

**CHAPTER 4**  
**Consciousness**  
**CHAPTER OUTLINE**

**Consciousness is the awareness of the outside world and of one's own mental processes, thoughts, feelings, and perceptions.**

**I. THE SCOPE OF CONSCIOUSNESS**

*Can unconscious thoughts affect your behavior?*

The features of consciousness make up your **state of consciousness**. Possible states include coma, deep sleep, hypnosis, meditation, daydreams, and alert wakefulness.

**A. States of Consciousness**

1. States of consciousness can be viewed as different points on a continuum of consciousness—from active to passive.
2. In active states, you intentionally direct and manipulate mental activity. In passive states, your mind wanders and allows various mental processes to “come to mind.”
3. People are most often in a waking state, where attention and arousal dictate the mental processes reaching awareness at any moment.

**B. Levels of Consciousness**

1. The mental events that you are currently aware of exist at the **conscious level**.
2. At the **nonconscious level** are mental events that *cannot* be experienced consciously.  
*Example:* We cannot directly “know” about brain modulation of blood pressure.
  - a) In *biofeedback training*, you learn which conscious sensory cues accompany a nonconscious process. This permits you to indirectly infer when nonconscious events occur.
3. The **cognitive unconscious** contains mental activities that are not conscious but can either become conscious or influence conscious experience. These include the preconscious and subconscious.
  - a) **Preconscious level** processing is not itself consciously experienced, but can easily and quickly be brought into conscious experience.  
*Example:* If asked what color your socks are, you can easily bring the answer into consciousness, even though you were not thinking about this information prior to the question.
  - b) Sigmund Freud hypothesized the **unconscious**, containing impulses (mostly sexual and aggressive), unacceptable thoughts, feelings, and memories of which one is seldom directly aware. Most psychologists do not accept Freud's view, but still use the term *unconscious* or **subconscious**, to describe normally inaccessible mental activity that influences us in various ways.

**C. Mental Processing without Awareness**

The impact and limitations of consciousness can be seen by studying mental processing that occurs without awareness.

1. Under anesthesia, people may still sense the world and form lasting memories, but without awareness of having done so.
2. One can learn certain cognitive problem-solving strategies without even being aware that the strategies exist.

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3. In cases where blindness has been caused by damage to the primary visual cortex, other pathways allow visual processing, but without awareness—a condition known as *blindsight*. People with this condition say they see nothing, but can track moving images and name the color of lights when asked to guess.
  4. *Priming* occurs when you respond to a stimulus faster or more accurately after having encountered it before. It occurs even if you cannot consciously recall the previous stimulus encounter.
  5. The *mere exposure effect* is the tendency to like previously encountered stimuli more than new ones, even if you are not aware of which stimuli are new to you and which are old.
- D. *Thinking Critically: Can Subliminal Messages Change Your Behavior?*
1. *What am I being asked to believe or accept?*  
Stimuli presented without conscious awareness can be sensed and perceived and can influence your actions without your consent.
  2. *Is there evidence available to support the claim?*  
In some experiments, stimuli are presented too rapidly to be consciously recognized while subjects consciously view other material. Such subliminal stimuli can affect subjects' judgments, physiological responses, and emotional reactions to the material that has been consciously experienced. Self-help tapes, in which subliminal messages try to help people improve memory or quit smoking, however, have only the reports of satisfied customers to support their effectiveness.
  3. *Can that evidence be interpreted another way?*  
Many commercial claims of subliminal effects have been publicity stunts using fraudulent data. Other claims are sometimes *Type I errors*, in which data is collected over and over again until a desired result finally occurs by chance. Double-blind, placebo-controlled studies of self-help tapes (in which experimenters and subjects do not know who listens to tapes with subliminal messages versus the same tapes with no such messages) show that commercial self-help tapes are no more effective than “placebo” versions. Indeed, many self-help tapes may rely entirely on placebo effects—subjects show effects if they just think the tapes will be helpful, regardless of the tapes' actual subliminal content.
  4. *What evidence would help to evaluate the alternatives?*  
Additional controlled studies are needed for all forms of alleged **subliminal perception**.
  5. *What conclusions are most reasonable?*  
Subliminal perception does occur, but affects only general measures (e.g., arousal), and only temporarily. It has virtually no potential for mind control—it does not create needs, skills, actions, or goals that do not already exist.
- E. Focus on Research: Subliminal Messages in Rock Music
1. *What was the researcher's question?*  
People claimed that evil and satanic messages were being delivered subliminally in rock music through backward masking. Two psychologists, John Vokey and

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Don Read, examined whether a listener can perceive and understand a backward message and, if so, whether it would have an effect on the listener's behavior.

2. *How did the researcher answer the question?*  
Vokey and Read played backward recordings of the 23<sup>rd</sup> Psalm and "The Jabberwocky" and asked participants to determine if the content would be meaningful if played forward.
3. *What did the researcher find?*  
Participants could not discriminate sense from nonsense, could not categorize the type of statements, and did not show any priming effects.
4. *What do the results mean?*  
Participants did not consciously or unconsciously understand the messages nor were they influenced by the backward messages.
5. *What do we still need to know?*  
Researchers would like to understand the persistence of the incorrect belief that backward messages in music or speech influence behavior.

F. Altered States of Consciousness

1. In an **altered state of consciousness**, changes in mental processes are sufficient for you or others to note significant differences from the waking state.
  - a) Waking consciousness typically serves as a baseline against which "altered" states are compared.
  - b) Different cultures place different values on waking versus altered states. For example, purposeful *hallucinations* are respected in certain cultures, like the Moche of Peru.

## II. SLEEPING AND DREAMING

*Does your brain go to sleep when you do?*

### A. Stages of Sleep

*Electroencephalograms (EEGs)*, which measure brain activity, show *brain waves* whose height (amplitude) and speed (frequency) reflect variations in behavioral and mental processes. EEGs and other physiological measures help divide sleep into stages.

1. At first, one is relaxed with eyes closed, but awake. The EEG is mixed but includes *alpha waves*, rhythmic waves at 8 to 12 cycles per second (cps).
2. During **slow wave sleep** (stages 3 and 4), sleepers breathe deeply while showing a calm heartbeat and low blood pressure. A person in the deepest stage of slow wave sleep, stage 4, is difficult to awaken.
3. **Rapid eye movement (REM) sleep**, or *paradoxical sleep*, resembles an awake state with its fast EEG, high heart rate, rapid breathing, and high blood pressure. Eyelids are closed (although the eyes move), but muscle tone decreases to virtual paralysis.

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4. Sleepers cycle through the sleep stages four to six times a night, with a typical pattern of 1-2-3-4-3-2-REM. Each cycle is about ninety minutes; deep sleep (stages 3 and 4) dominates early in the night, whereas stage 2 and REM dominate later.
5. Sleep declines with age, from an average of sixteen hours a day in infancy to an average of six hours a day by age 70. Most of the decrease occurs in REM sleep.
6. Individuals vary widely in their need for restful sleep (4–10 hours).

**B. Sleep Disorders**

1. **Insomnia**, the most common sleeping problem, occurs when a person is tired during the day because of trouble falling asleep or staying asleep. Sleeping pills can be helpful, but learning-based treatments may be more helpful in the long run.
2. In **narcolepsy**, a person switches abruptly from an active, sometimes emotional waking state to a few minutes of REM sleep. Helpful treatments involve regular naps and stimulants.
3. In **sleep apnea**, breathing stops, briefly awakening the sleeper to restart breathing. In the morning these awakenings are not remembered, but since they disrupted the normal sleep cycle, victims do not feel well rested. Effective treatments include weight loss, a mask that provides a steady air supply, or, in some cases, surgery to widen the air passageway in the upper throat.
4. **Sudden infant death syndrome (SIDS)** occurs when a sleeping infant stops breathing and suffocates. SIDS might be caused by brain systems regulating breathing or by cigarette smoke exposure. About half of the SIDS cases might be caused by accidental suffocations caused when infants sleep face down on a soft surface.
5. **Sleepwalking** starts primarily in non-REM sleep, most commonly during childhood. Despite myths, there is no special danger in waking a sleepwalker.
6. **Nightmares** are frightening dreams that occur in REM sleep.
7. **Night terrors**, occurring in stage 4 sleep, are horrific dreams that abruptly awaken a person in a state of intense fear. Sometimes treatable with drugs.
8. **REM behavior disorder** is a loss of the paralysis that usually occurs in REM sleep. As a result, a sleeper may appear to act out dreams, sometimes even attacking a sleep partner in the process. Drug treatments are usually effective.

**C. Why Do People Sleep?**

1. Many biological processes show a **circadian rhythm**—cycling about every 24 hours.
  - a) These rhythms are linked to environmental cues such as light, but can continue even without them. An example is the sleep-wake cycle.
  - b) **Jet lag** is a pattern of fatigue, irritability, and sleeping problems when you travel across time zones. It is due to disrupted sleep-wake cycles.
2. Neurons of the *suprachiasmatic nuclei (SCN)*, in the hypothalamus, appear to act as a built-in biological clock.

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3. The SCN receives light information and sends signals to hindbrain areas that initiate sleep or wakefulness. It also releases the hormone, *melatonin*, which appears to be important in maintaining circadian rhythms.

**D. The Functions of Sleep**

1. Sleep deprivation for even as long as a week causes fatigue, irritability, and poor alertness, but no serious long-term effects.
2. *Note:* The *Guinness Book of World Records* credits Randy Gardner, a 17-year-old high school student, with the record for staying awake without sleep. In 1965 he stayed awake for 264 hours, 12 minutes (over 11 days).
3. Short-term sleep deprivation may be the primary cause in 25% of auto accidents and makes learning more difficult.
4. Non-REM sleep is believed to restore the brain and body's energy stores.
5. REM sleep shuts off the brain's norepinephrine-releasing neurons, which originate in the brain's *locus coeruleus*. This may "reset" daytime sensitivity to norepinephrine, thought to underlie waking alertness.
6. REM sleep may help the brain develop and test synaptic connections. This might explain why human infants, whose brains are still developing, have so much REM sleep.
7. REM sleep seems to solidify daytime learning. Studies show that memory is impaired after REM deprivation relative to either non-REM sleep deprivation or normal sleep.

**E. Dreams and dreaming**

1. The mind is active throughout sleep. **Dreams** differ in that they are experienced as sensations and perceptions that are story-like and last several seconds to minutes.
2. Dreams may be organized or chaotic, realistic or bizarre. Like all mental activity, they sometimes offer creative solutions to problems.
3. Daytime activity has a minor impact on dream content. It also may be possible to consciously control dreams during **lucid dreaming**, in which the sleeper is aware of dreaming while a dream is happening.
4. All people, including those who are blind, dream every night. Your remembrance of a dream depends on how you sleep and when you awaken.
5. There are several speculations as to why people dream.
  - a) Nonhuman mammals also dream. Dreams may be a fundamental mammalian activity to consolidate learning of high personal or survival value.
  - b) Sigmund Freud saw dreams as **wish fulfillment**: disguised ways to satisfy unconscious desires that are too upsetting to face consciously. Dreams might therefore offer clues to unconscious conflicts.
  - c) The **activation-synthesis theory** sees dreams as meaningless byproducts of random neural activity during REM sleep.

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**III. HYPNOSIS**

*Can you be hypnotized against your will?*

**Hypnosis** is an altered state of consciousness brought on by special techniques and typified by responsiveness to suggestion and changes in experience and behavior.

You cannot be hypnotized unwillingly, and the more the people want to cooperate with the hypnotist, the more likely it is that they will experience hypnosis.

**A. Experiencing Hypnosis**

1. A hypnotist brings on hypnosis by gradually focusing a subject's attention on a restricted, often monotonous set of stimuli.
2. Those with high **hypnotic susceptibility** have a better ability to focus attention and ignore distraction, process information quickly and easily, tend to fantasize, have active imaginations, have a tendency to be suggestible, and have positive attitudes toward hypnosis.
3. Hypnotized people show changes in movement, perception, memory, emotion, or thought. In **age regression**, people seem to recall or reenact childhood memories.
4. **Posthypnotic suggestions** are instructions given under hypnosis about experiences or behaviors to take place after hypnosis. After hypnosis, some, but not all, subjects have **posthypnotic amnesia**—memory loss for the events of the hypnosis session.
5. Hypnotized people tend not to begin actions on their own, pay attention only to the hypnotist, have an enhanced ability to fantasize, readily take on roles, and show reduced reality testing.

**B. Explaining Hypnosis**

Hypnotized people may look and act differently than other people. Does this mean hypnosis is an altered state of consciousness?

1. The **state theory** says that hypnosis is a true altered state of consciousness.
  - a) There are subtle qualitative differences between the *way* that mental processes occur in hypnotized versus unhypnotized subjects.
  - b) For example, hypnotized people were more likely to follow a posthypnotic suggestion to mail a postcard.
2. The **role theory** holds that hypnosis is not a special state of consciousness; subjects merely act out a special *social role*.
  - a) People act bizarre in other situations (e.g., fans at a sports event) that are not considered altered states of consciousness.
  - b) Motivated laboratory subjects can duplicate most aspects of hypnotic behavior.
3. The **dissociation theory** says hypnosis is not one specific state but a general condition where people reorganize control of their behavior. Hypnosis creates a *dissociation*, or a split, in consciousness. It is a social agreement to share central control with the hypnotist.

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**C. Applications of Hypnosis**

1. Hypnosis can manage the pain from dental work, childbirth, burns, cancer, and migraine headaches.
2. It can help reduce the use of nicotine, alcohol, and other drugs.
3. Hypnosis has reduced nausea and vomiting from chemotherapy and can even reduce surgical bleeding.
4. It is unlikely that hypnosis improves memory for the purposes of eyewitness recall or for recovering lost memories through age regression.

**IV. LINKAGES: MEDITATION, HEALTH, AND STRESS**

- A. *Meditation* techniques are designed to create an altered state of consciousness characterized by inner peace and tranquility.
- B. Techniques differ, but most use focusing methods try to narrow attention to just one thing, allowing one to stop thinking about all other things and experience “pure awareness.”
- C. The meditator finds a quiet environment, assumes a comfortable position, and uses a mental focusing method (e.g., repeating a *mantra*, or soothing phrase) to organize attention.
- D. Meditation is often accompanied by lowered heart rate, muscle tension, blood pressure, and oxygen consumption. Also, dopamine is increased.
- E. Meditation may reduce stress-related problems and increase general mental health, self-esteem, and social openness. Many of its effects can be achieved by other methods, such as biofeedback, hypnosis, or just relaxing.

**V. PSYCHOACTIVE DRUGS**

*How do drugs affect the brain?*

A *drug* is a chemical not normally needed for physiological activity that can affect a body upon entering it. **Psychoactive drugs**, studied in the field of **psychopharmacology**, affect the brain, changing consciousness and other psychological processes.

*Note:* Some use the term *drug* for therapeutic, medicinal compounds and the term *substance* for nonmedical drugs.

**A. Psychopharmacology**

1. Psychoactive drugs must overcome the **blood-brain barrier**, a functional barrier in the brain’s blood vessels that limits which substances can enter the brain from the blood.
2. Most psychoactive drugs work by altering neurotransmitter-receptor interactions in the brain.
  - a) **Agonists** bind to and stimulate a neurotransmitter’s receptors.
  - b) **Antagonists** block normal neurotransmitter-receptor binding without stimulating the receptors.
  - c) Some drugs alter the amount of neurotransmitter released into the synapse.
  - d) Some drugs alter the removal of neurotransmitter from the synapse.

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**B. The Varying Effects of Drugs**

People take a drug to obtain desirable effects, viewed as the drug's main effects. Of course, the drug does not "know" which of its effects are desired; undesirable effects are called side effects.

1. Substance Abuse

- a) **Substance abuse** is the self-administration of drugs in ways that cause serious social, legal, or interpersonal problems for the user.
- b) **Psychological dependence** occurs when a person uses drugs despite adverse effects: The person needs the drug for a sense of well-being and is preoccupied with finding more drug if it becomes unavailable. Psychological dependence may occur with or without physical dependence.
- c) *Physical dependence*, or **addiction**, is a physiological state in which continued drug use is needed to prevent a **withdrawal syndrome**. Withdrawal symptoms vary across drugs but often include a craving for the drug and effects generally opposite those of the drug itself.
- d) **Tolerance** occurs when larger drug doses are needed to cause a given effect.

2. Expectations and Drug Effects

- a) In addition to biochemistry, *learned expectations* from person to person and culture to culture determine drug effects.
- b) In one study, aggressive changes attributed to "drunkenness" depended on whether subjects believed the drinks contained alcohol, and not on whether or not drinks actually did contain alcohol.

**C. Depressants**

**Depressants** suppress activity of the central nervous system. Often, depressants increase activity of GABA, a neurotransmitter that inhibits postsynaptic neuron activity.

1. Alcohol

- a) Alcohol's effects involve the neurotransmitters GABA, endorphins, and dopamine.
- b) Alcohol depresses activity in the locus coeruleus, which tends to cause a decrease in inhibitions.
- c) It also affects the hippocampus, making it more difficult to process information and form new memories; suppresses the cerebellum, causing poor motor coordination; and depresses hindbrain mechanisms required for breathing and heartbeat.
- d) Some effects, such as anger and aggressiveness, depend on biochemical factors and learned expectations.
- e) Genetic predispositions for alcohol dependence exist in certain ethnic groups, while other groups may have inherited metabolic characteristics that enhance alcohol's adverse effects.

2. **Barbiturates**

- a) *Barbiturates* ("downers," sleeping pills), in small doses, cause relaxation, mild pleasure, poor muscle coordination, and lowered attention.

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- b) Higher doses cause deep sleep, but continued use cause sleep disturbances.
- c) Long-term use leads to severe withdrawal symptoms, including intense agitation, violent outbursts, convulsions, hallucinations, and even sudden death.

**3. GHB**

- a) *Gamma hydroxybutyrate (GHB)* is a naturally occurring substance similar to the neurotransmitter GABA.
- b) A laboratory-manufactured version, known as “G” has become a popular “club drug” because it creates relaxation, euphoria, loss of inhibitions, and increased sex drive.
- c) Side effects are nausea, headaches, memory loss, dizziness, loss of muscle control, loss of consciousness, and even death, especially when combined with alcohol or other drugs.
- d) Dependent users may experience withdrawal symptoms that include seizures, hallucinations, agitation, or even coma or death.

**D. Stimulants**

**Stimulants** increase activity in the central nervous system.

1. Amphetamines

- a) *Amphetamines* (“uppers,” “speed”) increase the release and decrease the removal of norepinephrine and dopamine at synapses, and reduce the activity of GABA.
- b) Common effects are increased alertness, arousal, and appetite suppression.
- c) Continued use leads to anxiety, insomnia, heart problems, confusion, paranoia, nonstop talking, psychological and physical dependence.

2. Cocaine

- a) *Cocaine* specifically increases norepinephrine and dopamine activity and decreases GABA activity. Cocaine and amphetamines produce very similar psychological effects, but cocaine acts much faster and is more addictive.
- b) Common effects are increased self-confidence, a sense of well-being, and optimism.
- c) Continued use brings nausea, overactivity, insomnia, paranoia, sudden depressive “crashes,” hallucinations, sexual dysfunction, and seizures.

3. Caffeine

- a) *Caffeine* is found in coffee, tea, chocolate, and many soft drinks. It decreases drowsiness and increases cognitive performance, capacity for physical work, and urine production. High doses causes anxiety and tremors.
- b) It can induce physical dependence. Withdrawal symptoms can include headaches, fatigue, anxiety, shakiness, and cravings.
- c) Continued moderate use appears to have few, if any, negative effects.

4. Nicotine

- a) *Nicotine*, tobacco’s psychoactive ingredient, is an acetylcholine agonist, increases the availability of glutamate, and activates the brain’s dopamine-related reward systems.
- b) Common effects are elevated mood and improved memory and attention.

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- c) It can be physically and psychologically addictive. Withdrawal symptoms include craving, anxiety, irritability, lowered heart rate, and weight gain.
- 5. MDMA
  - a) *MDMA* (“Ecstasy”) has properties of both stimulants and psychedelics.
  - b) It causes euphoria, increased sex drive, visual hallucinations, feelings of emotional closeness with others, increased blood pressure fever, dry mouth, hyperactivity, and jaw muscle spasms (“lockjaw”), and dangerously abnormal heart rhythms.
  - c) The day after one use people often experience muscles aches, fatigue, depression, and poor concentration.
  - d) MDMA increases dopamine and serotonin activity, kills dopamine- and serotonin-sensitive neurons in the brain. Continued use can cause tremors like those in Parkinson’s and symptoms of panic disorder.

**E. Opiates**

- 1. The **opiates** cause sleep and relieve pain. *Opium* comes from the poppy plant and relieves pain while bringing feelings of euphoria and dreamy relaxation.
- 2. *Morphine* is an active ingredient in opium and is used in pain relief. *Heroin* is derived from morphine but is three times more potent.
- 3. Opiates stimulate receptors normally stimulated by endorphins, the body’s naturally-occurring painkillers.

**F. Hallucinogens**

**Hallucinogens**, also called *psychedelics*, cause hallucinations and a temporary loss of contact with reality.

- 1. LSD
  - a) *LSD* (*lysergic acid diethylamide*) is a potent psychedelic causing bizarre hallucinations and a distorted sense of time. Its hallucinatory effects are probably due to its action as a serotonin agonist.
  - b) Unpleasant hallucinations can occur with any LSD experience. Some users suffer lasting side effects, including severe short-term memory loss, paranoia, violent outbursts, nightmares, and panic attacks.
- 2. Ketamine
  - a) **Ketamine** is an anesthetic used by veterinarians to ease pain in animals, but also has hallucinatory effects, making it a desirable recreational drug (called Special K).
  - b) It can lead to enduring memory loss, possibly because it damages structures such as the hippocampus.
- 3. Marijuana
  - a) *Marijuana* is the leaves, flowers, and stems from the hemp plant. Its active ingredient is *tetrahydrocannabinol* (*THC*).
  - b) Low doses may initially cause restlessness and hilarity, followed by dreamy, carefree relaxation, an expanded sense of time and space, more vivid sensations, food cravings, and subtle changes in thinking.

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- c)* Controversy exists on whether or not it is addictive, leads to the use of opiates, or is less potent than other drugs.
- d)* It disrupts memory formation, reduces creativity, and disrupts motor coordination. Long-term use can lead to psychological dependence, impairments in reasoning or memory that last for months or years after use stops. Heavy use is associated with later appearance of anxiety, depression, and other symptoms of mental disorder.
- e)* It has been used successfully in the treatment of asthma, glaucoma, epilepsy, chronic pain, and nausea from chemotherapy.