

# Consciousness and the Two-Track Mind

## Chapter Preview

Consciousness is our awareness of ourselves and our environment. Cognitive neuroscientists study the links between brain activity and mental processes. Research indicates that we have a two-track mind. Conscious information processing enables us to exercise control and to communicate our mental states to others. Beneath the surface, unconscious processing occurs simultaneously on many parallel tracks. Our awareness focuses on a limited aspect of all that we experience.

Our daily schedule of waking and sleeping is governed by a biological clock known as circadian rhythm. Our sleep also follows a repeating cycle. Awakenings during REM sleep yields predictable “dreamlike” reports that are mostly of ordinary events. Freud’s view that dreams can be traced back to erotic wishes is giving way to newer theories, for example, that dreams help us process information and fix it in memory or that dreams erupt from neural activity.

Studies of hypnosis indicate that, although hypnotic procedures may facilitate recall, the hypnotist’s beliefs frequently work their way into subjects’ recollections. Hypnosis can be at least temporarily therapeutic and has the potential of bringing significant pain relief. Hypnosis may be an extension both of normal principles of social influence and of everyday splits in consciousness.

Psychoactive drugs also alter consciousness. Depressants act by depressing neural functioning. Although their effects are pleasurable, they impair memory and self-awareness and may have other physical consequences. Stimulants act at the synapses by influencing the brain’s neurotransmitters. Hallucinogens can distort judgment of time and can alter sensations and perceptions. A number of those who survive a brush with death later recall visionary experiences. Drug effects depend on dosage and the user’s personality and expectations.

## Chapter Guide

### Introduction

*Introductory Exercise: Fact or Falsehood?*

The correct answers to Handout 3–1 are as follows: 1. T 2. T 3. T 4. T 5. F 6. F 7. F 8. F 9. F 10. F

- ▶ Project: A Penny for Your Thoughts (p. 123)

3-1. *Describe the place of consciousness in psychology's history.*

Psychology began as the study of **consciousness**, our awareness of ourselves and our environment. But the difficulty of scientifically studying consciousness led many psychologists to turn to direct observations of behavior. By the middle of the twentieth century psychology was defined as the science of behavior. By 1960, mental concepts began to reenter psychology, and today, investigating states of mind is again one of psychology's pursuits. Advances in neuroscience made it possible to relate brain activity to sleeping, dreaming, and other mental states.

**Cognitive neuroscience** is the interdisciplinary study of how brain activity is linked with our mental processes. It is helping us to understand how specific brain states relate to conscious experiences. Most cognitive neuroscientists are exploring and mapping the *conscious* functions of the cortex. Based on our cortical activation patterns, they are beginning to "read our minds." For example, they can tell which of 10 similar objects we are viewing.

### The Brain and Consciousness

- ▶ Lectures: The Mind-Body Problem (p. 123); Automatic Processing (p. 124); Blindsight (p. 125); Psychological Distance and Evaluative Judgments (p. 126); The Deliberation-Without-Attention Effect (p. 127)
- ▶ Exercise: The Dualism Scale (p. 124); Mindful Attention Awareness Scale (p. 127)
- ▶ Worth Video Anthology: *Hidden Prejudice: The Implicit Association Test; Consciousness and Artificial Intelligence*

3-2. *Explain what is meant by "dual processing," as revealed by today's cognitive neuroscience.*

Cognitive neuroscientists and others studying the brain activity underlying consciousness have discovered a two-track human mind, each with its own neural processing. Perception, memory, thinking, language, and attitudes all operate on two levels—a conscious, deliberate "high road" and an unconscious, automatic "low road." Researchers call this **dual processing**. Conscious information processing enables us to exert voluntary control and to communicate our mental states to others. Beneath the surface, faster unconscious processing occurs simultaneously on many parallel tracks. Clearly, much of our everyday thinking, feeling, and acting occurs outside our conscious awareness. The phenomenon of **blindsight** clearly illustrates this dual processing.

- ▶ Lectures: Inattentional Blindness (p. 129); Change Blindness (p. 130); Mindsight—A Sixth Sense (p. 132)
- ▶ Lecture/Lecture Break: Inattention and Change Blindness (p. 131)
- ▶ Exercises: Field Dependence–Independence (p. 128); Human Earphones (p. 128)
- ▶ Worth Video Anthology: *Attention; Visual Attention: There's a Gorilla on the Court; Visual Attention: Piecing Things Together; Neisser's Selective Attention Test; "Blindsight": Seeing Without Awareness; Automatic Skills: Disrupting a Pilot's Performance*

3-3. *Discuss how much information we can consciously attend to at once.*

**Selective attention** means that at any moment, awareness focuses on only a limited aspect of all that we experience. The *cocktail party effect* refers to our ability to attend to only one voice among many. When talking on the phone while driving, our selective attention shifts back and forth from the road to the phone. The process of shifting attentional gears can entail a fatal delay in coping. One analysis of phone records for the moments before a car crash found cell-phone users were four times more at risk. Selective attention limits our perception, as many stimuli will pass by unnoticed. This lack of awareness is evident in studies of **inattention blindness**. One form of this is **change blindness**. Some stimuli, however, are so powerful, so strikingly distinct, that we experience *pop-out*.

## Sleep and Dreams

- ▶ Lectures: Afternoon Naps (p. 134); The Neural Basis of Biological Rhythms (p. 136)
- ▶ Exercises: The Sleep and Dream Information Questionnaire-Revised (p. 132); The Sleep IQ Test (p. 134)
- ▶ Exercise/Critical Thinking Break: Jet Lag and Circadian Rhythms (p. 131)
- ▶ Worth Video Anthology: *Circadian Rhythms*

### 3-4. Describe how our biological rhythms influence our daily functioning.

Our daily schedule of waking and sleeping is governed by a biological clock known as **circadian rhythm**. Our body temperature rises as morning approaches, peaks during the day, dips for a time in early afternoon, and begins to drop again in the evening. Thinking is sharpest and memory most accurate when people are at their peak in circadian arousal.

- ▶ Exercise: Larks or Owls? (p. 137)
- ▶ Projects: Keeping a Sleep Diary (p. 137); Catching the Hypnagogic State (p. 137)
- ▶ PsychSim 5: EEG and Sleep Stages (p. 137)
- ▶ Worth Video Anthology: Sleep: Why We Sleep

### 3-5. Describe the biological rhythm of our sleeping and dreaming stages.

We pass through a cycle of four sleep stages that total about 90 minutes. As we lie awake and relaxed, before we **sleep**, our EEG shows relatively slow **alpha waves**. Stage 1 sleep (NREM-1) is characterized by fantastic images resembling **hallucinations** (*hypnagogic sensations*). Stage 2 sleep (NREM-2, the stage in which we spend about half the night) follows for the next 20 minutes, with its characteristic *sleep spindles*. During Stage 3 slow-wave sleep (NREM-3), the brain emits large, slow **delta waves**. This slow-wave sleep stage lasts for about 30 minutes, during which we are hard to awaken. Reversing course, we retrace our path through these stages with one difference. About an hour after falling asleep, we begin approximately 10 minutes of **REM** (rapid eye movement) **sleep** in which most dreaming occurs. In this fourth stage (also known as *paradoxical sleep*), we are internally aroused but outwardly paralyzed. The sleep cycle repeats itself about every 90 minutes for younger adults (somewhat more frequently for older adults), with periods of deep NREM-3 sleep progressively shortening and periods of REM and NREM-2 sleep lengthening.

### 3-6. Explain how biology and environment interact in our sleep patterns.

People differ in their individual sleep requirements. For example, newborns sleep twice as much as adults. These age-related changes are rivaled by differences in the normal amount of sleep among individuals of any age. Twin studies suggest that these differences may be partially genetic. Sleep patterns are also culturally influenced. North Americans get less sleep because of shift modern light bulbs, shift work, and social diversions, for example. As with waking behavior, biology and environment interact.

Our sleep pattern is in part a response to light activating the light-sensitive retina, signaling the **suprachiasmatic nucleus** in the hypothalamus to cause the brain's pineal gland to decrease its productivity of sleep-inducing **melatonin** in the morning and to increase it in the evening. The sleep-waking cycle lasts about 24 hours, but it can be disrupted by bright light, time changes, and alterations in our sleep schedule (such as staying up late and sleeping in on weekends).

- ▶ Lecture: Sleep and Memory (p. 138)

### 3-7. Describe sleep's functions.

The first explanation of why we sleep is that sleep may have played a protective role in human evolution by keeping people safe during potentially dangerous times. A second idea is that sleep may help us recuperate, restoring and repairing brain tissue. A third explanation is that sleep restores and rebuilds our fading memories of the day's experiences. People trained to perform tasks recall them better even after a short nap. A fourth possible reason why we sleep is that sleep

feeds creative thinking. After working on a task, then sleeping on it, people solve problems more insightfully than do those who stay awake. Finally, sleep may play a role in the growth process. During deep sleep, the pituitary gland releases a growth hormone.

- ▶ Lecture: How Long Can Humans Stay Awake? (p. 139)
- ▶ Exercise: Am I Sleep Deprived? (p. 139)
- ▶ Exercise/Project: Epworth Sleepiness Scale (p. 140)
- ▶ Worth Video Anthology: *Sleep and Sleepiness; The Effects of Sleep Deprivation: Three Brave Souls*

3-8. *Describe the effects of sleep loss, and identify the major sleep disorders.*

People today suffer from sleep patterns that thwart their having an energized feeling of well-being. Findings suggest that sleep deprivation predicts depression and puts people at risk for a depressed immune system, impaired concentration, irritability, and slowed performance with greater vulnerability to accidents. Chronic sleep deprivation can also create conditions that may contribute to obesity, high blood pressure, and memory impairment.

- ▶ Lectures: Sleep Disorders (p. 140); Treating Insomnia (p. 142)
- ▶ Exercise: Diagnosing Insomnia (p. 142)
- ▶ Worth Video Anthology: *Sleep Terror Disorder; Narcoleptic Dogs*

One in 10 adults, and 1 in 4 older adults, complain of **insomnia**—problems in falling or staying asleep. Rarer but more severe than insomnia are the sleep disorders **narcolepsy** and **sleep apnea**. People with narcolepsy suffer periodic, overwhelming sleepiness, sometimes at the most inopportune times. The person sometimes collapses directly into a brief period of REM sleep. Those who suffer sleep apnea (mostly overweight men) intermittently stop breathing during sleep. After an airless minute or so, decreased blood oxygen arouses the sleeper to snort in air for a few seconds. Still other sleepers, mostly children, experience **night terrors**. They sit up or walk around, talk incoherently, experience a doubling of heart and breathing rates, and appear terrified. Children also are most prone to *sleepwalking* and *sleepwalking*.

- ▶ Projects: Remembering Daydreams (p. 142); Remembering Night Dreams (p. 143); Dreaming and Problem Solving (p. 144)

3-9. *Describe the most common content of dreams.*

Our **dreams** are mostly of ordinary events; they often relate to everyday experiences and more frequently involve anxiety or misfortune than triumphant achievement. The story line of our dreams sometimes incorporates traces of previous days' nonsexual experiences and preoccupations. Only 1 in 10 dreams among young men and 1 in 30 among young women have sexual overtones. The sensory stimuli of our environment may also intrude on our dreams.

3-10. *Describe the functions of dreams.*

Freud believed that a dream's **manifest content** is a censored version of its **latent content**, which gratifies our unconscious wishes. The *information-processing* perspective suggests that dreams help us process information and fix it in memory. Some physiological theories propose that REM-induced regular brain stimulation helps develop and preserve neural pathways in the brain. Another explanation is that REM sleep triggers impulses in brain areas that process visual images, but not the visual cortex area, evoking visual images that our brain weaves into a story line. Add the limbic system's emotional tone to the brain's visual bursts and we have a dream. The cognitive development perspective maintains that dreams represent the dreamer's level of brain maturation and cognitive development and emphasizes top-down control of our dream content. Despite their differences, most theorists agree that REM sleep and its associated dreams serve an important function, as shown by the **REM rebound** that occurs following REM deprivation.

## Hypnosis

- ▶ Lecture: Treating Pain Through Hypnosis (p. 147)
- ▶ Exercises: Attitudes Toward Hypnosis Scale (p. 145); Hypnosis as Heightened Suggestibility (p. 145); The Creative Imagination Scale (p. 146); Hypnosis—A Stage Demonstration (p. 147)
- ▶ Worth Video Anthology: *Hypnosis: Medical and Psychological Applications*

3-11. *Define hypnosis, and describe how a hypnotist can influence a hypnotized subject.*

**Hypnosis** is a social interaction in which one person (the hypnotist) suggests to another (the subject) that certain perceptions, feelings, thoughts, or behaviors will spontaneously occur.

People who are highly hypnotizable frequently become deeply absorbed in imaginative activities. They have the ability to focus attention totally on a task. Hypnosis does not enhance recall of forgotten events and may even foster false memories. Research indicates that hypnotized people cannot be made to act against their will any more than nonhypnotized people can and that hypnosis can be at least temporarily therapeutic. **Posthypnotic suggestions** have helped people to reduce headaches, asthma, stress-related skin disorders, and obesity. However, drug, alcohol, and smoking addictions have not responded well to hypnosis. Hypnotizable people can enjoy significant pain relief.

- ▶ Lecture: Is Hypnosis an Altered State of Consciousness? (p. 148)
- ▶ Worth Video Anthology: *Hypnosis: An Altered Mental State?*

3-12. *Discuss whether hypnosis is an extension of normal consciousness or an altered state.*

Some psychologists believe that hypnosis is a by-product of normal social and cognitive processes and thus not a unique state of consciousness. These advocates of *social influence theory* note that behaviors produced through hypnotic procedures can also be produced without them. “Hypnotized” people may be acting the role of “good hypnotic subjects” and allowing the hypnotist to direct their fantasies. Evidence for this view comes from experiments in which the researcher tells hypnotized subjects that hypnosis reveals their gullibility, and they stop responding as directed.

Others argue that hypnosis involves not only social influence but also a special dual-processing state of **dissociation**. This belief gains support from the fact that hypnotized subjects sometimes carry out suggested behaviors on cue, even when they believe no one is watching them. Furthermore, hypnosis is accompanied by distinctive brain activity. The divided-consciousness theory of hypnosis views hypnosis as a vivid form of everyday mind splits. Hilgard suggests that dissociation accounts for a hypnotized subject’s awareness of experiences that go unreported during hypnosis. Another form of dual processing—*selective attention*—may also play a role in hypnotic pain relief. Although the divided-consciousness theory is controversial, it is clear that much of our behavior occurs on autopilot; we have two-track minds.

## Drugs and Consciousness

- ▶ Lectures: Incentive-Sensitization Theory (p. 149); Overcoming Addictions (p. 150)
- ▶ Exercises: The Internet Addiction Test (p. 150)
- ▶ Exercise/Project: Signs of Drug Abuse (p. 149)
- ▶ Exercise/Critical Thinking Break: Drug Effects and the Nervous System (p. 149)
- ▶ Worth Video Anthology: *Experimenting With Alcohol and Drugs*

3-13. *Discuss the nature of drug tolerance, dependence, and addiction, and identify some common misconceptions about addiction.*

**Psychoactive drugs** are chemicals that change perceptions and moods. Continued use of a psychoactive drug produces **tolerance**. With continued use of alcohol and some other drugs, the user’s brain chemistry adapts to offset the drug effect (a process called *neuroadaptation*). Cessation of use may produce the undesirable side effects of **withdrawal**. The pain of withdrawal and intense

craving for a dose indicates a **physical dependence**. People can also develop **psychological dependence**, particularly for drugs used to relieve stress. An **addiction** is a compulsive craving for a substance despite adverse consequences.

Many drug researchers believe the following three statements about addiction are false: (1) Medical drugs, for example, those used to control pain, are powerfully addictive; (2) addictions cannot be overcome voluntarily but only through treatment; and (3) we can extend the concept of addiction to cover a whole spectrum of repetitive, pleasure-seeking behaviors, such as overeating, exercise, gambling, sex, and Internet use.

- ▶ PsychSim 5: Your Mind on Drugs (p. 152)
- ▶ Exercise/Project: Drug Awareness (p. 152)

Psychoactive drugs operate at the brain's synapses by stimulating, inhibiting, or mimicking the activity of neurotransmitters, the brain's chemical messengers. Our culturally influenced expectations also play a role in the effects of drugs.

- ▶ Lectures: Alcohol Consumption Among Students (p. 152)
- ▶ Exercise: Alcohol Expectancies (p. 153)

3-14. *Identify the depressants, and describe their effects.*

**Depressants** such as alcohol, the **barbiturates**, and the **opiates** act by reducing neural activity and slowing body functions. Each offers its own pleasures, but at the cost of impaired memory and self-awareness or other physical consequences. Alcohol is a **disinhibitor** and thus increases the likelihood that we will act on both helpful and harmful impulses. It also impairs judgment, reduces self-awareness and self-control, and disrupts memory processes by suppressing REM sleep. Research indicates that when people believe that alcohol affects social behavior in specific ways, and believe that they have been drinking alcohol, they will behave accordingly. In those with **alcohol dependence**, prolonged and excessive drinking can shrink the brain. **Barbiturates**, or **tranquilizers**, depress nervous system activity. Prescribed to induce sleep or reduce anxiety, in larger doses they can impair memory and judgment. In combination with alcohol, they can be lethal. The **opiates** also depress neural functioning and can cause the brain to stop producing its own opiates, the **endorphins**.

- ▶ Lecture: Caffeine—Is It Harmful? (p. 154)
- ▶ Worth Video Anthology: *The Nature and Abuse of Ecstasy (MDMA); The Brain's Reward Center*

3-15. *Identify the stimulants, and describe their effects.*

**Stimulants**, such as caffeine, nicotine, and the **amphetamines**, and the even more powerful cocaine, Ecstasy, and **methamphetamines**, excite neural activity and speed up body functions. As with nearly all psychoactive drugs, they act at the synapses by influencing the brain's neurotransmitters, and their effects depend on dosage, the user's personality and expectations, and the situation. Methamphetamine is highly addictive; over time, it appears to reduce baseline dopamine levels. **Nicotine** triggers the release of epinephrine and norepinephrine, which in turn diminish appetite and boost alertness and mental efficiency. Cocaine produces a euphoric rush and depletes the brain's supply of the neurotransmitters dopamine, serotonin, and norepinephrine. A crash of agitated depression follows as the drug's effects wear off. Regular users become addicted and may experience emotional disturbance, suspiciousness, convulsions, cardiac arrest, or respiratory failure. **Ecstasy (MDMA)** is both a stimulant and a mild hallucinogen. By releasing serotonin and blocking its reuptake, it produces high energy, emotional elevation, and connectedness with those around them. Its repeated use may suppress the immune system, damage serotonin-producing neurons, and lead to a permanently depressed mood.

- ▶ Lectures: The LSD Experience (p. 155); Near-Death Experiences (p. 156); Is Marijuana Good Medicine? (p. 156)
- ▶ Worth Video Anthology: *The Medical Use of Marijuana*

3-16. *Identify the hallucinogens, and describe their effects..*

**Hallucinogens** distort perceptions and evoke sensory images in the absence of sensory input. Common components of the LSD experience are hallucinations and emotions ranging from euphoria to panic. Some scientists note that such experiences closely parallel reports of the hallucinations produced by loss of oxygen or extreme sensory deprivation. A person's current mood and expectations affect the drug's effects.

The emotions of an LSD trip are similar to the **near-death experience**. These experiences are marked by out-of-body sensations, visions of tunnels and bright lights, and a replay of old memories.

Marijuana's main active ingredient, **THC**, produces a variety of effects, including disinhibition, a euphoric high, feelings of relaxation, relief from pain, and amplified sensitivity to colors, sounds, tastes, and smells. It may also increase anxiety or depression; impair motor coordination, perceptual skills, and reaction time; and disrupt memory formation. Because THC lingers in the body for a week or more, regular users may achieve a high with smaller amounts of the drug than do occasional users.

- ▶ Lectures: Factors in Drug Use (p. 158); The Amethyst Initiative—Should the Drinking Age Be Lowered? (p. 159); Treating Alcohol Dependence (p. 159)
- ▶ Project: Debates on Drugs and Society (p. 158)

3-17. *Explain why some people become regular users of consciousness-altering drugs.*

Drug use among U.S. high school seniors declined from 1978 to 1992, then rose, but has recently been tapering off. Various studies indicate that some people are biologically more likely to become dependent on drugs. For example, researchers have identified genes that are more common among people and animals predisposed to alcohol dependence. These genes may produce deficiencies in the brain's natural dopamine reward system. One psychological factor that contributes to drug use is the feeling that one's life is meaningless and directionless. Studies reveal that heavy drug users often have experienced significant stress or failure and are depressed. Drug use can also have social roots, evident in differing rates of drug use across cultural and ethnic groups. In the United States, drug addiction rates are very low among the Amish, Mennonites, Mormons, and Orthodox Jews. Peer pressure may lead people, especially teenagers, to experiment with—and become dependent on—drugs. Possible avenues for treatment and prevention involve education, boosting people's self-esteem and purpose in life, and inoculation against peer pressure.

HANDOUT 3-1

**Fact or Falsehood?**

- |            |  |
|------------|--|
| <b>T F</b> | 1. By observing our brain activity, researchers can tell which of 10 similar objects (hammer, drill, and so forth) we are viewing. |
| <b>T F</b> | 2. Much of our everyday thinking, feeling, and acting operates outside our conscious awareness.                                    |
| <b>T F</b> | 3. Allowed to sleep unhindered, most adults will sleep at least 9 hours a night.   |
| <b>T F</b> | 4. People who sleep 7 to 8 hours a night tend to outlive those who are chronically sleep deprived.                                 |
| <b>T F</b> | 5. The most common dreams are those with sexual imagery.   |
| <b>T F</b> | 6. Most psychologists believe that dreams provide a key to understanding our inner conflicts.                                      |
| <b>T F</b> | 7. Under hypnosis, some people can recover accurate memories as far back as birth.   |
| <b>T F</b> | 8. Under hypnosis, people can be induced to perform dangerous acts they would otherwise never perform.                             |
| <b>T F</b> | 9. Those given morphine to control pain often become addicted to the drug.   |
| <b>T F</b> | 10. In large amounts, alcohol is a depressant; in small amounts, it is a stimulant.  |