bed and the house is finally quiet, does the speedy Gonzalez relax--if you define relaxing as mopping the floors, doing yet more laundry and reading e-mail until 2 a.m.

Kirn, Time, 2004
Societal Sleep Deprivation - Chronic and Pervasive

Personally, I enjoy working about 18 hours a day. Besides the short catnaps I take each day, I average about four to five hours of sleep per night.

Time is really the only capital that any human being has and the thing that he can least afford to waste or lose...

Thomas Edison

- As a society, we now get 20% less sleep than our ancestors only 100 years ago.
- College students oversleep their alarms 50% of the time
Life is Too Short - Challenges to Adequate Sleep
Life is Too Short - Challenges to Adequate Sleep

• Coffee is drug of choice for 60% Americans
• There are 167 million coffee drinkers in the U.S.
• They consumed nearly 6.3 billion gal. last year alone.
• The average drinker admits:
  3.4 cups coffee a day
  2.4 billion gal. of tea in 2003
  70% carbonated drinks caffeinated.
  Americans consumed a stunning 15.3 billion gal. in 2003, or 574 cans for every man, woman and child.

Kluger, Time, 2004
What is sleep and why is it important?
What is sleep?

• A reversible behavioral state of perceptual disengagement from and unresponsiveness to the environment.

• A very complex amalgam of physiological and behavioral processes.

• Unlike coma: physiologic, recurrent, and reversible.
Polysomnography

Electroencephalogram (EEG) = Brain Waves

Electrooculogram (EOG) = Eye Movements

Electromyogram (EMG) = Muscle Tension
How do we define sleep?

- Non-Rapid Eye Movement Sleep (NREM)
- Rapid Eye Movement (NREM)
- Differentiated by sleep study parameters
  - Electroencephalogram
  - Electrooculogram
  - Electromyolomyogram
Primer on Sleep Architecture

4-6 times/night at 60-90 minute intervals
## Physiologic Changes During Sleep

<table>
<thead>
<tr>
<th>Physiologic Change</th>
<th>Stages 1 &amp; 2</th>
<th>Stages 3 &amp; 4</th>
<th>REM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate</td>
<td>↓</td>
<td>↓</td>
<td>Fluctuates</td>
</tr>
<tr>
<td>Respiratory Rate</td>
<td>Periodic breathing</td>
<td>Regular</td>
<td>Irregular</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>Slightly ↓</td>
<td>↓</td>
<td>Fluctuates</td>
</tr>
<tr>
<td>Skeletal Muscle Tone</td>
<td>Fluctuates</td>
<td>Stable</td>
<td>Fluctuates/↓</td>
</tr>
<tr>
<td>Alveolar Ventilation</td>
<td>Fluctuates with periodic breathing</td>
<td>Slightly decreased</td>
<td>Fluctuates</td>
</tr>
<tr>
<td>Ventilatory Response to Hypoxia</td>
<td>Slightly &lt; awake</td>
<td>Slightly &lt; awake</td>
<td>↓</td>
</tr>
<tr>
<td>Ventilatory Response to Hypercapnea</td>
<td>Slightly &lt; awake</td>
<td>Slightly &lt; awake</td>
<td>↓↓↓↓</td>
</tr>
</tbody>
</table>
Older vs. Middle-Aged Sleep

![Graph comparing sleep stages of normal adults and older persons.](Image)
Circadian Rhythm

Diurnal rhythm - biphasic

Body temperature sinusoidal
Advanced Sleep Phase
Bedtime Behind - Sleepy Phase Ahead

Sleep Tendency

Sleepy in Evening

Alert in Morning

Early Morning Arousal

Time (days-nights)

Symptoms • Early morning arousal
• Daytime fatigue especially late afternoon & evening

Scheduled Bedtime Hours

Circadian Sleep Tendency

Desired Schedule

Sleep Academic Award
Delayed Sleep Phase
Bedtime Ahead - Sleepiness Behind

Sleep Tendency

Long Objective Sleep Latency
Alert in Evening
Sleepy in Morning

Time (days-nights)

Symptoms
- Can't fall asleep at night
- Can't get up in morning
- Tired all day except evening

Scheduled Bedtime Hours
Circadian Sleep Tendency
Desired Schedule
Shift Work - "Blue collar” jet lag"

Sleep monitoring on 20 nuclear power workers: 25% fell asleep *while* operating the plant - predominately on the night shift.

55% of night shift workers report nodding off or falling asleep at work at least once per week.

>30% report such incidents occur more than three times per week.
How much sleep do you need?
Sleep Loss and Cognitive Processing

Van Dongen, et al., Sleep, 1993
Deficits in Behavioral Alertness Following Chronic Sleep Restriction

Van Dongen et al., Sleep, 2003
What happens when you don’t get sleep?
Sleep Deprivation and Performance

Sleep deprivation causes little or no effect on our basic capacities to perform:

- Vision
- Hearing
- Motor skills
- Learning
- Memory
- Using well-learned tasks or procedures
Sleep Deprivation and Performance

• When sleep-deprived persons are asked to perform almost any short-term task, and they are highly motivated to do so, they can do those tasks.

• HOWEVER, what they CANNOT DO is intensively or extensively sustain their attention on any tasks.

Courtesy Dr. David Dinges
Sleep Deprivation and Performance

• The fundamental effects from sleep loss which permeate performance on virtually all cognitive and sustained attention tasks are not trivial.

• The most powerful determinant of lapsing and decreased performance in a sleepy person is required task duration.
Sleep Deprivation & Performance

• After about 18 hours without sleep, reaction time begins to slow from a quarter of a second to half a second and then longer.

• Microsleep--moments when you zone out for anywhere from two to 20 seconds

Gorman, Time, 2005
Sleep Deprivation & Performance

• Reaction time is roughly the same as someone with blood-alcohol level of 0.08 — high enough to get you arrested for driving under the influence in 49 states

• Two nights without sleep, performance dramatically decreases—beyond double what it was the first night. "You fall massively off the cliff." (Dr. David Dinges)
Sleep Disorders - Socioeconomic Consequences

• More than 100,000 motor vehicle accidents annually are sleep-related.

• Disasters such as Chernobyl, Three Mile Island, Challenger, Bhopal, and Exxon Valdez were officially attributed to errors in judgement induced by sleepiness or fatigue.
Sleep Will Not Be Denied!

Buffalo Crash 2/12/09

forest fire fighters

Hazmat truck crash

Courtesy Dr. David Dinges
Sleep Will Not Be Denied!

Combat troops in Iraq

Aviation crash
Crossair Flight
LX 3579-Zurich

Grounded ferry

Courtesy Dr. David Dinges
Accidents vs. Time of Day
### Health Risks to Short Sleep Duration

<table>
<thead>
<tr>
<th>Variable</th>
<th>≤ 5h</th>
<th>6 h</th>
<th>7 h</th>
<th>8h (Ref.)</th>
<th>≥9h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total CHD</td>
<td>1.82</td>
<td>1.30</td>
<td>1.06</td>
<td>1</td>
<td>1.57</td>
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<tr>
<td>Nonfatal MI</td>
<td>1.89</td>
<td>1.43</td>
<td>1.19</td>
<td>1</td>
<td>1.5</td>
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<tr>
<td>Fatal CHD</td>
<td>1.67</td>
<td>1.05</td>
<td>0.80</td>
<td>1</td>
<td>1.71</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
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<th>7 h</th>
<th>8h (Ref.)</th>
<th>≥9h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total DM</td>
<td>1.57</td>
<td>1.27</td>
<td>0.98</td>
<td>1</td>
<td>1.47</td>
</tr>
<tr>
<td>Symptomatic DM</td>
<td>1.85</td>
<td>1.33</td>
<td>0.97</td>
<td>1</td>
<td>1.54</td>
</tr>
</tbody>
</table>

Ayas et al., *Diabetes Care*, 2007; Ayas et al., *Arch Int. Med*, 2003
How has sleep apnea affected relationships?

• Problems at work
  • Falling asleep
  • Coworkers not trusting their work quality
  • Getting fired

• Marital problems
  • Spouse being upset with them
  • Lack of interest in sexual relations
  • Divorce

• Restriction of social life
  • Too tired to do things with family or friends
  • Falling asleep early

• Embarrassment
  • Falling asleep in public
  • People think they lack interest in others

• Poor mood
  • Irritable
  • Impatient
Differences in QOL Between OSA Patients and Controls

Weaver, et al. Sleep, 1997
Sleep Hygiene Measures

• Regular schedule, especially rise time
• Avoid stimulants, alcohol, caffeine, nicotine
• Set aside a worry time
• Keep sleeping room cool, dark, quiet
• Use bed only for sleep and sex
Sleep Hygiene Measures

• Limit naps to 30 min
• Avoid large meals; or emotional activities prior to retiring to bed
• Upon awakening, get up out of the bed, no matter what the time is
• Avoid looking at the clock - turn the clock around!
Websites for Sleep Information

• Sleep Net. Com - http://www.sleepnet.com/
  • http://www.nhlbi.nih.gov/health/prof/sleep/index.htm
• American Academy of Sleep Medicine - http://www.asda.org/
Websites for Sleep Information

- NAPS - New Abstracts and Papers in Sleep  
  http://www.websciences.org/bibliosleep/NAPS/

- National Sleep Foundation  
  http://www.sleepfoundation.org/  
  http://www.Sleepforkids.org
Thank You!

Asleep? You be the judge

We don’t want to pass judgment but these judges appear to be a little less than enthused during a ceremony yesterday at the University Ave courthouse formally opening Ontario’s courts for 2000.

Toronto Sun
Jan 11, 2000