

Chapter 4: Consciousness and Its Variations

Consciousness

- Can be characterized as the “Private I”
- Personal awareness of mental activities, internal sensations, and the external environment
- William James (1892) described it as a “stream” or “river”; unified and unbroken

Circadian Rhythm

- Any rhythmic change that continues at close to a 24-hour cycle in the absence of 24-hour cues
 - body temperature
 - cortisol secretion
 - sleep and wakefulness
- In the absence of time cues, the cycle period will become somewhat longer than 24 hours.

Table 4.1

Examples of Human Circadian Rhythms

Function	Typical Circadian Rhythm
Peak mental alertness and memory functions	Two daily peaks: around 9:00 A.M. and 9:00 P.M.
Lowest body temperature	About 97°F around 4:00 A.M.
Highest body temperature	About 99°F around 4:00 P.M.
Peak physical strength	Two daily peaks: around 11:00 A.M. and 7:00 P.M.
Peak hearing, visual, taste, and smell sensitivity	Two daily peaks: around 3:00 A.M. and 6:00 P.M.
Lowest sensitivity to pain	Around 4:00 P.M.
Peak sensitivity to pain	Around 4:00 A.M.
Peak degree of sleepiness	Two daily peaks: around 3:00 A.M. and 3:00 P.M.
Peak melatonin hormone in blood	Between 1:00 A.M. and 3:00 A.M.
Peak allergic sensitivity to pollen and dust	Between 11:00 P.M. and 1:00 A.M.

Sources: Campbell (1997); Czeisler & Dijk (2001); Refinetti (2000); M. Young (2000).

The Body's Clock

Suprachiasmatic nucleus (SCN)—cluster of neurons in the hypothalamus that governs the timing of circadian rhythms

Melatonin—hormone of the pineal gland that produces sleepiness

Electroencephalogram (EEG)

- Electrodes placed on the scalp provide a gross record of the electrical activity of the brain.
- EEG recordings are a rough index of psychological states.



EEG Waves of Wakefulness

- Awake, but drowsy: large, alpha brain waves

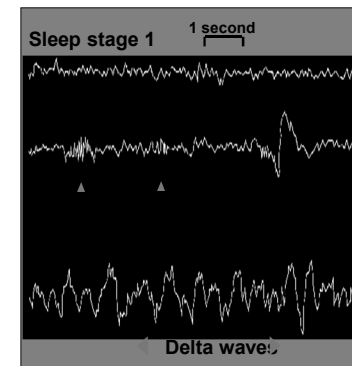


- Awake and alert: beta brain waves



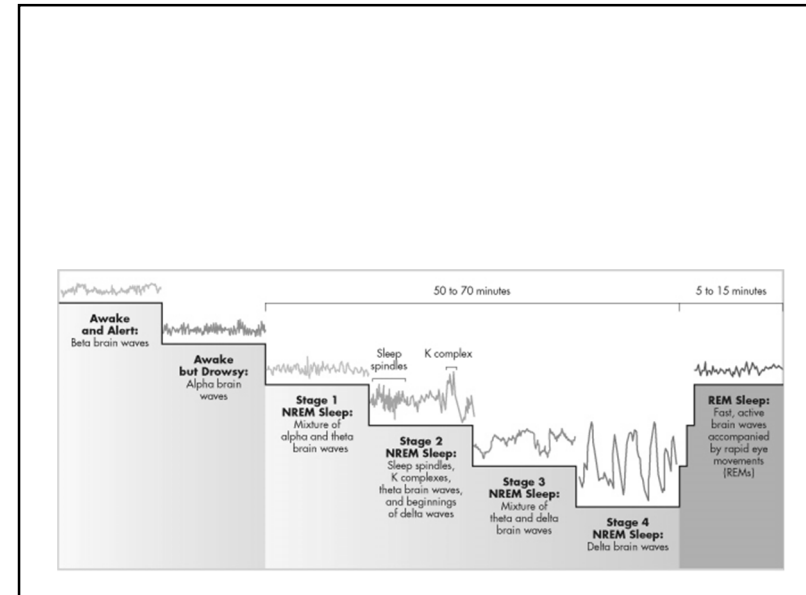
Stages of Sleep

- Sleep stage 1: brief transition stage when first falling asleep
- Stages 2 through 4 (slow-wave sleep): successively deeper stages of sleep
- Characterized by an increasing percentage of slow, irregular, high-amplitude delta waves



Stages of Sleep

- Upon reaching stage 4 and after about 80 to 100 minutes of total sleep time, sleep lightens, returns through stages 3 and 2
- REM sleep emerges, characterized by EEG patterns that resemble beta waves of alert wakefulness
 - muscles most relaxed
 - rapid eye movements occur
 - dreams occur
- Four or five sleep cycles occur in a typical night's sleep; less time is spent in slow-wave, more is spent in REM



Things To Know about Sleep

- Yawning may be related to our ability to feel empathy for others.
- Increased adenosine in body increases need for sleep.
- Sleep paralysis, sometimes occurs upon waking; related to moving out of REM sleep
- Deaf people can “sleep sign” during sleep.
- *Sleeptalking* usually occurs during NREM stages 3
- *Sleepwalking* occurs during NREM stages 3 & 4; not generally dangerous to wake a sleepwalker

Sleep Across the Lifespan

- Sleep cycles emerge during prenatal development.
- Newborns sleep about 16 hours per day.
- By age 2, 75-minute sleep cycles are experienced.
- By age 5, typical 90-minute sleep cycles of alternating REM and NREM sleep emerge.
- Deeper slow-wave sleep decreases with age.
- Time in REM sleep *increases* during childhood and adolescence, remains *stable* throughout adulthood, and *decreases* during late adulthood.

Sleep Across the Lifespan

- *Quality* changes significantly over the lifespan.
- Sleep decreases over the lifespan.
- By middle adulthood, people usually experience *wakefulness after sleep onset* (WASO).
- Those over 55 take longer to fall asleep (*sleep latency*).
- Many spend an hour dozing or resting quietly in bed.

Sleep Deprivation

- Some individuals need more and some less than the typical 8 hours per night.
- After being deprived of sleep for just one night, *microsleeps* develop-episodes of sleep lasting a few seconds during wakefulness.
- Disruptions in mood, mental abilities, reaction time, perceptual skills, and complex motor skills occur with sleep deprivation.
- Most people are *not* good at judging the extent to which their performance is impaired by inadequate sleep.

Effects of Sleep Deprivation

- Moods become more volatile
- Harmful changes in levels of stress hormones
- Immune system compromised
- REM deprivation often results in REM rebound increasing REM by 50%
- Changes become more pronounced the longer the sleep deprivation
- The brain needs to experience the full range of sleep states, compensating when possible.

Emotional Effects of Sleep Deprivation

- Seung-Schik Yoo (2007) found that the sleep-deprived brain is much more prone to strong emotional reactions, especially in response to negative stimuli.
- Amygdala (responsible for emotion) is more strongly activated with those who are sleep deprived.

Sleep and Memory

- Sleep critical for:
 - strengthening new memories
 - integrating new memories with existing memories
- NREM slow-wave sleep contributes to forming new *episodic memories* (memories of personally experienced events).
- REM sleep and NREM stage 2 sleep help consolidate new *procedural memories* (e.g., learning a new skill or task until it can be performed automatically).

Hormones Produced During Sleep

- Neurotransmitter *acetylcholine* produced during REM sleep.
 - When it reaches a certain threshold, signs of REM sleep emerge .
 - When this peaks, REM-off neuronal activity picks up.
- Neurotransmitters *norepinephrine* and *serotonin* then suppress REM sleep.
 - the characteristic features of slow-wave NREM sleep then reemerge
 - reduced brain and physiological activity, movement capabilities, and the vague, ruminating thoughts of sleep thinking

Dreams and REM Sleep

- True dream—vivid, detailed dreams consisting of sensory and motor sensations experienced during REM
- Sleep thought—lacks vivid sensory and motor sensations, is more similar to daytime thinking, and occurs during slow-wave sleep
- Lucid dreaming

What are true dreams for?

- Psychoanalytic interpretation
- Activation synthesis model

Psychoanalytic Interpretation

- Manifest content—elements of the dream that are consciously experienced and remembered
- Latent content—the unconscious wishes that are concealed in the manifest content
- Dreams as “wish fulfillments”

Activation Synthesis Model

- Brain activity during sleep produces dream images (activation) that are combined by the brain into a dream story (synthesis).
- Meaning is to be found by analyzing the way the dreamer makes sense of the progression of chaotic dream images.

Sleep Disorders

- Insomnia—inability to fall asleep or stay asleep
- REM sleep disorder—sleeper acts out his or her dreams
- Night terrors—sudden arousal from sleep and intense fear accompanied by physiological reactions (eg, rapid heart rate, perspiration) that occurs during slow-wave sleep
- Narcolepsy—overpowering urge to fall asleep that may occur while talking or standing up
- Sleep apnea—failure to breathe when asleep

Sleep Disorders

Insomniacs—people who have an abnormal desire for sleep, but are unable to sleep and feel tired during the day.

Sleep Apnea

- Can cause daytime grogginess, poor concentration, memory and learning problems, and irritability
- Can increase health risks, such as high blood pressure, heart attack, and stroke
- Obstructive sleep apnea tends to run in families.
- Becomes more common as people age (1 in 10 senior adults)
- More common in men than women
- Can be treated with lifestyle changes, such as avoiding alcohol or losing weight
- In more serious cases, treated with *continuous positive airway pressure* (CPAP)

Parasomnias

Undesirable physical arousal, behaviors, or events during sleep or sleep transitions)

- Nightmare—different than sleep terror
- Sleepsex—involves abnormal sexual behaviors and experiences during sleep
- Sleepwalking—an episode involving walking or performing other actions during sleep
- Sleep-related eating disorder (SRED)—the sleeper will sleepwalk and eat compulsively
- REM sleep behavior disorder—a failure of the brain mechanisms that normal suppress voluntary actions during REM sleep

Night Terrors

- Occur in the first few hours of sleep during stage 3 or 4 NREM sleep
- First sign is sharply increased physiological arousal—restlessness, sweating, and racing heart.
- The person appears to be awake, thrashing in bed, terrified, and disoriented.
- A *nightmare* involves a progressive unpleasant dream story, but a *sleep terror* is usually accompanied by a single but terrifying sensation, such as being crushed or falling.
- Impossible to calm down the person
- Dramatic but brief, lasting for a minute or less. As the episode passes, the person drops back to quiet sleep and wakes in the morning with no recollection of the incident.
- More common in children than adults

Hypnosis

- State of awareness
- Highly focused attention
- Increased responsiveness to suggestion
- Vivid imagery
- Willingness to accept distortions of logic
- Alteration of sensation and perception

Table 4.3

Help Through Hypnosis

Research has demonstrated that hypnosis can effectively:

- Reduce pain and discomfort associated with cancer, rheumatoid arthritis, burn wounds, and other chronic conditions
- Reduce pain and discomfort associated with childbirth
- Reduce the use of narcotics to relieve postoperative pain
- Improve the concentration, motivation, and performance of athletes
- Lessen the severity and frequency of asthma attacks
- Eliminate recurring nightmares
- Enhance the effectiveness of psychotherapy in the treatment of obesity, hypertension, and anxiety
- Remove warts
- Eliminate or reduce stuttering
- Suppress the gag reflex during dental procedures

Meditation

- Sustained concentration that focuses attention and heightens awareness
- Lowered physiological arousal
 - decreased heart rate
 - decreased blood pressure
- Predominance of alpha brain waves

Psychoactive Drugs

- **Depressants**—inhibit brain activity
- **Opiates**—pain relief and euphoria
- **Stimulants**—increase brain activity
- **Psychedelics**—distort sensory perceptions

Common Properties

- Physical dependence
- Tolerance
- Withdrawal symptoms
- Drug rebound effect
- Approximately 23 million Americans age 12 and older abuse or are dependent on psychoactive drugs (National Survey on Drug Abuse and Health).

Drug Abuse

Recurrent drug use that results in disruption of academic, social, or occupational functioning, or in legal or psychological problems.

Depressants

- **Alcohol**—CNS depressant
- **Barbiturates**—induce sleep
- **Inhalants**—can cause relaxation or hallucinations
- **Tranquilizers**—relieve anxiety

Effects of Alcohol

- About 17 million Americans have problems with alcohols.
- They drink heavily on a regular basis and suffer social, occupational, and health problems as a result of their drinking (Substance Abuse and Mental Health Services Administration, 2008).
- Alcohol *lessens inhibitions* by depressing the brain centers responsible for judgment and self-control.
- Reduced inhibitions and self-control contribute to aggressive and violent behavior.

Table 4.4

Behavioral Effects of Blood Alcohol Levels

Blood Alcohol Level	Behavioral Effects
0.05%	Lowered alertness; release of inhibitions; impaired judgment
0.10%	Slowed reaction times; impaired motor function; less caution
0.15%	Large, consistent increases in reaction time
0.20%	Marked depression in sensory and motor capability; obvious intoxication
0.25%	Severe motor disturbance; staggering; sensory perceptions greatly impaired
0.30%	Stuporous but conscious; no comprehension of the world around them
0.35%	Surgical anesthesia; minimal level causing death
0.40%	About half of those at this level die



This Is Fun? According to a national survey of college students, more than half "drank to get drunk" in the previous year (Wechsler & others, 2002). Despite the deaths from alcohol poisoning of several college students each year, binge drinking and public drunkenness remain common at spring break celebrations. College students currently spend \$5.5 billion a year on alcohol, more than they spend on textbooks, soft drinks, tea, milk, juice, and coffee combined (Nelson & others, 2005).

Opiates

- Chemically similar to morphine and have strong pain-relieving properties
- Mimic the brain's endorphins
- Heroin, methadone
- Percodan, Demerol

Stimulants

- Caffeine
- Nicotine
- Amphetamines
- Cocaine

Facts about Caffeine

- The most widely used psychoactive drug in the world
- Found in coffee, tea, cola drinks, chocolate, and certain over-the-counter medications
- Stimulates the release of dopamine in the brain's prefrontal cortex.
- Is physically addictive, withdrawal symptoms can be seen: headaches, irritability, drowsiness, and fatigue can last a week or longer
- Excess caffeine use can produce anxiety, restlessness, increased heart rate, and disrupt normal sleep patterns

Nicotine

- Upon inhalation, nicotine reaches the brain in seconds
- Over the next hour or two, nicotine's desired effects diminish.
- Steady brain levels of nicotine are maintained over time for addicts
- For the pack-a-day smoker, that averages out to some 70,000 "hits" of nicotine every year

Amphetamines

- Methamphetamine is highly addictive and can cause extensive brain damage and tissue loss.
- Destroys the neurotransmitter Dopamine in the brain
- Behavioral effects of losing dopamine receptors and transporters involve memory and motor skill and social skill problems.
- Depression, emotional instability, and impulsive and violent behavior are also common.

Cocaine

- An illegal stimulant derived from the leaves of the coca plant, which is found in South America.
- Produces intense euphoria, mental alertness, and self-confidence.
- Cocaine blocks the reuptake of three different neurotransmitters – dopamine, serotonin, and norepinephrine.
- Cocaine reaches the brain in seconds and its effects peak in about 5 minutes.
- Schizophrenia-like symptoms develop from prolonged use (auditory hallucinations of voices and bizarrely paranoid ideas).

Psychedelics

- Create perceptual distortions
- Flashback reactions and psychotic episodes
- Examples: Mescaline, LSD, Marijuana

“Club” Drugs

- Ecstasy (MDMA)**—feelings of euphoria, increased well-being
- Side effects*—dehydration, hyperthermia, tremor, rapid heartbeat
- Dissociative anesthetics** (include PCP and Ketamine)—deaden pain, produce stupor or coma, may induce hallucinations