The Science of Sleep

Tina Locke
Sleep Patterns

Weekdays:
- What time do you go to bed?
- What time do you wake up?

Weekend days:
- What time do you go to bed?
- What time do you wake up?

Do you think you get enough sleep?
Question # 8

Sleep is a time for the body and brain to shut down for rest.

Disagree

Sleep is a dynamic process:
- Some increased brain activity
- Endocrine systems increases secretions of certain hormones

What is sleep video

Question # 6

Most teens need at least nine hours of sleep each night.

Agree

- Teens do need at least 9 hours of sleep per night
- Teens need more sleep than adults
- Most teens do not get enough sleep
Why is sleep important?

• Memory
• Concentration
• Motor response/reaction
• Controlling emotions
• School/work/athletic performance
Sleep Regulation

Sleep variables:

- Duration
- Sleep intensity

Regulated by:

- Circadian system (Biological clock)
- Homeostatic mechanism

(Tobler and Achermann)
Sleep Cycles

1. Biological clock – when
2. NREM/REM – how
3. Sleep Homeostasis - need
Question #1

Everyone has a biological clock.

True

➢ The timing of sleep in humans is regulated by our biological clock
(1) Biological Clock

- Cycle: a little longer than 24 hour period
  "CIRCADIAN CLOCK"
  - circa=about
  - diem=day

- Clock Regulates:
  - Seasonal reproductive cycles
  - Sleep/wake cycles

- External and internal rhythms.

Question # 9

The body quickly adjusts to different sleep schedules?

False

- Circadian clock works on day/night schedule, despite attempts to change it

- Clock can sometimes be reset, but only by an hour or two.
Circadian Rhythms

Two Clock Rhythms

- External (environmental) rhythm
- Internal rhythm
External rhythm
LIGHT

- Clock location: suprachiasmatic nucleus (SCN) of the hypothalamus in the brain

- At SCN signals interact with genes (active/inactive) to serve as “pacemakers”
Internal rhythm

- Rhythm continues in absence of environmental cues
- Cycles just over 24 hours, bedtime 1 hour later each night.
- 24 days back to same bedtime.

Biological Clock Video
(2) NREM/REM
(Ultradian Rhythm)

- Slow wave - Non Rapid Eye Movement (NREM)
- Rapid Eye Movement (REM)
NREM

• Slow wave
  – Low muscle movement
  – Limited eye movement

➤ Brain distributes information into networks & categories. (FRONTLINE)

➤ Connections between nerve cells strengthen - consolidating new skills. (FRONTLINE)
REM

- Burst of rapid eye movement
- Almost paralyzed

- Brain re-enacts previous day
- Solidifies newly made connections through memory banks
Practice makes perfect!!

NovaSleep Video

(3) Sleep Homeostasis  
(Homeostatic “rhythm”)

**Homeostasis**: maintaining internal equilibrium by adjusting internal processes

- Sleep pressure increases when awake
- Sleep pressure decreases during sleep
Sleep Homeostasis

- **Molecule Adenosine:**
  - Keep tracks of sleep loss
  - May induce sleep

  Caffeine binds and blocks receptors

- **Hormone melatonin:**
  - Levels rise during the night
  - Levels decline at dawn

  Controlled by the clock
Circadian patterns typical of someone who rises early in morning, eats lunch around noon, and sleeps at night (10 p.m.).

1) Biological Clock - when
2) NREM/REM - how
3) Homeostasis - need

Why is sleep important?

- Memory
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Question #10

Getting one hour less sleep per night than I need will not have any effect on my daytime performance.

False

- small, regular, decreases can effect daytime performance.
What are good and bad sleep habits?

<table>
<thead>
<tr>
<th>Good Sleep Habits</th>
<th>Bad Sleep Habits</th>
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What are some consequences of bad sleep habits?

Individually

Socially
Question #3

Safe drivers don’t have to worry about being sleepy?

False

➢ Sleepiness = decrease in alertness

➢ Decrease in alertness ≠ safe driving
Question # 7

Driving makes you sleepy.

False

- Driving makes your level of sleepiness apparent
- Safest to drive during alert times
References

Unless otherwise noted within the presentation, information, charts and graphs have been obtained from *NIH Curriculum Supplements for Grades 9-12. Sleep Disorders and Biological Rhythms.*

1. *NIH Curriculum Supplement Series for Grades 9-12. Sleep Disorders and Biological Rhythms.* National Institutes of Health
2. FRONTLINE. Adolescents and Sleep, A Summary of What Researchers Know About Teenagers’ Need for Sleep and Why Sleep Affects Memory and Learning.
   [http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/from/sleep.html#fnB0](http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/from/sleep.html#fnB0)
4. Tobler, Irene and Achermann, Peter, Sleep
5. What is Sleep, Biological Clock and Homeostasis videos:
   [http://www.videojug.com/interview/healthy-sleep-for-children#what-is-our-bodys-internal-clock](http://www.videojug.com/interview/healthy-sleep-for-children#what-is-our-bodys-internal-clock)