Sleep & Dreams
Objectives

1. Concepts of biological and circadian rhythms
2. Functions of sleep
3. Stages of sleep (including EEG wave patterns)
4. Age and the sleep cycle
5. Sleep disturbances and problems/disorders
6. Dreaming and why we dream (theoretical explanations)
Biological Rhythms

Fluctuations in physiological functioning that appear in a pattern or cycle.

Humans:
- year
- 28 days (lunar month)
- 24 hours (Circadian)
- 90 minutes
Circadian Rhythms

• “circa” = approximately; “dies” = day
• Changes in sleep, alertness, body temperature, growth hormone secretion, etc.
• 25-hour drift? (exposure to light "resets"?)
• Implications for things like high-speed long-distance travel (jet lag), shift work (esp. rotating shifts).
Examples of circadian rhythms. Alertness tends to diminish with declining body temperature.

(adapted from Wadsworth/Thomson Learning, 2001)
Core body temperature is a good indicator of a person’s circadian rhythm. Most people reach a low point 2 to 3 hours before their normal waking time. It’s no wonder that both the Chernobyl and Three Mile Island nuclear power plant accidents occurred around 4 a.m. Rapid travel to a different time zone, shift work, depression, and illness can throw sleep and waking patterns out of synchronization with the body’s core rhythm. Mismatches of this kind are very disruptive (Hauri & Linde, 1990).

Core Body Temperature

(adapted from Wadsworth/Thomson Learning, 2001)
Time required to adjust to air travel across six time zones. The average time to resynchronize was shorter for westbound travel than for eastbound flights. (Data from Beljan et al., 1972; cited by Moore-Ede et al., 1982.)

"Jetlag"

(adapted from Wadsworth/Thomson Learning, 2001)
Functions of Sleep

• Hypothesis 1:
  Sleep evolved to conserve organisms’ energy

• Hypothesis 2:
  Immobilization during sleep is adaptive because it reduces danger

• Hypothesis 3:
  Sleep helps animals to restore energy and other bodily resources

(adapted from Wadsworth/Thomson Learning, 2001)
Stages of Sleep

- **Stage 1**: Small, irregular waves produced in light sleep. People may or may not say they were asleep.

- **Stage 2**: Deeper sleep; sleep spindles (bursts of distinctive brain wave activity) appear.

- **Stage 3**: Deeper sleep. Delta waves appear; very large and slow.

- **Stage 4**: Deepest level of normal sleep; almost purely delta waves.

(adapted from Wadsworth/Thomson Learning, 2001)
Stages of Sleep (continues)

• **Rapid Eye Movements (REM)**: Associated with dreaming.
  – Sleep very light here
  – Body very still during REM sleep
  – Lack of muscle paralysis during REM sleep is called “REM Behavioral Disorder”

• **Non-REM (NREM) Sleep**: Occurs during stages 2, 3 and 4; no rapid eye movement occurs
  – Seems to help us recover from daily fatigue

(adapted from Wadsworth/Thomson Learning, 2001)
Awake
Low-voltage, high-frequency beta waves

Drowsy
Alpha waves prominent

Stage 1 sleep
Theta waves prominent

Stage 2 sleep
Sleep spindles and mixed EEG activity

Slow-wave sleep (stage 3 and stage 4 sleep)
Progressively more delta waves (stage 4 shown)

REM sleep
Low-voltage, high-frequency waves
Stages of Sleep

EEG CYCLES

90 MIN.  90 MIN.  90 MIN.  90 MIN.  90 MIN.

REM  REM  REM  REM  REM  REM  REM

beta waves

theta waves

sleep spindles

delta waves

(adapted from Wadsworth/Thomson Learning, 2001)
Variation in sleep needs. Based on data from a variety of sources, Webb (1992b) estimates that average sleep length among young adults is distributed normally, as shown here. Although most young adults sleep an average of 6.5 to 8.5 hours per night, some people need less and some people need more sleep.

Typical Sleep Per Day

(adapted from Wadsworth/Thomson Learning, 2001)
During an average life span, @ 25 years are spent sleeping.
Changes in Sleep Over Lifespan

(adapted from Cengage, 2019)
Partial sleep deprivation, or sleep restriction, occurs when people make do with substantially less sleep than normal over a period of time.

- Effects include:
  - Impaired attention, reaction time, motor coordination, and decision making
  - Negative effects on endocrine and immune system functioning
  - Transportation accidents and mishaps in the workplace

Deprivation of REM and slow-wave sleep causes more REM and slow-wave sleep.

- REM and slow-wave sleep aid in memory consolidation, performance, and creativity.
- Deprivation lowers students’ grades.

(Cengage, 2019)
Sleep Disturbances

• **Insomnia**: Difficulty in getting to sleep or staying asleep
  – Sleeping pills exacerbate insomnia; cause decrease in REM and Stage 4 sleep and may cause dependency

• **Drug-Dependency Insomnia**: Insomnia that follows withdrawal from sleeping pills

• **Somnambulism** – Arising and wandering about while remaining asleep; sleepwalking
  – Symptoms – Tends to occur during the first 3 hours of sleep, during slow-wave sleep; can last from a minute or 2 up to 30 minutes; may awaken during or after their journey

• **Sleeptalking**: Speaking while asleep; occurs in NREM Sleep

(adapted from Wadsworth/Thomson Learning, 2001)
Sleep Disturbances Continued

• **Nightmares**: Bad dreams
  – Occur during REM sleep.
  – May occur once or twice a month; brief and easily (unfortunately) remembered
  – Imagery Rehearsal: Mentally rehearse the changed dream before you go to sleep again; may help to eliminate nightmares

• **Night Terrors**: Total panic and hallucinations may occur
  – Occurs during Stage 4 sleep
  – Most common in childhood; may occur in adults

(adapted from Wadsworth/Thomson Learning, 2001)
Physiological Sleep Problems

• **Narcolepsy**: Sudden irresistible sleep attack
  – Rare; runs in families
  – Lapse immediately into REM sleep

(adapted from Wadsworth/Thomson Learning, 2001)
Other Physiological Sleep Problems

• **Sleep Apnea**: Interrupted breathing during sleep; cause of very loud snoring
  – Hypersomnia: Extreme daytime sleepiness
  – Apnea can be treated by
    • Surgery
    • Weight loss
    • Breathing mask

• **Sudden Infant Death Syndrome (SIDS; Crib Death)**: Sudden, unexplained death of healthy infant. Infants should sleep on back or on side to try to prevent

(adapted from Wadsworth/Thomson Learning, 2001)
More Sleep Disorders

• **REM sleep behavior disorder (RBD)** – A sleep disorder marked by potentially troublesome dream enactments during REM periods
  – Symptoms – Talking, yelling, gesturing, flailing about, or leaping out of bed during REM dreams
Why We Dream: Explanations

A. Wish Fulfillment (Freud; Psychoanalytic)
   1. Self-protection – satisfy unconscious needs

B. Problem Solving (Cartwright; Cognitive)
   1. Housekeeping – deal with life problems
   2. Self-stimulation/mental exercise
   3. Continuity

C. Activation-Synthesis (Hobson & McCarley; Biological)
   1. Brain trying to make sense of random neuron firings; no real function

(adapted from Wadsworth/Thomson Learning, 2001)
<table>
<thead>
<tr>
<th>Rank</th>
<th>Dream content</th>
<th>Total prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chased or pursued, not physically injured</td>
<td>81.5</td>
</tr>
<tr>
<td>2</td>
<td>Sexual experiences</td>
<td>76.5</td>
</tr>
<tr>
<td>3</td>
<td>Falling</td>
<td>73.8</td>
</tr>
<tr>
<td>4</td>
<td>School, teachers, studying</td>
<td>67.1</td>
</tr>
<tr>
<td>5</td>
<td>Arriving too late, e.g., missing a train</td>
<td>59.5</td>
</tr>
<tr>
<td>6</td>
<td>Being on the verge of falling</td>
<td>57.7</td>
</tr>
<tr>
<td>7</td>
<td>Trying again and again to do something</td>
<td>53.5</td>
</tr>
<tr>
<td>8</td>
<td>A person now alive as dead</td>
<td>54.1</td>
</tr>
<tr>
<td>9</td>
<td>Flying or soaring through the air</td>
<td>48.3</td>
</tr>
<tr>
<td>10</td>
<td>Vividly sensing ... a presence in the room</td>
<td>48.3</td>
</tr>
<tr>
<td>11</td>
<td>Failing an examination</td>
<td>45.0</td>
</tr>
<tr>
<td>12</td>
<td>Physically attacked (beaten, stabbed, raped)</td>
<td>42.4</td>
</tr>
<tr>
<td>13</td>
<td>Being frozen with fright</td>
<td>40.7</td>
</tr>
<tr>
<td>14</td>
<td>A person now dead as alive</td>
<td>38.4</td>
</tr>
<tr>
<td>15</td>
<td>Being a child again</td>
<td>36.7</td>
</tr>
<tr>
<td>16</td>
<td>Being killed</td>
<td>34.5</td>
</tr>
<tr>
<td>17</td>
<td>Insects or spiders</td>
<td>33.8</td>
</tr>
<tr>
<td>18</td>
<td>Swimming</td>
<td>34.3</td>
</tr>
<tr>
<td>19</td>
<td>Being nude</td>
<td>32.6</td>
</tr>
<tr>
<td>20</td>
<td>Being inappropriately dressed</td>
<td>32.5</td>
</tr>
<tr>
<td>21</td>
<td>Discovering a new room at home</td>
<td>32.3</td>
</tr>
<tr>
<td>22</td>
<td>Losing control of a vehicle</td>
<td>32.0</td>
</tr>
<tr>
<td>23</td>
<td>Eating delicious foods</td>
<td>30.7</td>
</tr>
<tr>
<td>24</td>
<td>Being half awake and paralyzed in bed</td>
<td>27.2</td>
</tr>
<tr>
<td>25</td>
<td>Finding money</td>
<td>25.7</td>
</tr>
</tbody>
</table>
The Contents of Dreams

• Most dreams are relatively mundane.

• People dream quite a bit about sex, aggression, and misfortune.

• What people dream about is affected by what is going on in their lives.

• The contents of dreams can be affected by external stimuli experienced while one is dreaming.
Culture and Dreams

• In Western cultures, dreams are considered insignificant and meaningless.

• In many non-Western cultures, dreams are viewed as important sources of information about:
  – Oneself
  – The future
  – The spiritual world

• Some basic dream themes appear to be nearly universal:
  – Falling
  – Being pursued
  – Having sex

• Contents of some dreams vary from one culture to another.