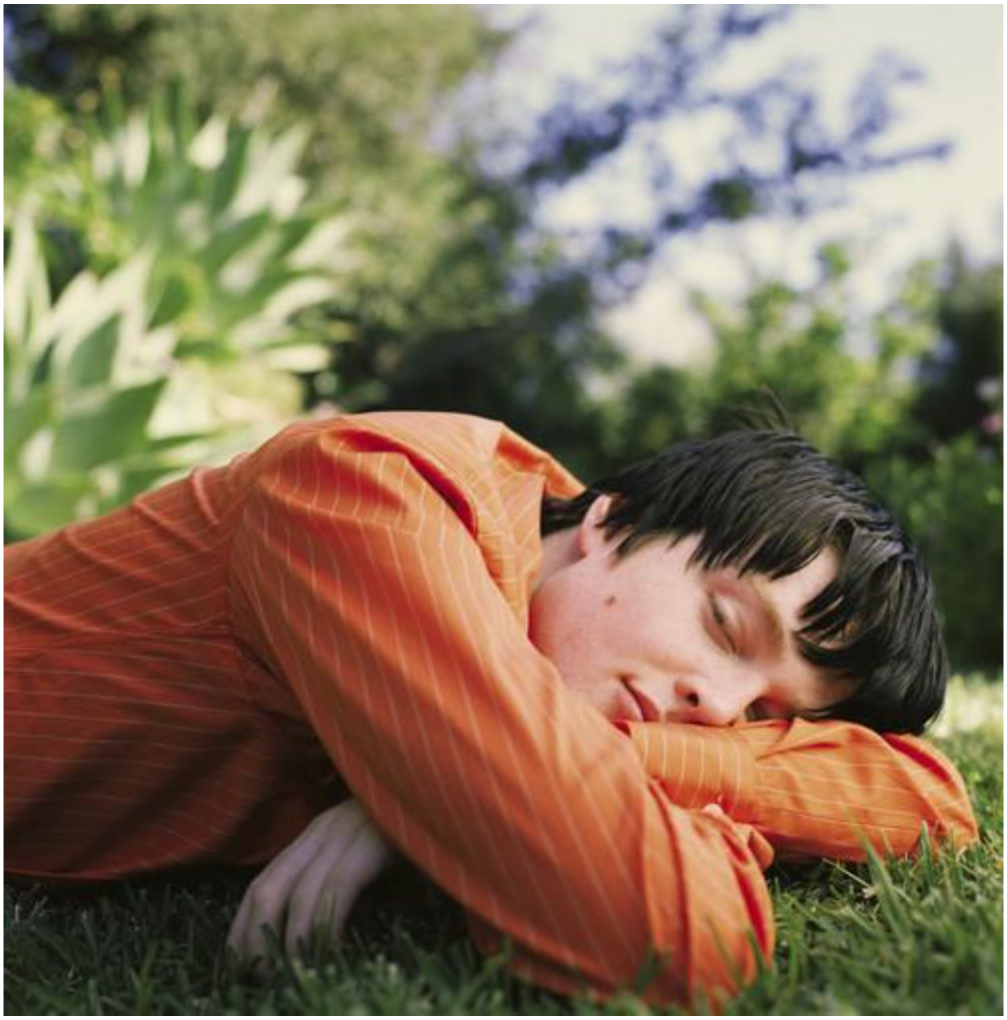
UNIT 5: States of Consciousness



CHAPTER OUTLINE

Explaining the Hypnotized State

Drugs and Consciousness

Dependence and Addiction

Psychoactive Drugs

Influences on Drug Use

Consciousness can be a funny thing. It offers us weird experiences, as when entering sleep or leaving a dream, and sometimes it leaves us wondering who is really in control. After putting me under the influence of nitrous oxide, my dentist tells me to turn my head to the left. My conscious mind resists: "No way," I silently say. "You can't boss me around!" Whereupon my robotic head, ignoring my conscious mind, turns obligingly under the dentist's control.

During my noontime pickup basketball games, I am sometimes mildly irritated as my body passes the ball while my conscious mind is saying, "No, stop, you fool! Peter is going to intercept!" Alas, my body completes the pass on its own. Other times, notes psychologist Daniel Wegner (2002) in *Illusion of Conscious Will,* people believe their consciousness is controlling their actions when it isn't. In one experiment, people co-controlled a computer mouse with a partner (who was actually the experimenter's accomplice). Even when the partner caused the mouse to stop on a predetermined square, the participants perceived that *they* had caused it to stop there.

And then there are those times when consciousness seems to split. Reading *Green Eggs and Ham* to one of my preschoolers for the umpteenth time, my obliging mouth could say the words while my mind wandered elsewhere. And if someone asks what you're doing for lunch while you're texting, it's not a problem. Your fingers complete the message as you suggest getting tacos.

Was my drug-induced dental experience akin to people's experiences with other *psychoactive drugs* (mood- and perception-altering substances)? Was my automatic obedience to my dentist like people's responses to a hypnotist? Or does a split in consciousness, like those that we have when our mind goes elsewhere while reading or texting, explain people's behavior while under hypnosis? And during sleep, when and why do those weird dream experiences occur?

"Neither [psychologist] Steve Pinker nor I can explain human subjective consciousness.… We don't understand it."

Evolutionary biologist Richard Dawkins (1999)

But first questions first: What is *consciousness?* Every science has concepts so fundamental they are nearly impossible to define. Biologists agree on what is alive but not on precisely what life is. In physics, *matter* and *energy* elude simple definition. To psychologists, consciousness is similarly a fundamental yet slippery concept.

> "Psychology must discard all reference to consciousness."
>
> Behaviorist John B. Watson (1913)

At its beginning, *psychology* was "the description and explanation of states of consciousness" (Ladd, 1887). But during the first half of the twentieth century, the difficulty of scientifically studying consciousness led many psychologists—including those in the emerging school of *behaviorism* (**Unit 6**)—to turn to direct observations of behavior. By the 1960s, psychology had nearly lost consciousness and was defining itself as "the science of behavior." Consciousness was likened to a car's speedometer: "It doesn't make the car go, it just reflects what's happening" (Seligman, 1991, p. 24).

After 1960, mental concepts began to reemerge. Advances in neuroscience made it possible to relate brain activity to sleeping, dreaming, and other mental states. Researchers began studying consciousness altered by hypnosis and drugs. Psychologists of all persuasions were affirming the importance of *cognition,* or mental processes. Psychology was regaining consciousness.

For most psychologists today, **consciousness** is *our awareness of ourselves and our environment*. As we saw in **Unit 3B**, our conscious awareness is one part of the *dual processing* that goes on in our two-track minds. Although much of our information processing is conscious, much is unconscious and automatic—outside our awareness. **Unit 4** highlighted our *selective attention*, which directs the spotlight of our awareness, allowing us to assemble information from many sources as we reflect on our past and plan for our future. We are also attentive when we learn a complex concept or behavior—say, riding a bike—making us aware of obstacles that we have to steer around and how to use the brakes. With practice, riding a bike no longer requires our undivided attention, freeing us to focus our attention on other things. As we do so, we experience what the early psychologist William James called a continuous "stream of consciousness," with each moment flowing into the next. Over the course of a day, we also flit between a variety of *states of consciousness*, including sleeping, waking, and other altered states (**Figure 5.1**).

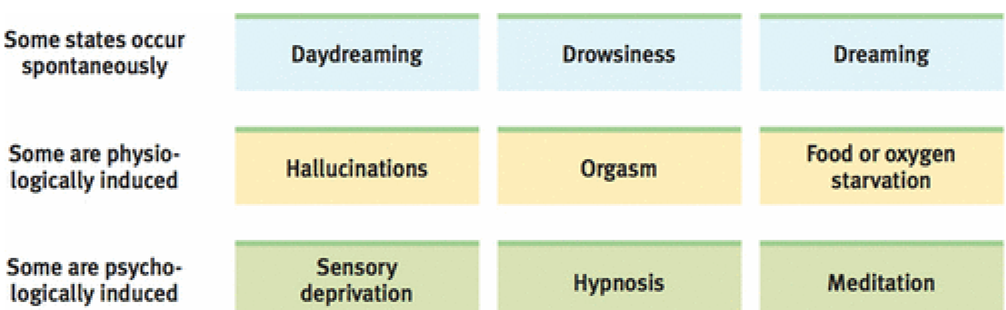


Figure 5.1 States of consciousness In addition to normal, waking awareness, consciousness comes to us in altered states, including daydreaming, sleeping, meditating, and drug-induced hallucinating.

5.1 Sleep and Dreams

SLEEP—THE IRRESISTIBLE TEMPTER TO WHOM we inevitably succumb. Sleep—the equalizer of seniors and second graders. Sleep—sweet, renewing, mysterious sleep.

"I love to sleep. Do you? Isn't it great? It really is the best of both worlds. You get to be alive and unconscious."

Comedian Rita Rudner, 1993

Even when you are deeply asleep, your perceptual window is actually not completely shut. You move around on your bed, but you manage not to fall out. The occasional roar of passing vehicles may leave your deep sleep undisturbed, but a cry from a baby's nursery quickly interrupts it. So does the sound of your name. EEG recordings confirm that the brain's auditory cortex responds to sound stimuli even during sleep (Kutas, 1990). And when we are asleep, as when we are awake, we process most information outside our conscious awareness.

Many of sleep's mysteries are now being solved as some people sleep, attached to recording devices, while others observe. By recording brain waves and muscle movements, and by observing and occasionally waking sleepers, researchers are glimpsing things that a thousand years of common sense never told us. Perhaps you can anticipate some of their discoveries. Are the following statements true or false?

1. When people dream of performing some activity, their limbs often move in concert with the dream.
2. Older adults sleep more than young adults.
3. Sleepwalkers are acting out their dreams.
4. Sleep experts recommend treating insomnia with an occasional sleeping pill.
5. Some people dream every night; others seldom dream.

Dolphins, porpoises, and whales sleep with one side of their brain at a time (Miller et al., 2008).

All these statements (adapted from Palladino & Carducci, 1983) are false. To see why, read on.

5.1.1 Biological Rhythms and Sleep

1: How do our biological rhythms influence our daily functioning?

At about age 20 (slightly earlier for women), we begin to shift from being evening-energized "owls" to being morning-loving "larks" (Roenneberg et al., 2004). Most 20-year-olds are owls, with performance improving across the day (May & Hasher, 1998). Most older adults are larks, with performance declining as the day wears on. Retirement homes are typically quiet by mid-evening; in university dorms, the day is far from over.

Like the ocean, life has its rhythmic tides. Over varying time periods, our bodies fluctuate, and with them, our minds. Let's look more closely at two of those biological rhythms—our 24-hour biological clock and our 90-minute sleep cycle.

Circadian Rhythm

The rhythm of the day parallels the rhythm of life—from our waking at a new day's birth to our nightly return to what Shakespeare called "death's counterfeit." Our bodies roughly synchronize with the 24-hour cycle of day and night through a biological clock called the **circadian rhythm** (from the Latin *circa*, "about," and *diem*, "day"). Body temperature rises as morning approaches, peaks during the day, dips for a time in early afternoon (when many people take siestas), and then begins to drop again before we go to sleep. Thinking is sharpest and memory most accurate when we are at our daily peak in circadian arousal. Pulling an all-nighter, we may feel groggiest about 4:00 A.M., and then we get a second wind after our normal wake-up time arrives.

Bright light in the morning tweaks the circadian clock by activating light-sensitive retinal proteins. These proteins control the circadian clock by triggering signals to the brain's *suprachiasmatic nucleus (SCN)*—a pair of grain-of-rice-sized, 20,000-cell clusters in the hypothalamus (Foster, 2004). The SCN does its job in part by causing the brain's pineal gland to decrease its production of the sleep-inducing hormone *melatonin* in the morning or increase it in the evening (**Figure 5.2**).

Bright light at night helps delay sleep, thus resetting our biological clock when we stay up late and sleep in on weekends (Oren & Terman, 1998). Sleep often eludes those who sleep till noon on Sunday and then go to bed just 11 hours later in preparation for the new school week. They are like New Yorkers whose biology is on California time. But what about North Americans who fly to Europe, and who need to be up when their circadian rhythm cries "Sleep!"? Studies in the laboratory and with shift workers find that bright light—spending the next day outdoors—helps reset the biological clock (Czeisler et al., 1986, 1989; Eastmanet al., 1995).

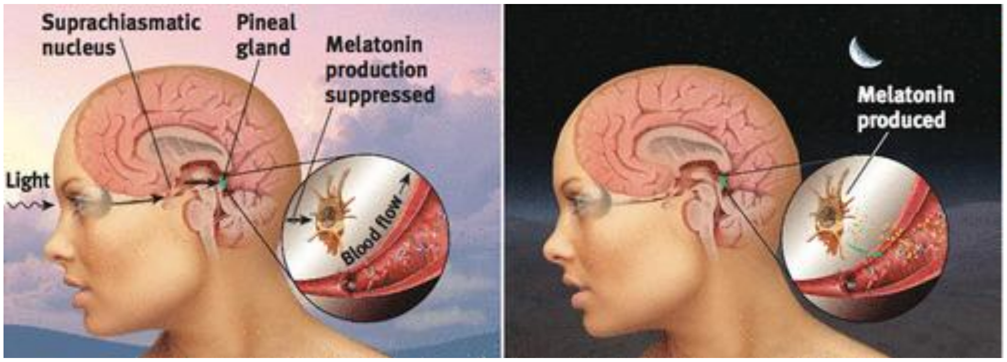


Figure 5.2 **The biological clock** Light striking the retina signals the suprachiasmatic nucleus (SCN) to suppress the pineal gland's production of the sleep hormone melatonin. At night, the SCN quiets down, allowing the pineal gland to release melatonin into the bloodstream.

If our natural circadian rhythm were attuned to a 23-hour cycle, would we instead need to discipline ourselves to stay up later at night and sleep in longer in the morning?

Curiously—given that our ancestors' body clocks were attuned to the rising and setting sun of the 24-hour day—many of today's young adults adopt something closer to a 25-hour day, by staying up too late to get 8 hours of sleep. For this, we can thank (or blame) Thomas Edison, inventor of the light bulb. Being bathed in light disrupts our 24-hour biological clock (Czeisler et al., 1999; Dement, 1999). This helps explain why, until our later years, we must discipline ourselves to go to bed and force ourselves to get up. Most animals, too, when placed under unnatural constant illumination, will exceed a 24-hour day. Artificial light delays sleep.

Sleep Stages

2: What is the biological rhythm of our sleep?

As sleep overtakes us and different parts of our brain's cortex stop communicating, consciousness fades (Massimini et al., 2005). But our still-active sleeping brain does not emit a constant dial tone, because sleep has its own biological rhythm. About every 90 minutes, we pass through a cycle of five distinct sleep stages. This elementary fact apparently was unknown until 8-year-old Armond Aserinsky went to bed one night in 1952. His father, Eugene, a University of Chicago graduate student, needed to test an electroencephalograph (EEG) he had been repairing that day (Aserinsky, 1988; Seligman & Yellen, 1987). Placing electrodes near Armond's eyes to record the rolling eye movements then believed to occur during sleep, Aserinsky watched the machine go wild, tracing deep zigzags on the graph paper. Could the machine still be broken? As the night proceeded and the activity periodically recurred, Aserinsky finally realized that the fast, jerky eye movements were accompanied by energetic brain activity. Awakened during one such episode, Armond reported having a dream. Aserinsky had discovered what we now know as **REM sleep** (*r*apid *e*ye *m*ovement sleep).

To find out if similar cycles occur during adult sleep, Nathaniel Kleitman (1960) and Aserinsky pioneered procedures that have now been used with thousands of volunteers. To appreciate their methods and findings, imagine yourself in their lab. As the hour grows late, you feel sleepy and you yawn in response to reduced brain metabolism. (Yawning, which can be socially contagious, stretches your neck muscles and increases your heart rate, which increases your alertness [Moorcroft, 2003]). When you are ready for bed, the researcher tapes electrodes to your scalp (to detect your brain waves), just outside the corners of your eyes (to detect eye movements), and on your chin (to detect muscle tension) (**Figure 5.3**). Other devices allow the researcher to record your heart rate, your respiration rate, and your genital arousal.

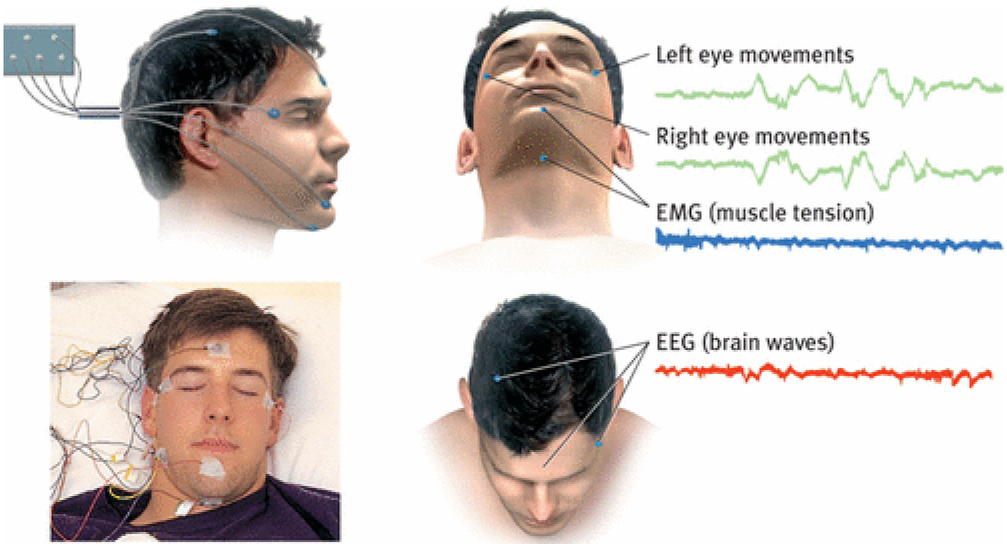


Figure 5.3 **Measuring sleep activity** Sleep researchers measure brain-wave activity, eye movements, and muscle tension by electrodes that pick up weak electrical signals from the brain, eye, and facial muscles. (From Dement, 1978.) Hank Morgan/Rainbow

Figure 5.5 **The moment of sleep** We seem unaware of the moment we fall into sleep, but someone eavesdropping on our brain waves could tell. (From Dement, 1999.)

When you are in bed with your eyes closed, the researcher in the next room sees on the EEG the relatively slow **alpha waves** of your awake but relaxed state (**Figure 5.4**). As you adapt to all this equipment, you grow tired and, in an unremembered moment, slip into **sleep.** The transition is marked by the slowed breathing and the irregular brain waves of Stage 1 (**Figure 5.5**).

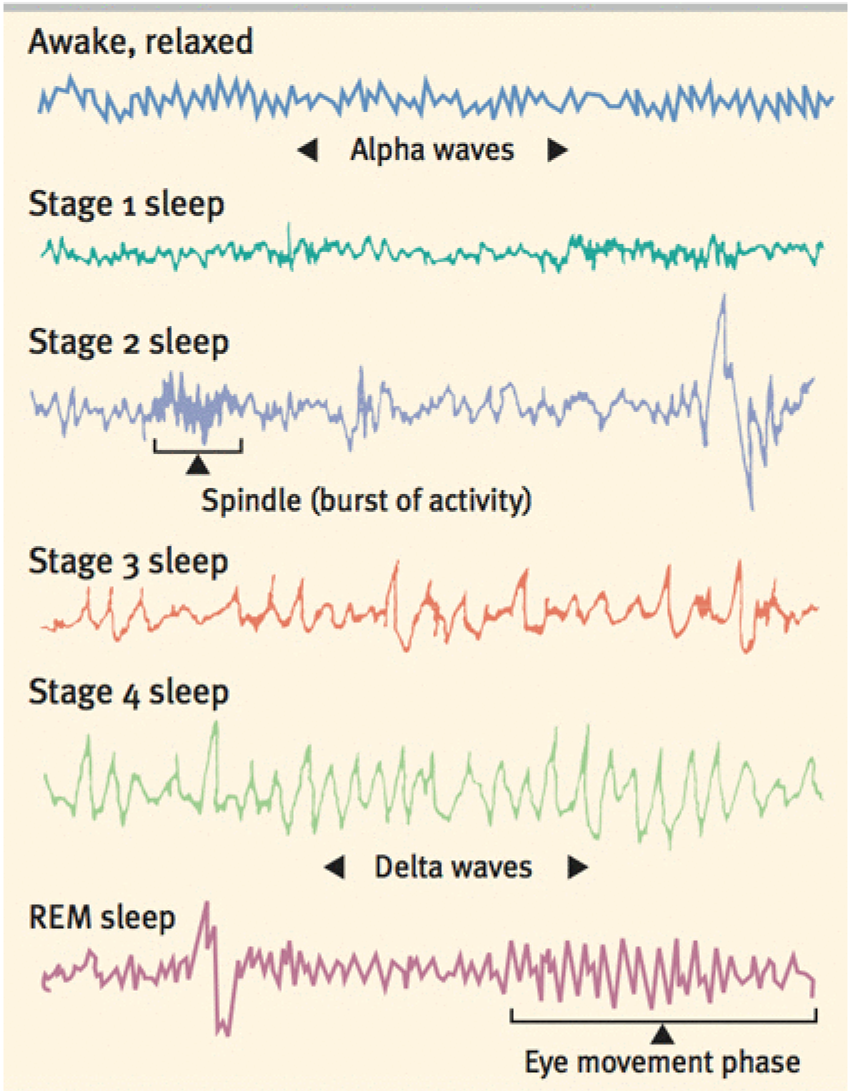


Figure 5.4 Brain waves and sleep stages The regular alpha waves of an awake, relaxed state are quite different from the slower, larger delta waves of deep Stage 4 sleep. Although the rapid REM sleep waves resemble the near-waking Stage 1 sleep waves, the body is more aroused during REM sleep than during Stage 1 sleep. (From Dement, 1978.)

In one of his 15,000 research participants, William Dement (1999) observed the moment the brain's perceptual window to the outside world slammed shut. Dement asked this sleep-deprived young man, lying on his back with eyelids taped open, to press a button every time a strobe light flashed in his eyes (about every 6 seconds). After a few minutes the young man missed one. Asked why, he said, "Because there was no flash." But there was a flash. He missed it because (as his brain activity revealed) he had fallen asleep for 2 seconds. Unaware that he had done so, he had missed not only the flash 6 inches from his nose but also the abrupt moment of his entry into sleep.

During this brief Stage 1 sleep you may experience fantastic images, resembling **hallucinations**—sensory experiences that occur without a sensory stimulus. You may have a sensation of falling (at which moment your body may suddenly jerk) or of floating weightlessly. Such *hypnagogic* sensations may later be incorporated into memories. People who claim to have been abducted by aliens—often shortly after getting into bed—commonly recall being floated off or pinned down on their beds (Clancy, 2005).

To catch your own hypnagogic experiences after going to bed, you might have a “snooze” alarm awaken you every five minutes.

You then relax more deeply and begin about 20 minutes of Stage 2 sleep, characterized by the periodic appearance of *sleep spindles*—bursts of rapid, rhythmic brain-wave activity (see **Figure 5.4**). Although you could still be awakened without too much difficulty, you are now clearly asleep. Sleeptalking—usually garbled or nonsensical—can occur during Stage 2 or any other sleep stage (Mahowald & Ettinger, 1990).

Then for the next few minutes you go through the transitional Stage 3 to the deep sleep of Stage 4. First in Stage 3, and increasingly in Stage 4, your brain emits large, slow **delta waves.** These two slow-wave stages last for about 30 minutes, during which you would be hard to awaken. Ever say to classmates, “That thunder was so loud last night,” only to have them respond, “What thunder?” Those who missed the storm may have been in delta sleep. Curiously, it is at the end of the deep sleep of Stage 4 that children may wet the bed or begin sleepwalking. About 20 percent of 3- to 12-year-olds have at least one episode of sleepwalking, usually lasting 2 to 10 minutes; some 5 percent have repeated episodes (Giles et al., 1994).

REM Sleep

Horses, which spend 92 percent of each day standing and can sleep standing, must lie down for REM sleep (Morrison, 2003).

About an hour after you first fall asleep, a strange thing happens. You leave behind the stages known as **NREM sleep.** Rather than continuing in deep slumber, you ascend from your initial sleep dive. Returning through Stage 3 and Stage 2 (where you spend about half your night), you enter the most intriguing sleep phase—REM sleep (**Figure 5.6**). For about 10 minutes, your brain waves become rapid and saw-toothed, more like those of the nearly awake Stage 1 sleep. But unlike Stage 1 sleep, during REM sleep your heart rate rises, your breathing becomes rapid and irregular, and every half-minute or so your eyes dart around in a momentary burst of activity behind closed lids. Because anyone watching a sleeper’s eyes can notice these REM bursts, it is amazing that science was ignorant of REM sleep until 1952.

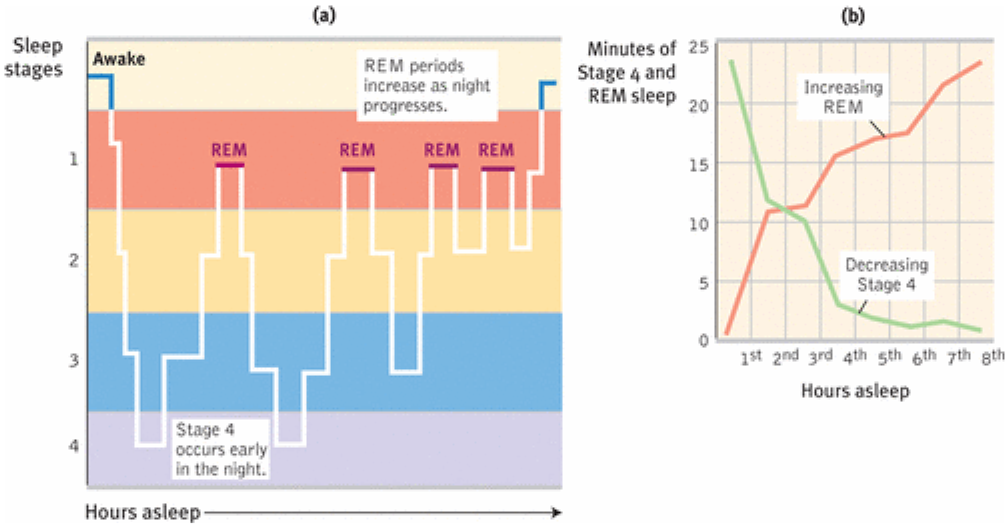


Figure 5.6 **The stages in a typical night's sleep** Most people pass through the five-stage sleep cycle (graph a) several times, with the periods of Stage 4 sleep and then Stage 3 sleep diminishing and REM sleep periods increasing in duration. Graph b plots this increasing REM sleep and decreasing deep sleep based on data from 30 young adults. (From Cartwright, 1978; Webb, 1992.)

Except during very scary dreams, your genitals become aroused during REM sleep, and you have an erection or increased vaginal lubrication, regardless of whether the dream's content is sexual (Karacan et al., 1966). Men's common "morning erection" stems from the night's last REM period, often just before waking.

Although your brain's motor cortex is active during REM sleep, your brainstem blocks its messages, leaving muscles relaxed—so relaxed that, except for an occasional finger, toe, or facial twitch, you are essentially paralyzed. Moreover, you cannot easily be awakened. Thus, REM sleep is sometimes called *paradoxical sleep*, with the body internally aroused and externally calm.

"Boy are my eyes tired! I had REM sleep all night long." © 1994 by Sidney Harris.

More intriguing than the paradoxical nature of REM sleep is what the rapid eye movements announce: the beginning of a dream. Even those who claim they never dream will, more than 80 percent of the time, recall a dream after being awakened during REM sleep. Unlike the fleeting images of Stage 1 sleep ("I was thinking about my test today," or "I was trying to borrow something from someone"), REM sleep dreams are often emotional, usually storylike, and more richly hallucinatory, including visual, auditory, and other sensory details:

My girlfriend and I were at some friends' house, but our friends weren't there. Their TV had been left on, but otherwise it was very quiet. After we wandered around for a while, their dogs finally noticed us and barked and growled loudly, with bared teeth.

People rarely snore during dreams. When REM starts, snoring stops.

The sleep cycle repeats itself about every 90 minutes. As the night wears on, deep Stage 4 sleep gets progressively briefer and then disappears. The REM and Stage 2 sleep periods get longer (see **Figure 5.6b**). By morning, 20 to 25 percent of our average night's sleep—some 100 minutes—has been REM sleep. Thirty-seven percent of people report rarely or never having dreams "that you can remember the next morning" (Moore, 2004). Unknown to those people, they spend about 600 hours a year experiencing some 1500 dreams, or more than 100,000 dreams over a typical lifetime—dreams swallowed by the night but never acted out, thanks to REM's protective paralysis.

Some sleep deeply, some not The fluctuating sleep cycle enables safe sleep for these soldiers on the battlefield. One benefit of communal sleeping is that someone will probably be awake or easily roused in the event of a threat. AP Photo/David Guttenfelder

5.1.2 Why Do We Sleep?

The idea that "everyone needs 8 hours of sleep" is untrue. Newborns spend nearly two-thirds of their day asleep, most adults no more than one-third. Age-related differences in average sleeping time are rivaled by the differences among individuals at any age.

Some people thrive with fewer than 6 hours per night; others regularly rack up 9 hours or more. Such sleep patterns may be genetically influenced. When Wilse Webb and Scott Campbell (1983) checked the pattern and duration of sleep among fraternal and identical twins, only the identical twins were strikingly similar.

In 1989, Michael Doucette was named America's Safest Driving Teen. In 1990, while driving home from college, he fell asleep at the wheel and collided with an oncoming car, killing both himself and the other driver. Michael's driving instructor later acknowledged never having mentioned sleep deprivation and drowsy driving (Dement, 1999).

Sleep patterns are also culturally influenced. In the United States and Canada, for example, adults average just over 8 hours per night (Hurst, 2008; Robinson & Martin, 2007). (The weeknight sleep of many students and workers falls short of this average [NSF, 2008].) North Americans are nevertheless sleeping less than their counterparts a century ago. Thanks to modern light bulbs, shift work, the Internet, and social diversions, those who would have gone to bed at 9:00 p.m. are now up until 11:00 p.m. or later. Thomas Edison (1948) was pleased to accept credit for this, believing that less sleep meant more productive time and greater opportunities.

Allowed to sleep unhindered, most adults will sleep at least 9 hours a night, reports Stanley Coren (1996). With that much sleep, we awake refreshed, sustain better moods, and perform more efficient and accurate work. Compare that with a succession of 5-hour nights, when we accumulate a sleep debt that cannot be paid off by one long marathon sleep. "The brain keeps an accurate count of sleep debt for at least two weeks," says William Dement (1999, p. 64). With our body yearning for sleep, we will begin to feel terrible. Trying to stay awake, we will eventually lose. In the tiredness battle, sleep always wins. It's easy to spot students who have stayed up late to study for a test or finish a term paper: they are often fighting the "nods" (their heads bobbing downward) as they try to stay awake.

Obviously, then, we need sleep. Sleep commands roughly one-third of our lives—some 25 years, on average. But why? It seems an easy question to answer: Just keep people awake for several days and note how they deteriorate. If you were a volunteer in such an experiment, how do you think it would affect your body and mind? You would, of course, become terribly drowsy—especially during the hours when your biological clock programs you to sleep. But could the lack of sleep physically damage you? Would it noticeably alter your biochemistry or body organs? Would you become emotionally disturbed? Mentally disoriented?

The Effects of Sleep Loss

3: How does sleep loss affect us?

Good news! Psychologists have discovered a treatment that strengthens memory, increases concentration, boosts mood, moderates hunger and obesity, fortifies the disease-fighting immune system, and lessens the risk of fatal accidents. Even better news: The treatment feels good, it can be self-administered, the supplies are limitless, and it's available free! If you are a typical high school senior, often going to bed near midnight and dragged out of bed six or seven hours later by the dreaded alarm, the treatment is simple: Each night add an hour to your sleep.

In a 2001 Gallup poll, 61 percent of men, but only 47 percent of women, said they got enough sleep.

The U.S. Navy and the National Institutes of Health have demonstrated the benefits of unrestricted sleep in experiments in which volunteers spent 14 hours daily in bed for at least a week. For the first few days, the volunteers averaged 12 hours of sleep a day or more, apparently paying off a sleep debt that averaged 25 to 30 hours. That accomplished, they then settled back to 7.5 to 9 hours nightly and, with no sleep debt, felt energized and happier (Dement, 1999). In one Gallup survey (Mason, 2005), 63 percent of adults who reported getting the sleep they need also reported being "very satisfied" with their personal life (as did only 36 percent of those needing more sleep). When Daniel Kahneman and his colleagues (2004) invited 909 working women to report on their daily moods, they were struck by what mattered little, such as money (so long as they were not battling poverty). And they were struck by what mattered a lot—less time pressure at work and a good night's sleep.

Sleepless and suffering These fatigued, sleep-deprived earthquake rescue workers in China may experience a depressed immune system, impaired concentration, and greater vulnerability to accidents.
Reuters/China Daily (China)

Unfortunately, many of us are suffering from patterns that not only leave us sleepy but also thwart our having an energized feeling of wellbeing (Mikulincer et al., 1989). Teens who typically need 8 or 9 hours of sleep now average less than 7 hours—nearly 2 hours less each night than did their counterparts of 80 years ago (Holden, 1993; Maas, 1999). In one survey, 28 percent of high school students acknowledged falling asleep in class at least once a week (Sleep Foundation, 2006). When the going gets boring, the students start snoring.

Even when awake, students often function below their peak. And they know it: Four in five American teens and three in five 18- to 29-year-olds wish they could get more sleep on weekdays (Mason, 2003, 2005). Yet that teen who staggers glumly out of bed in response to an unwelcome alarm, yawns through morning classes, and feels half-depressed much of the day may be energized at 11 p.m. and mindless of the next day's looming sleepiness (Carskadon, 2002).

Sleep researcher William Dement (1997) reports that at Stanford University, 80 percent of students are "dangerously sleep deprived…Sleep deprivation [entails] difficulty studying, diminished productivity, tendency to make mistakes, irritability, fatigue." A large sleep debt "makes you stupid," says Dement (1999, p. 231).

To test whether you are one of the many sleep-deprived students, see **Table 5.1**.•

It can also make you fatter. Sleep deprivation increases the hunger-arousing hormone ghrelin and decreases its hunger-suppressing partner, leptin. It also increases the stress hormone cortisol, which stimulates the body to make fat. Sure enough, children and adults who sleep less than normal are fatter than those who sleep more (Chen et al., 2008; Knutson et al., 2007; Schoenborn & Adams, 2008). And experimental sleep deprivation of adults increases appetite and eating (Nixon et al., 2008; Patel et al., 2006; Spiegel et al., 2004; Van Cauter et al., 2007). This may help explain the common weight gain among sleep-deprived students (although a review of 11 studies reveals that the mythical college student's "freshman 15" is, on average, closer to a "first-year 4" [Hull et al., 2007]).

Table 5.1

Cornell University psychologist James Maas reports that most students suffer the consequences of sleeping less than they should. To see if you are in that group, answer the following true-false questions:

True	False	
_____	_____	1. I need an alarm clock in order to wake up at the appropriate time.
_____	_____	2. It's a struggle for me to get out of bed in the morning.
_____	_____	3. Weekday mornings I hit the snooze bar several times to get more sleep.
_____	_____	4. I feel tired, irritable, and stressed out during the week.
_____	_____	5. I have trouble concentrating and remembering.
_____	_____	6. I feel slow with critical thinking, problem solving, and being creative.
_____	_____	7. I often fall asleep watching TV.
_____	_____	8. I often fall asleep in boring meetings or lectures or in warm rooms.
_____	_____	9. I often fall asleep after heavy meals.
_____	_____	10. I often fall asleep while relaxing after dinner.
_____	_____	11. I often fall asleep within five minutes of getting into bed.
_____	_____	12. I often feel drowsy while driving.
_____	_____	13. I often sleep extra hours on weekend mornings.
_____	_____	14. I often need a nap to get through the day.
_____	_____	15. I have dark circles around my eyes.

If you answered "true" to three or more items, you probably are not getting enough sleep. To determine your sleep needs, Maas recommends that you "go to bed 15 minutes earlier than usual every night for the next week—and continue this practice by adding 15 more minutes each week—until you wake without an alarm clock and feel alert all day." (Quiz reprinted with permission from James B. Maas, *Power sleep: The revolutionary program that prepares your mind and body for peak performance* [New York: HarperCollins, 1999].)

In addition to making us more vulnerable to obesity, sleep deprivation can suppress immune cells that fight off viral infections and cancer (Motivala & Irwin, 2007). This may help explain why people who sleep 7 to 8 hours a night tend to outlive those who are chronically sleep deprived, and why older adults who have no difficulty falling or staying asleep tend to live longer than their sleep-deprived age-mates (Dement, 1999; Dew et al., 2003). When infections do set in, we typically sleep more, boosting our immune cells.

Chronic sleep debt also alters metabolic and hormonal functioning in ways that mimic aging and are conducive to hypertension and memory impairment (Spiegel et al., 1999; Taheri, 2004). Other effects include irritability, slowed performance, and impaired creativity, concentration, and communication (Harrison & Horne, 2000). Reaction times slow and errors increase on visual tasks similar to those involved in airport baggage screening, performing surgery, and reading X-rays (Horowitz et al., 2003).

> "Drowsiness is red alert!"
>
> William Dement, The Promise of Sleep, 1999

Sleep deprivation can be devastating for driving, piloting, and equipment operating. Driver fatigue contributes to an estimated 20 percent of American traffic accidents (Brody, 2002) and to some 30 percent of Australian highway deaths (Maas, 1999). Consider the timing of four industrial disasters—the 1989 *Exxon Valdez* tanker hitting rocks and spilling millions of gallons of oil on the shores of Alaska; Union Carbide's 1984 release of toxic gas killing thousands in Bhopal, India; and the 1979 (Three Mile Island) and 1986 (Chernobyl) nuclear accidents—all occurred after midnight, when operators in charge were likely to be drowsiest and unresponsive to signals that require an alert response. When sleepy frontal lobes confront an unexpected situation, misfortune often results.

Stanley Coren capitalized on what is, for many North Americans, a semi-annual sleep-manipulation experiment—the "spring forward" to "daylight savings" time and "fall backward" to "standard" time. Searching millions of records, Coren found that in both Canada and the United States, accidents increase immediately after the time change that shortens sleep (**Figure 5.7**).

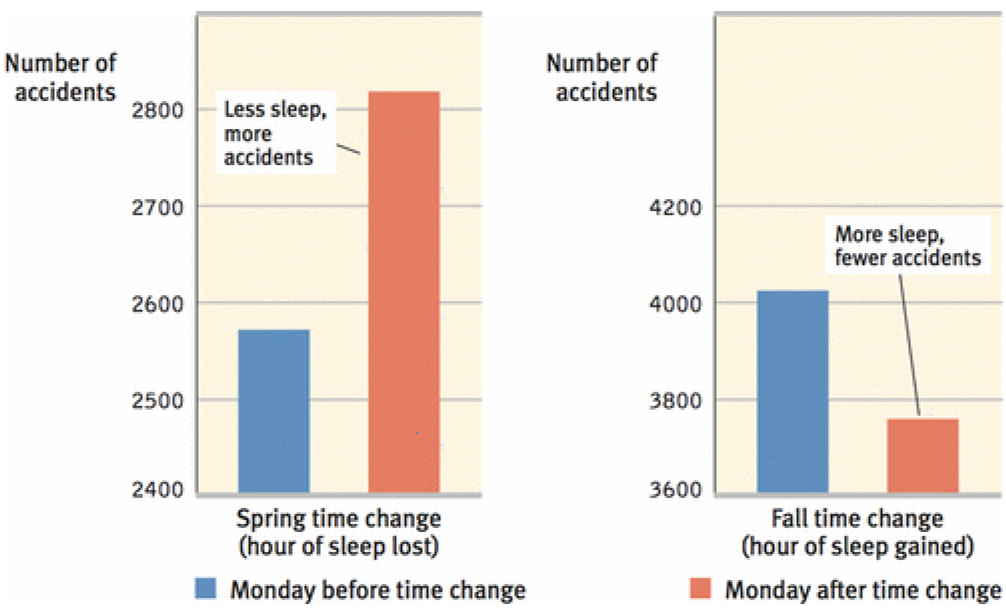


Figure 5.7 Canadian traffic accidents On the Monday after the spring time change, when people lose one hour of sleep, accidents increased as compared with the Monday before. In the fall, traffic accidents normally increase because of greater snow, ice, and darkness, but they diminished after the time change. (Adapted from Coren, 1996.)

But let's put all this positively: To manage your life with enough sleep to awaken naturally and well rested is to be more alert, productive, happy, healthy, and safe.

Sleep Theories

4: What is sleep's function?

So, nature charges us for our sleep debt. But why do we have this need for sleep?

"Sleep faster, we need the pillows."

Yiddish proverb

We have very few answers, but sleep may have evolved for five reasons: First, *sleep protects*. When darkness precluded our distant ancestors' hunting and food gathering and made travel treacherous, they were better off asleep in a cave, out of harm's way. Those who didn't try to navigate around rocks and cliffs at night were more likely to leave descendants. This fits a broader principle: A species' sleep pattern tends to suit its ecological niche. Animals with the greatest need to graze and the least ability to hide tend to sleep less. Elephants and horses sleep 3 to 4 hours a day, gorillas 12 hours, and cats 14 hours. For bats and eastern chipmunks, both of which sleep 20 hours, to live is hardly more than to eat and to sleep (Moorcroft, 2003). (Would you rather be like a giraffe and sleep 2 hours a day or a bat and sleep 20?)

"Corduroy pillows make headlines."

Anonymous

Second, *sleep helps us recuperate*. It helps restore and repair brain tissue. Bats and other animals with high waking metabolism burn a lot of calories, producing a lot of *free radicals*, molecules that are toxic to neurons. Sleeping a lot gives resting neurons time to repair themselves, while allowing unused connections to weaken (Siegel, 2003; Vyazovski et al., 2008). Think of it this way: When consciousness leaves your house, brain construction workers come in for a makeover.

But sleep is not just for keeping us safe and for repairing our brain. New research reveals that *sleep is for making memories*—for restoring and rebuilding our fading memories of the day's experiences. People trained to perform tasks recall them better after a night's sleep, or even after a short nap, than after several hours awake (Walker & Stickgold, 2006). And in both humans and rats, neural activity during slow-wave sleep reenacts and promotes recall of prior novel experiences (Peigneux et al., 2004; Ribeiro et al., 2004). In one experiment, people were exposed to the scent of roses while learning the locations of various picture cards. When reexposed to the scent during slow-wave sleep, their memory scratch pad—the hippocampus—was reactivated, and they remembered the picture placements with almost perfect accuracy the next day (Rasch et al., 2007).

Sleep also feeds creative thinking. On occasion, dreams have inspired noteworthy literary, artistic, and scientific achievements, such as the dream that clued chemist August Kekulé to the structure of benzene (Ross, 2006). More commonplace is the boost that a complete night's sleep gives to our thinking and learning. After working on a task, then sleeping on it, people solve problems more insightfully than do those who stay awake (Wagner et al., 2004). They can also, after sleep, better discern connections among different novel pieces of information (Ellenbogen et al., 2007). Even

15-month-olds, if retested after a nap, better recall relationships among novel words (Gómez et al., 2006). To think smart and see connections, it often pays to sleep on it.

Finally, *sleep may play a role in the growth process*. During deep sleep, the pituitary gland releases a growth hormone. As we age, we release less of this hormone and spend less time in deep sleep (Pekkanen, 1982). Such discoveries are beginning to solve the ongoing riddle of sleep.

So when it's time to sleep, pay attention to your body. Ignore that last text message, resist the urge to update your Facebook profile, and succumb to sleep, the gentle tyrant.

Economic-recession stress can rob sleep A National Sleep Foundation (2009) survey found 27 percent of people reporting sleeplessness related to the economy and their personal finances and employment. Higher stress levels, and more restless sleep, may plague those who are unemployed, or underemployed, and seeking new jobs, such as these people. AP Photo/Paul Sakuma

5.1.3 Sleep Disorders

5: What are the major sleep disorders?

No matter what their normal need for sleep, 1 in 10 adults, and 1 in 4 older adults, complain of **insomnia**—not an occasional inability to sleep when anxious or excited, but persistent problems in falling or staying asleep (Irwin et al., 2006).

"The lion and the lamb shall lie down together, but the lamb will not be very sleepy."

Woody Allen, in the movie Love and Death, 1975

From middle age on, sleep is seldom uninterrupted. Being occasionally awakened becomes the norm, not something to fret over or treat with medication. And some people do fret unnecessarily about their sleep (Coren, 1996). In laboratory studies, insomnia complainers do sleep less than others, but they typically overestimate—by about double—how long it takes them to fall asleep. They also underestimate by nearly half how long they actually have slept. Even if we have been awake only an hour or two, we may *think* we have had very little sleep because it's the waking part we remember.

The most common quick fixes for true insomnia—sleeping pills and alcohol—can aggravate the problem, reducing REM sleep and leaving the person with next-day blahs. Relying on sleeping pills—sales of which soared 60 percent from 2000 to 2006 (Saul, 2007)—the person may need increasing doses to get an effect. Then, when the drug is discontinued, the insomnia can worsen.

> "Sleep is like love or happiness. If you pursue it too ardently it will elude you."
>
> Wilse Webb, 1992

Scientists are searching for natural chemicals that are abundant during sleep, hoping they might be synthesized as a sleep aid without side effects. In the meantime, sleep experts offer other natural alternatives:

- Exercise regularly but not in the late evening. (Late afternoon is best.)
- Avoid all caffeine after early afternoon, and avoid rich foods before bedtime. Instead, try a glass of milk, which provides raw materials for the manufacture of serotonin, a neurotransmitter that facilitates sleep.
- Relax before bedtime, using dimmer light.
- Sleep on a regular schedule (rise at the same time even after a restless night) and avoid naps. Sticking to a schedule boosts daytime alertness, too, as shown in an experiment in which University of Arizona students averaged 7.5 hours of sleep a night on either a varying or consistent schedule (Manber et al., 1996).
- Hide the clock face so you aren't tempted to check it repeatedly.
- Reassure yourself that a temporary loss of sleep causes no great harm.
- Realize that for any stressed organism, being vigilant is natural and adaptive. A personal conflict during the day often means a fitful sleep that night (Åkerstedt et al., 2007; Brissette & Cohen, 2002). Managing your stress levels will enable more restful sleeping. (See **Unit 8B** and **Appendix C** for more on stress.)
- If all else fails, settle for less sleep, either going to bed later or getting up earlier.

> "In 1757 Benjamin Franklin gave us the axiom, 'Early to bed, early to rise, makes a man healthy, wealthy, and wise.' It would be more accurate to say 'consistently to bed and consistently to rise…'"
>
> James B. Maas, Power Sleep, 1999

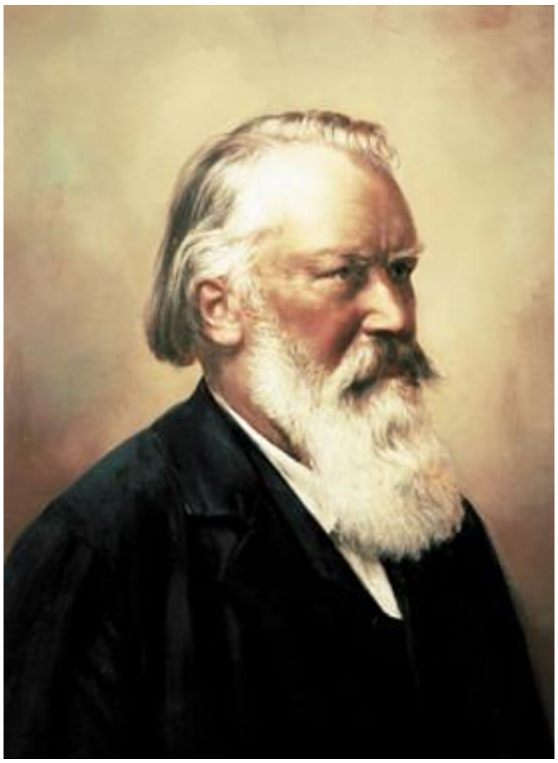
Rarer but also more troublesome than insomnia are the sleep disorders *narcolepsy, sleep apnea, night terrors*, and *sleepwalking*.

Narcolepsy (from *narco*, "numbness," and *lepsy*, "seizure") sufferers experience periodic, overwhelming sleepiness. Attacks usually last less than 5 minutes but sometimes occur at the most inopportune times, perhaps just after taking a terrific swing at a softball or when laughing loudly, shouting angrily, or having sex (Dement, 1978, 1999). In severe cases, the person may collapse directly into a brief period of REM sleep, with its accompanying loss of muscular tension. People with narcolepsy—1 in 2000 of us, estimates the Stanford University Center for Narcolepsy (2002)—must therefore live with extra caution. As a traffic menace, "snoozing is second only to boozing," says the American Sleep Disorders Association, and those with narcolepsy are especially at risk (Aldrich, 1989).

At the twentieth century's end, researchers discovered a gene causing narcolepsy in dogs (Lin et al., 1999; Taheri, 2004). Genes help sculpt the brain, and neuroscientists are searching the brain for abnormalities linked with narcolepsy. One team of researchers discovered a relative absence of a hypothalamic neural center that produces *orexin* (also called hypocretin), a neurotransmitter linked to alertness (Taheri et al., 2002; Thannickal et al., 2000). (That discovery has led to the clinical testing of a new sleeping pill that works by blocking orexin's arousing activity.) Narcolepsy, it is now clear, is a brain disease; it is not just "in your mind." And this gives hope that narcolepsy might be effectively relieved by a drug that mimics the missing orexin and can sneak through the blood-brain barrier (Fujiki et al., 2003; Siegel, 2000). In the meantime, physicians are prescribing other drugs to relieve narcolepsy's sleepiness in humans.

Imagine observing a person with narcolepsy in medieval times. Might such symptoms (especially the instant dreams from dropping into REM sleep) have seemed like demon possession?

Sleep apnea also puts millions of people at increased risk of traffic accidents (Teran-Santos et al., 1999). Although 1 in 20 of us has this disorder, it was unknown before modern sleep research. *Apnea* means "with no breath," and people with this condition intermittently stop breathing during sleep. After an airless minute or so, decreased blood oxygen arouses them and they wake up enough to snort in air for a few seconds, in a process that repeats hundreds of times each night, depriving them of slow-wave sleep. Apart from complaints of sleepiness and irritability during the day—and their mate's complaints about their loud "snoring"—apnea sufferers are often unaware of their disorder. The next morning they have no recall of these episodes, and may just report feeling fatigued and depressed (Peppard et al., 2006).



Did Brahms need his own lullabies? Cranky, overweight, and nap-prone, Johannes Brahms exhibited common symptoms of sleep apnea (Margolis, 2000). Archivo Iconografico, S.A./Corbis

Sleep apnea is associated with obesity, and as the number of obese people in the United States has increased, so has this disorder, particularly among overweight men, including some football players (Keller, 2007). Anyone who snores at night, feels tired during the day, and possibly has high blood pressure as well (increasing the risk of a stroke or heart attack) should be checked for apnea (Dement, 1999). A physician may prescribe a masklike device with an air pump that keeps the sleeper's airway open and breathing regular. If one doesn't mind looking a little goofy in the dark (imagine a snorkeler at a slumber party), the treatment can effectively treat both the apnea and associated depressed energy and mood.

Unlike sleep apnea, **night terrors** target mostly children, who may sit up or walk around, talk incoherently, experience a doubling of heart and breathing rates, and appear terrified (Hartmann, 1981). They seldom wake up fully during an episode and recall little or nothing the next morning—at most, a fleeting, frightening image. Night terrors are not nightmares (which, like other dreams, typically occur during early morning REM sleep); night terrors usually occur during the first few hours of Stage 4.

Children also are most prone to *sleepwalking*—another Stage 4 sleep disorder—and to *sleeptalking*, conditions that run in families. Finnish twin studies reveal that occasional childhood sleepwalking occurs for about one-third of those with a sleepwalking fraternal twin and half of those with a sleepwalking identical twin. The same is true for sleeptalking (Hublin et al., 1997, 1998). Sleepwalking is usually harmless and unrecalled the next morning. Sleepwalkers typically return to bed on their own or are guided there by a family member. Young children, who have the deepest and lengthiest Stage 4 sleep, are the most likely to experience both night terrors and sleepwalking. As we grow older and deep Stage 4 sleep diminishes, so do night terrors and sleepwalking. After being sleep deprived, people sleep more deeply, which increases any tendency to sleepwalk (Zadra et al., 2008).

5.1.4 Dreams

6: What do we dream?

Now playing at an inner theater near you: the premiere showing of a sleeping person's vivid dream. This never-before-seen mental movie features captivating characters wrapped in a plot so original and unlikely, yet so intricate and so seemingly real, that the viewer later marvels at its creation.

"I do not believe that I am now dreaming, but I cannot prove that I am not."

Philosopher Bertrand Russell (1872–1970)

Waking from a troubling dream, wrenched by its emotions, who among us has not wondered about this weird state of consciousness? How can our brain so creatively, colorfully, and completely construct this alternative, conscious world? In the shadowland between our dreaming and waking consciousness, we may even wonder for a moment which is real.

Discovering the link between REM sleep and dreaming opened a new era in dream research. Instead of relying on someone's hazy recall hours or days after having a dream, researchers could catch dreams as they happened. They could awaken people during or within 3 minutes after a REM sleep period and hear a vivid account.

What We Dream

REM **dreams**—"hallucinations of the sleeping mind"(Loftus & Ketcham, 1994, p. 67)—are vivid, emotional, and bizarre. They are unlike daydreams, which tend to involve the familiar details of our life—perhaps picturing ourselves explaining to a teacher why a paper will be late, or replaying in our mind personal encounters we relish or regret. The dreams of REM sleep are so vivid we may confuse them with reality. Awakening from a nightmare, a 4-year-old may be sure there is a bear in the house.

Would you suppose that people dream if blind from birth? Studies of blind people in France, Hungary, Egypt, and the United States all found them dreaming of using their nonvisual senses—hearing, touching, smelling, tasting (Buquet, 1988; Taha, 1972; Vekassy, 1977).

We spend six years of our life in dreams, many of which are anything but sweet. For both women and men, 8 in 10 dreams are marked by at least one negative event or emotion (Domhoff, 2007). People commonly dream of repeatedly failing in an attempt to do something; of being attacked, pursued, or rejected; or of experiencing misfortune (Hall et al., 1982). Dreams with sexual imagery occur less often than you might think. In one study, only 1 dream in 10 among young men and 1 in 30 among young women had sexual overtones (Domhoff, 1996). More commonly, the story line of our dreams—what Sigmund Freud called their **manifest content**—incorporates traces of previous days' nonsexual experiences and preoccupations (De Koninck, 2000):

- After suffering a trauma, people commonly report nightmares (Levin & Nielsen, 2007). One sample of Americans who were recording their dreams during September 2001 reported an increase in threatening dreams following the 9/11 attack (Propper et al., 2007).
- After playing a computer game for seven hours and then being awakened repeatedly during their first hour of sleep, 3 in 4 people reported experiencing images of the game (Stickgold et al., 2000).
- People in hunter-gatherer societies often dream of animals; urban Japanese rarely do (Mestel, 1997).
- Compared with nonmusicians, musicians report twice as many dreams of music (Uga et al., 2006).

"For what one has dwelt on by day, these things are seen in visions of the night."

Menander of Athens(342–292 b.c.e.), Fragments

"Follow your dreams, except for that one where you're naked at work."

Attributed to Henny Youngman

Sensory stimuli in our sleeping environment may also intrude. A particular odor or the telephone's ringing may be instantly and ingeniously woven into the dream story. In a classic experiment, William Dement and Edward Wolpert (1958) lightly sprayed cold water on dreamers' faces. Compared with sleepers who did not get the cold-water treatment, these people were more likely to dream about a waterfall, a leaky roof, or even about being sprayed by someone. Even while in REM sleep, focused on internal stimuli, we maintain some awareness of changes in our external environment.

A popular sleep myth: If you dream you are falling and hit the ground (or if you dream of dying), you die. (Unfortunately, those who could confirm these ideas are not around to do so. Some people, however, have had such dreams and are alive to report them.)

So, could we learn a foreign language by hearing it played while we sleep? If only it were so easy. While sleeping we can learn to associate a sound with a mild electric shock (and to react to the sound accordingly). But we do not remember recorded information played while we are soundly asleep (Eich, 1990; Wyatt & Bootzin, 1994). In fact, anything that happens during the 5 minutes just before we fall asleep is typically lost from memory (Roth et al., 1988). This explains why sleep apnea patients, who repeatedly awaken with a gasp and then immediately fall back to sleep, do not recall the episodes. It also explains why dreams that momentarily awaken us are mostly forgotten by morning. To remember a dream, get up and stay awake for a few minutes.

MAXINE

Why We Dream

7: What is the function of dreams?

Dream theorists have proposed several explanations of why we dream, including these:

> "When people interpret [a dream] as if it were meaningful and then sell those interpretations, it's quackery."
>
> Sleep researcher J. Allan Hobson (1995)

To satisfy our own wishes. In 1900, in his landmark book *The Interpretation of Dreams*, Freud offered what he thought was "the most valuable of all the discoveries it has been my good fortune to make": Dreams provide a psychic safety valve that discharges otherwise unacceptable feelings. According to Freud, a dream's *manifest* (apparent) *content* is a censored, symbolic version of its **latent content,** which consists of unconscious drives and wishes that would be threatening if expressed directly. Although most dreams have no overt sexual imagery, Freud nevertheless believed that most adult dreams can be "traced back by analysis to erotic wishes." Thus, a gun might be a disguised representation of a penis.

Freud considered dreams the key to understanding our inner conflicts. However, his critics say it is time to wake up from Freud's dream theory, which is a scientific nightmare. Based on the accumulated science, "there is no reason to believe any of Freud's specific claims about dreams and their purposes," notes dream researcher William Domhoff (2003). Some contend that even if dreams are symbolic, they could be interpreted any way one wished. Others maintain that dreams hide nothing. A dream about a gun is a dream about a gun. Legend has it that even Freud, who loved to smoke cigars, acknowledged that “sometimes, a cigar is just a cigar.” Freud’s wish-fulfillment theory of dreams has in large part given way to other theories.

To file away memories. Researchers who see dreams as *information processing* believe that dreams may help sift, sort, and fix the day’s experiences in our memory. As we noted earlier, people tested the next day generally improve on a learned task after a night of memory consolidation. Even after two nights of recovery sleep, those who have been deprived of both slow-wave and REM sleep don’t do as well as those who sleep undisturbed on their new learning (Stickgold et al., 2000, 2001). People who hear unusual phrases or learn to find hidden visual images before bedtime remember less the next morning if awakened every time they begin REM sleep than they do if awakened during other sleep stages (Empson & Clarke, 1970; Karni & Sagi, 1994).

Brain scans confirm the link between REM sleep and memory. The brain regions that buzz as rats learn to navigate a maze, or as people learn to perform a visual-discrimination task, buzz again during later REM sleep (Louie & Wilson, 2001; Maquet, 2001). So precise are these activity patterns that scientists can tell where in the maze the rat would be if awake.

Rapid eye movements also stir the liquid behind the cornea; this delivers fresh oxygen to corneal cells, preventing their suffocation

Some researchers are unpersuaded by these studies (Siegel, 2001; Vertes & Siegel, 2005). They note that memory consolidation may occur independent of dreaming, including during NREM sleep. But this much seems true: A night of solid sleep (and dreaming) has an important place in our lives. To sleep, perchance to remember. This is important news for students, many of whom, researcher Robert Stickgold (2000) believes, suffer from a kind of sleep bulimia—binge-sleeping on the weekend. “If you don’t get good sleep and enough sleep after you learn new stuff, you won’t integrate it effectively into your memories,” he warns. That helps explain why high school students with high grades average 25 minutes more sleep a night and go to bed 40 minutes earlier than their lower-achieving classmates (Wolfson & Carskadon, 1998).

To develop and preserve neural pathways. Some researchers speculate that dreams may also serve a *physiological* function. Perhaps the brain activity associated with REM sleep provides the sleeping brain with periodic stimulation. This theory makes developmental sense. As you will see in **Unit 9**, stimulating experiences develop and preserve the brain’s neural pathways. Infants, whose neural networks are fast developing, spend much of their abundant sleep time in REM sleep (**Figure 5.8**).

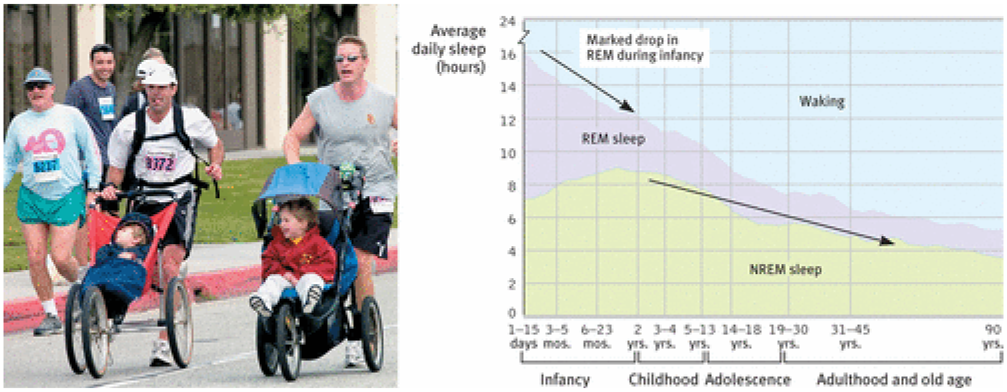


Figure 5.8 **Sleep across the life span** As we age, our sleep patterns change. During our first few months, we spend progressively less time in REM sleep. During our first 20 years, we spend progressively less time asleep. (Adapted from Snyder & Scott, 1972.) Tom Prettyman/PhotoEdit, Inc.

Question: Does eating spicy foods cause one to dream more?

Answer: Any food that causes you to awaken more increases your chance of recalling a dream (Moorcroft, 2003).

To make sense of neural static. Other theories propose that dreams erupt from neural activity spreading upward from the brainstem (Antrobus, 1991; Hobson, 2003, 2004). According to one version—the *activation-synthesis* theory—this neural activity is random, and dreams are the brain's attempt to make sense of it. Much as a neurosurgeon can produce hallucinations by stimulating different parts of a patient's cortex, so can stimulation originating within the brain. These internal stimuli activate brain areas that process visual images, but not the visual cortex area, which receives raw input from the eyes. As Freud might have expected, PET scans of sleeping people also reveal increased activity in the emotion-related limbic system (in the amygdala) during REM sleep. In contrast, frontal lobe regions responsible for inhibition and logical thinking seem to idle, which may explain why our dreams are less inhibited than we are (Maquet et al., 1996). Add the limbic system's emotional tone to the brain's visual bursts and—Voila!—we dream. Damage either the limbic system or the visual centers active during dreaming, and dreaming itself may be impaired (Domhoff, 2003).

To reflect cognitive development. Some dream researchers dispute both the Freudian and activation-synthesis theories, preferring instead to see dreams as part of brain maturation and cognitive development (Domhoff, 2003; Foulkes, 1999). For example, prior to age 9, children's dreams seem more like a slide show and less like an active story in which the dreamer is an actor. Dreams overlap with waking cognition and feature coherent speech. They draw on our concepts and knowledge. **Table 5.2** compares major dream theories.

Table 5.2

Dream Theories		
Theory	**Explanation**	**Critical Considerations**
Freud's wish-fulfillment	Dreams provide a "psychic safety valve"—expressing otherwise unacceptable feelings; contain manifest (remembered) content and a deeper layer of latent content—a hidden meaning.	Lacks any scientific support; dreams may be interpreted in many different ways.
Information-processing	Dreams help us sort out the day's events and consolidate our memories.	But why do we sometimes dream about things we have not experienced?
Physiological function	Regular brain stimulation from REM sleep may help develop and preserve neural pathways.	This may be true, but it does not explain why we experience *meaningful* dreams.
Activation-synthesis	REM sleep triggers neural activity that evokes random visual memories, which our sleeping brain weaves into stories.	The individual's brain is weaving the stories, which still tells us something about the dreamer.
Cognitive development	Dream content reflects dreamers' cognitive development—their knowledge and understanding.	Does not address the neuroscience of dreams.

Although sleep researchers debate dreams' function—and some are skeptical that dreams serve any function—there is one thing they agree on: We need REM sleep. Deprived of it by repeatedly being awakened, people return more and more quickly to the REM stage after falling back to sleep. When finally allowed to sleep undisturbed, they literally sleep like babies—with increased REM sleep, a phenomenon called **REM rebound.** Withdrawing REM-suppressing sleeping medications also increases REM sleep, but with accompanying nightmares.

Most other mammals also experience REM rebound, suggesting that the causes and functions of REM sleep are deeply biological. That REM sleep occurs in mammals—and not in animals such as fish, whose behavior is less influenced by learning—also fits the information-processing theory of dreams.

So does this mean that because dreams serve physiological functions and extend normal cognition, they are psychologically meaningless? Not necessarily. Every psychologically meaningful experience involves an active brain. We are once again reminded of a basic principle: *Biological and psychological explanations of behavior are partners, not competitors*. Dreams may be akin to abstract art—open to more than one meaningful interpretation.

Dreams are a fascinating altered state of consciousness. But they are not the only altered states. Hypnosis and drugs can also alter conscious awareness.

5.2 Hypnosis

8: What is hypnosis, and what powers does a hypnotist have over a hypnotized subject?

IMAGINE YOU ARE ABOUT TO BE hypnotized. The hypnotist invites you to sit back, fix your gaze on a spot high on the wall, and relax. In a quiet voice the hypnotist suggests, "Your eyes are growing tired…Your eyelids are becoming heavy…now heavier and heavier…They are beginning to close…You are becoming more deeply relaxed…Your breathing is now deep and regular…Your muscles are becoming more and more relaxed. Your whole body is beginning to feel like lead."

After a few minutes of this *hypnotic induction*, you may experience **hypnosis.** When the hypnotist suggests, "Your eyelids are shutting so tight that you cannot open them even if you try," it may indeed seem beyond your control to open your eyelids. Told to forget the number 6, you may be puzzled when you count 11 fingers on your hands. Invited to smell a sensuous perfume that is actually ammonia, you may linger delightedly over its pungent odor. Told that you cannot see a certain object, such as a chair, you may indeed report that it is not there, although you manage to avoid the chair when walking around (illustrating once again that two-track mind of yours).

But is hypnosis really an *altered* state of consciousness? Let's start with some agreed-upon facts.

5.2.1 Facts and Falsehoods

Those who study hypnosis have agreed that its power resides not in the hypnotist but in the subject's openness to suggestion (Bowers, 1984). Hypnotists have no magical mind-control power; they merely engage people's ability to focus on certain images or behaviors. But how open to suggestions are we?

Can Anyone Experience Hypnosis?

To some extent, we are all open to suggestion. When people stand upright with their eyes closed and are told that they are swaying back and forth, most will indeed sway a little. In fact, *postural sway* is one of the items assessed on the Stanford Hypnotic Susceptibility Scale. People who respond to such suggestions without hypnosis are the same people who respond with hypnosis (Kirsch & Braffman, 2001).

After giving a brief hypnotic induction, a hypnotist suggests a series of experiences ranging from easy (your outstretched arms will move together) to difficult (with eyes open, you will see a nonexistent person). Highly hypnotizable people—say, the 20 percent who can carry out a suggestion not to smell or react to a bottle of ammonia held under their nose—are those who easily become deeply absorbed in imaginative activities (Barnier & McConkey, 2004; Silva & Kirsch, 1992). Typically, they have rich fantasy lives and become absorbed in the imaginary events of a novel or movie. (Perhaps you can recall being riveted by a movie into a trancelike state, oblivious to the people or noise surrounding you.) Many researchers refer to hypnotic "susceptibility" as hypnotic *ability*—the ability to focus attention totally on a task, to become imaginatively absorbed in it, to entertain fanciful possibilities.

Indeed, anyone who can turn attention inward and imagine is able to experience some degree of hypnosis—because that's what hypnosis is. And virtually anyone will experience hypnotic responsiveness if led to *expect* it. Imagine being asked to stare at a high spot and then hearing that "your eyes are growing tired…your eyelids are becoming heavy." With such strain, anyone's eyes would get tired. (Try looking up for 30 seconds.) But you likely would attribute your heavy eyelids to the hypnotist's abilities and then become more open to other suggestions.

Can Hypnosis Enhance Recall of Forgotten Events?

"Hypnosis is not a psychological truth serum and to regard it as such has been a source of considerable mischief."

Researcher Kenneth Bowers (1987)

Can hypnotic procedures enable people to recall kindergarten classmates? To retrieve forgotten or suppressed details of a crime? Should testimony obtained under hypnosis be admissible in court?

Most people believe (wrongly, as **Unit 7A** will explain) that our experiences are all "in there," recorded in our brain and available for recall if only we can break through our own defenses (Loftus, 1980). In one community survey, 3 in 4 people agreed with the inaccurate statement that hypnosis enables people to "recover accurate memories as far back as birth" (Johnson & Hauck, 1999). But 60 years of research disputes such claims of age regression—the supposed ability to relive childhood experiences. Age-regressed people act as they believe children would, but they typically miss the mark by outperforming real children of the specified age (Silverman & Retzlaff, 1986). They may, for example, feel childlike and print much as they know a 6-year-old would. But they sometimes do so with perfect spelling and typically without any change in their adult brain waves, reflexes, and perceptions.

See **Unit 7A** for a more detailed discussion of how people may construct false memories.

"Hypnotically refreshed" memories combine fact with fiction. Without either person being aware of what is going on, a hypnotist's hints—"Did you hear loud noises?"—can plant ideas that become the subject's pseudomemory. Thus, American, Australian, and British courts generally ban testimony from witnesses who have been hypnotized (Druckman & Bjork, 1994; Gibson, 1995; McConkey, 1995).

Other striking examples of memories created under hypnosis come from the thousands of people who since 1980 have reported being abducted by UFOs. Most such reports have come from people who are predisposed to believe in aliens, are highly hypnotizable, and have undergone hypnosis (Newman & Baumeister, 1996; Nickell, 1996).

Can Hypnosis Force People to Act Against Their Will?

Researchers have induced hypnotized people to perform an apparently dangerous act: plunging one hand briefly into fuming "acid," then throwing the "acid" in a researcher's face (Orne & Evans, 1965). Interviewed a day later, these people exhibited no memory of their acts and emphatically denied they would ever follow such orders.

"It wasn't what I expected. But facts are facts, and if one is proved to be wrong, one must just be humble about it and start again."

Agatha Christie's Miss Marple

Had hypnosis given the hypnotist a special power to control others against their will? To find out, researchers Martin Orne and Frederich Evans unleashed that enemy of so many illusory beliefs—the control group. Orne asked other individuals to *pretend* they were hypnotized. Laboratory assistants, unaware that those in the experiment's control group had not been hypnotized, treated both groups the same. The result? All the *un*hypnotized participants (perhaps believing that the laboratory context assured safety) performed the same acts as those who were hypnotized.

Such studies illustrate a principle that **Unit 14** emphasizes: An authoritative person in a legitimate context can induce people—hypnotized or not—to perform some unlikely acts. Hypnosis researcher Nicholas Spanos (1982) put it directly: "The overt behaviors of hypnotic subjects are well within normal limits."

Can Hypnosis Be Therapeutic?

Hypnotherapists try to help patients harness their own healing powers (Baker, 1987). **Posthypnotic suggestions** have helped alleviate headaches, asthma, and stress-related skin disorders. One woman, who for more than 20 years suffered from open sores all over her body, was asked to imagine herself swimming in shimmering, sunlit liquids that would cleanse her skin, and to experience her skin as smooth and unblemished. Within three months her sores had disappeared (Bowers, 1984).

In one statistical digest of 18 studies, the average client whose therapy was supplemented with hypnosis showed greater improvement than 70 percent of other therapy patients (Kirsch et al., 1995, 1996). Hypnosis seemed especially helpful for the treatment of obesity. However, drug, alcohol, and smoking addictions have not responded well to hypnosis (Nash, 2001). In controlled studies, hypnosis speeds the disappearance of warts, but so do the same positive suggestions given without hypnosis (Spanos, 1991, 1996).

Can Hypnosis Alleviate Pain?

Yes, hypnosis *can* relieve pain (Druckman & Bjork, 1994; Patterson, 2004). When unhypnotized people put their arm in an ice bath, they feel intense pain within 25 seconds. When hypnotized people do the same after being given suggestions to feel no pain, they indeed report feeling little pain. As some dentists know, even light hypnosis can reduce fear, thus reducing hypersensitivity to pain.

Nearly 10 percent of us can become so deeply hypnotized that we can even undergo major surgery without anesthesia. Half of us can gain at least some pain relief from hypnosis. In surgical experiments, hypnotized patients have required less medication, recovered sooner, and left the hospital earlier than unhypnotized controls, thanks to the inhibition of pain-related brain activity (Askay & Patterson, 2007; Spiegel, 2007). The surgical use of hypnosis has flourished in Europe, where one Belgian medical team has performed more than 5000 surgeries with a combination of hypnosis, local anesthesia, and a mild sedative (Song, 2006).

5.2.2 Explaining the Hypnotized State

9: **Is hypnosis an extension of normal consciousness or an altered state?**

We have seen that hypnosis involves heightened suggestibility. We have also seen that hypnotic procedures do not endow a person with special powers. But they can sometimes help people overcome stress-related ailments and cope with pain. So, just what *is* hypnosis? And is hypnosis an *altered* state of consciousness?

Hypnosis as a Social Phenomenon

Some researchers believe that hypnotic phenomena reflect the workings of normal consciousness and the power of social influence (Lynn et al., 1990; Spanos & Coe, 1992). They point out how powerfully our interpretations and attentional spotlight influence our ordinary perceptions.

Does this mean that people are consciously faking hypnosis? No—like actors caught up in their roles, subjects begin to feel and behave in ways appropriate for "good hypnotic subjects." The more they like and trust the hypnotist, the more they allow that person to direct their attention and fantasies (Gfeller et al., 1987). "The hypnotist's ideas become the subject's thoughts," explained Theodore Barber (2000), "and the subject's thoughts produce the hypnotic experiences and behaviors." If told to scratch their ear later when they hear the word *psychology*, subjects will likely do so only if they think the experiment is still under way (and scratching is therefore expected). If an experimenter eliminates their motivation for acting hypnotized—by stating that hypnosis reveals their "gullibility"—subjects become unresponsive.

Based on such findings, advocates of the *social influence theory* contend that hypnotic phenomena—like the behaviors associated with other supposed altered states, such as dissociative identity disorder (**Unit 12**) and spirit or demon possession—are an extension of everyday social behavior, not something unique to hypnosis (Spanos, 1994, 1996).

Hypnosis as Divided Consciousness

Most hypnosis researchers grant that normal social and cognitive processes play a part in hypnosis, but they nevertheless believe hypnosis is more than inducing someone to play the role of "good subject." For one thing, hypnotized subjects will sometimes carry out suggested behaviors on cue, even when they believe no one is watching (Perugini et al., 1998). Moreover, distinctive brain activity accompanies hypnosis. When deeply hypnotized people in one experiment were asked to imagine a color, areas of their brain lit up as if they were really seeing the color. Mere imagination had become—to the hypnotized person's brain—a compelling hallucination (Kosslyn et al., 2000). Another experiment invited hypnotizable or nonhypnotizable people to say the color of letters—an easy task that slows if, say, green letters form the conflicting word **RED** (Raz et al., 2005). When given a suggestion to focus on the color and to perceive the letters as irrelevant gibberish, easily hypnotized people became much less slowed by the word-color conflict. (Brain areas that decode words and detect conflict remained inactive.)

These results would not have surprised famed researcher Ernest Hilgard (1986, 1992), who believed hypnosis involves not only social influence but also a special state of

dissociation—a split between different levels of consciousness. Hilgard viewed hypnotic dissociation as a vivid form of everyday mind splits—similar to doodling while listening to a teacher or keying in the end of a sentence while starting a conversation. Hilgard felt that when, for example, hypnotized people lower their arm into an ice bath, as in **Figure 5.9**, hypnosis dissociates the sensation of the pain stimulus (of which the subjects are still aware) from the emotional suffering that defines their experience of pain. The ice water therefore feels cold—very cold—but not painful.

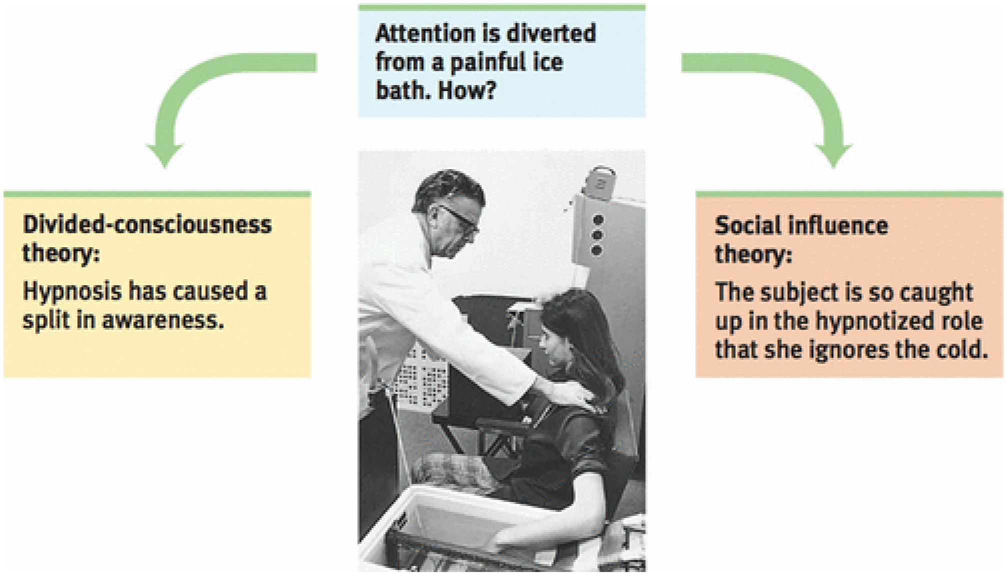


Figure 5.9 **Dissociation or role-playing?** This hypnotized woman tested by Ernest Hilgard exhibited no pain when her arm was placed in an ice bath. But asked to press a key if some part of her felt the pain, she did so. To Hilgard, this was evidence of dissociation, or divided consciousness. Proponents of social influence theory, however, maintain that people responding this way are caught up in playing the role of "good subject." Courtesy of News and Publications Service, Stanford University

Hypnotic pain relief may also result from another form of dual processing we've discussed—*selective attention*—as when an injured athlete, caught up in the competition, feels little or no pain until the game ends. Support for this view comes from PET scans showing that hypnosis reduces brain activity in a region that processes painful stimuli, but not in the sensory cortex, which receives the raw sensory input (Rainville et al., 1997). Hypnosis does not block sensory input, but it may block our *attention* to those stimuli.

The total possible consciousness may be split into parts which co-exist but mutually ignore each other.

William James, Principles of Psychology, 1890

Although the divided-consciousness theory of hypnosis is controversial, this much seems clear: There is, without doubt, much more to thinking and acting than we are conscious of. Our information processing, which starts with selective attention, is divided into simultaneous conscious and nonconscious realms. In hypnosis as in life, *much of our behavior occurs on autopilot*. We have two-track minds.

Yet, there is also little doubt that social influences do play an important role in hypnosis. So, might the two views—social influence and divided consciousness—be bridged? Researchers John Kihlstrom and Kevin McConkey (1990) believe there is no contradiction between the two approaches, which are converging toward a *unified account of hypnosis*. Hypnosis, they suggest, is an extension *both* of normal principles of social influence *and* of everyday dissociations between our conscious awareness and our automatic behaviors. Hypnosis researchers are moving beyond the "hypnosis is social influence" *versus* "hypnosis is divided consciousness" debate (Killeen & Nash, 2003; Woody & McConkey, 2003). They are instead exploring how brain activity, attention, and social influences interact to affect hypnotic phenomena (**Figure 5.10**).

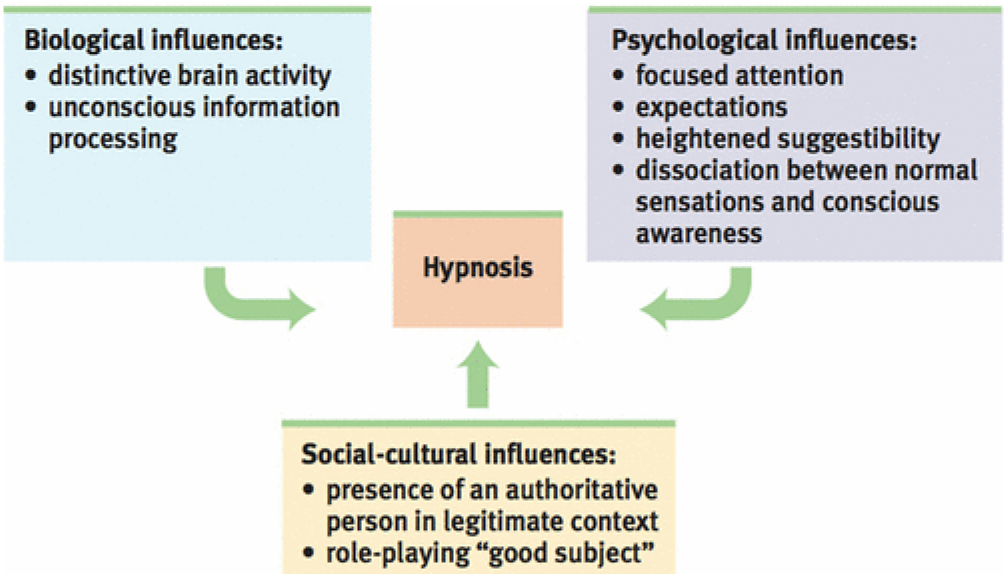


Figure 5.10 Levels of analysis for hypnosis Using a biopsychosocial approach, researchers explore hypnosis from complementary perspectives.

5.3 Drugs and Consciousness

THERE IS CONTROVERSY ABOUT WHETHER hypnosis uniquely alters consciousness, but there is little dispute that some drugs do. **Psychoactive drugs** are chemicals that change perceptions and moods through their actions at the neural synapses (see **Unit 3A**). Let's imagine a day in the life of a legal-drug user. It begins with a wake-up latte. By midday, several cigarettes have calmed frazzled nerves before an appointment at the plastic surgeon's office for wrinkle-smoothing Botox injections. A diet pill before dinner helps stem the appetite, and its stimulating effects can later be partially offset with a glass of wine and two Tylenol PMs. And if performance needs enhancing, there are beta blockers for onstage performers, Viagra for middle-aged men, hormone-delivering "libido patches" for middle-aged women, and Adderall for students hoping to focus their concentration. Before drifting off into REM-depressed sleep, our hypothetical drug user is dismayed by news reports of pill-sharing, pill-popping college students and of celebrity deaths attributed to accidental overdoses of lethal drug combinations.

"*Just tell me where you kids got the idea to take so many drugs.*" © 1992 by Sidney Harris.

5.3.1 Dependence and Addiction

10: What are tolerance, dependence, and addiction, and what are some common misconceptions about addiction?

Why might a person who rarely drinks alcohol get tipsy on one can of beer, but a heavy drinker show few effects until the second six-pack? Continued use of alcohol and other psychoactive drugs produces **tolerance.** As the user's brain adapts its chemistry to offset the drug effect (a process called *neuroadaptation*), the user requires larger and larger doses to experience the same effect (**Figure 5.11**). Despite the connotations of alcohol "tolerance," the brain, heart, and liver of a person addicted to alcohol suffer damage from the excessive alcohol being "tolerated."

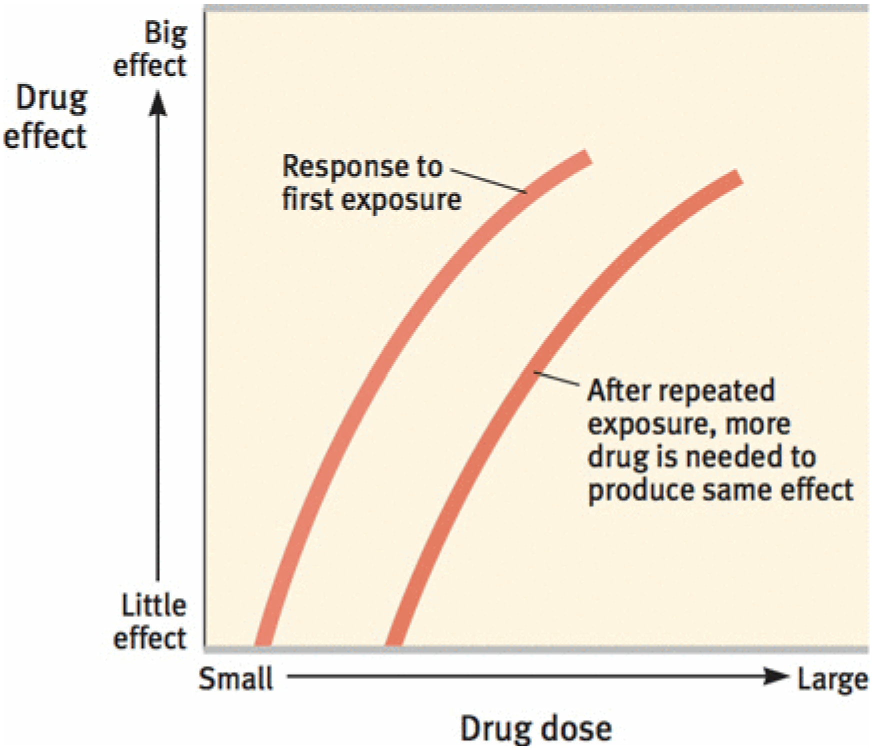


Figure 5.11 Drug tolerance With repeated exposure to a psychoactive drug, the drug's effect lessens. Thus, it takes bigger doses to get the desired effect.

Users who stop taking psychoactive drugs may experience the undesirable side effects of **withdrawal.** As the body responds to the drug's absence, the user may feel physical pain and intense cravings, indicating **physical dependence.** People can also develop **psychological dependence,** particularly for stress-relieving drugs. Such drugs, although not physically addictive, can become an important part of the user's life, often as a way of relieving negative emotions. With either physical or psychological dependence, the user's primary focus may be obtaining and using the drug.

Misconceptions About Addiction

An **addiction** is a compulsive craving for a substance despite adverse consequences and often with physical symptoms such as aches, nausea, and distress following sudden withdrawal. Worldwide, reports the World Health Organization (2008), 90 million people suffer from such problems related to alcohol and other drugs.

The odds of getting hooked after trying various drugs:

Marijuana	9%
Alcohol	15%
Heroin	23%
Tobacco	32%

Source: National Academy of Science, Institute of Medicine (Brody, 2003).

In recent pop psychology, the supposedly irresistible seduction of addiction has been extended to cover many behaviors formerly considered bad habits or even sins. Has the concept been stretched too far? Are addictions as irresistible as commonly believed? Many drug researchers argue that the following three common beliefs about addiction are *myths:*

Myth 1. Addictive drugs quickly corrupt; for example, morphine taken to control pain is powerfully addictive and often leads to heroin abuse. People given morphine to control pain rarely develop the cravings of the addict who uses morphine as a mood-altering drug (Melzack, 1990). But some people—perhaps 10 percent—do indeed have a hard time using a psychoactive drug in moderation or stopping altogether. Even so, controlled, occasional users of drugs such as alcohol and marijuana far outnumber those addicted to these substances (Gazzaniga, 1988; Siegel, 1990). "Even for a very addictive drug like cocaine, only 15 to 16 percent of people become addicted within 10 years of first use," report Terry Robinson and Kent Berridge (2003). Much the same is true for rats, only some of which become compulsively addicted to cocaine (Deroche-Garmonet et al., 2004).

Myth 2. Addictions cannot be overcome voluntarily; therapy is required. Addictions can be powerful, and some addicts do benefit from treatment programs. Alcoholics Anonymous, for example, has supported many people in overcoming their alcohol dependence. But the recovery rates of treated and untreated groups differ less than one might suppose. Helpful as therapy or group support may be, people often recover on their own.

"About 70 percent of Americans have tried illicit drugs, but…only a few percent have done so in the last month…. Past age 35, the casual use of illegal drugs virtually ceases." Having sampled the pleasures and their aftereffects, "most people eventually walk away."

Neuropsychologist Michael Gazzaniga (1997)

Moreover, viewing addiction as a disease, as diabetes is a disease, can undermine self-confidence and the will to change cravings that, without treatment, "one cannot fight." And that, critics say, would be unfortunate, for many people do voluntarily stop using addictive drugs, without treatment. Most of America's 41 million ex-smokers kicked the habit on their own, usually after prior failed efforts or treatments.

Myth 3. We can extend the concept of addiction to cover not just drug dependencies, but a whole spectrum of repetitive, pleasure-seeking behaviors. We can, and we have, but should we? The addiction-as-disease-needing-treatment idea has been suggested for a host of driven behaviors, including too much eating, shopping, exercise, sex, gambling, and work. Initially, we may use the term metaphorically ("I'm a science fiction addict"), but if we begin taking the metaphor as reality, addiction can become an all-purpose excuse. Those who embezzle to feed their "gambling addiction," surf the Web half the night to satisfy their "Internet addiction," or abuse or betray to indulge their "sex addiction" can then explain away their behavior as an illness.

Sometimes, though, behaviors such as gambling, playing video games, or surfing the Internet do become compulsive and dysfunctional, much like abusive drug taking (Griffiths, 2001; Hoeft et al., 2008). Some Internet users, for example, do display an apparent inability to resist logging on, and staying on, even when this excessive use impairs their work and relationships (Ko et al., 2005). So, there may be justification for stretching the addiction concept to cover certain social behaviors. Debates over the addiction-as-disease model continue.

5.3.2 Psychoactive Drugs

11: What are depressants, and what are their effects?

"That is not one of the seven habits of highly effective people." © The New Yorker Collection 1998. Leo Cullum from cartoonbank.com. All Rights Reserved.

The three major categories of psychoactive drugs—*depressants, stimulants*, and *hallucinogens*—all do their work at the brain's synapses. They stimulate, inhibit, or mimic the activity of the brain's own chemical messengers, the neurotransmitters. Our culturally influenced expectations also play a role in the way these drugs affect us (Ward, 1994). If one culture assumes that a particular drug produces euphoria (or aggression or sexual arousal) and another does not, each culture may find its expectations fulfilled.

Depressants

Depressants are drugs such as alcohol, barbiturates (tranquilizers), and opiates that calm neural activity and slow body functions.

Alcohol True or false? In large amounts, alcohol is a depressant; in small amounts, it is a stimulant. *False*. Low doses of alcohol may, indeed, enliven a drinker, but they do so by slowing brain activity that controls judgment and inhibitions. Alcohol lowers our inhibitions, slows neural processing, disrupts memory formation, and reduces self-awareness.

Disinhibition Alcohol is an equal-opportunity drug: It increases harmful tendencies—as when angered people become aggressive after drinking. And it increases helpful tendencies—as when tipsy restaurant patrons leave extravagant tips (M. Lynn, 1988). The urges you would feel if sober are the ones you will more likely act upon when intoxicated.

Slowed Neural Processing Low doses of alcohol relax the drinker by slowing sympathetic nervous system activity. In larger doses, alcohol can become a staggering problem: Reactions slow, speech slurs, skilled performance deteriorates. Paired with sleep deprivation, alcohol is a potent sedative. (Although either sleep deprivation or drinking can put a driver at risk, their combination is deadlier yet.) These physical effects, combined with lowered inhibitions, contribute to alcohol's worst consequences—the several hundred thousand lives claimed worldwide each year in alcohol-related accidents and violent crime. Car accidents occur despite most drinkers' belief (when sober) that driving under the influence of alcohol is wrong and despite their insisting that they would not do so. Yet, as blood-alcohol levels rise and moral judgments falter, people's qualms about drinking and driving lessen. Virtually all will drive home from a bar, even if given a breathalyzer test and told they are intoxicated (Denton & Krebs, 1990; MacDonald et al., 1995).

Dangerous disinhibition Alcohol consumption leads to feelings of invincibility, which become especially dangerous behind the wheel of a car, such as this one totaled by a teenage drunk driver. This Colorado University Alcohol Awareness Week exhibit prompted many students to post their own anti-drinking pledges (white flags). Ray Ng/Time & Life Pictures/Getty Images

Memory Disruption Alcohol also disrupts the processing of recent experiences into long-term memories. Thus, heavy drinkers may not recall people they met the night before or what they said or did while intoxicated. These blackouts result partly from the way alcohol suppresses REM sleep, which helps fix the day's experiences into permanent memories.

The effects of heavy drinking on the brain and cognition can be long-term. In rats, at a development period corresponding to human adolescence, binge-drinking diminishes the genesis of nerve cells, impairs the growth of synaptic connections, and contributes to nerve cell death (Crews et al., 2006, 2007). MRI scans show another way prolonged and excessive drinking can affect cognition (**Figure 5.12**). It can shrink the brain, especially in women, who have less of a stomach enzyme that digests alcohol (Wuethrich, 2001). Girls and young women can also become addicted to alcohol more quickly than boys and young men do, and they are at risk for lung, brain, and liver damage at lower consumption levels (CASA, 2003).

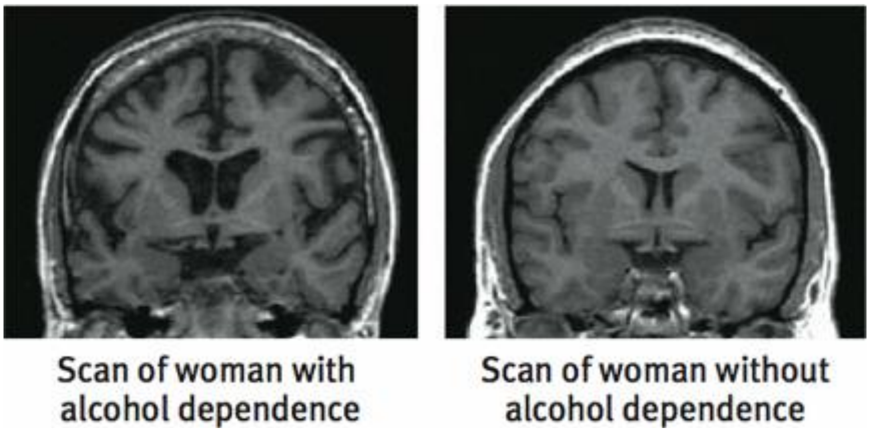


Figure 5.12 **Alcohol dependence shrinks the brain** MRI scans show brain shrinkage in women with alcohol dependence (left) compared with women in a control group (right). Daniel Hommer, NIAAA, NIH, HHS

Reduced Self-Awareness and Self-Control Alcohol not only impairs judgment and memory, it also reduces self-awareness (Hull et al., 1986). This may help explain why people who want to suppress their awareness of failures or shortcomings are more likely to drink than are those who feel good about themselves. Losing a business deal, a game, or a romantic partner sometimes elicits a drinking binge. Excess drinking is especially common when people with low self-esteem experience pain in a romantic relationship (DeHart et al., 2008). By focusing attention on the immediate situation and away from any future consequences, alcohol also lessens impulse control (Steele & Josephs, 1990). In surveys of rapists, more than half acknowledge drinking before committing their offense (Seto & Barbaree, 1995).

Expectancy Effects As with other psychoactive drugs, alcohol's behavioral effects stem not only from its alteration of brain chemistry but also from the user's expectations. When people believe that alcohol affects social behavior in certain ways, and believe, rightly or wrongly, that they have been drinking alcohol, they will behave accordingly (Leigh, 1989). David Abrams and Terence Wilson (1983) demonstrated this in a now-classic experiment. They gave Rutgers University men who volunteered for a study on "alcohol and sexual stimulation" either an alcoholic or a nonalcoholic drink. (Both had strong tastes that masked any alcohol.) In each group, half the participants thought they were drinking alcohol and half thought they were not. After watching an erotic movie clip, the men who thought they had consumed alcohol were more likely to report having strong sexual fantasies and feeling guilt-free. Being able to attribute their sexual responses to alcohol released their inhibitions—whether they actually had drunk alcohol or not. If, as commonly believed, liquor is the quicker pick-her-upper, the effect lies partly in that powerful sex organ, the mind.

Alcohol + Sex = The Perfect Storm Alcohol's effects on self-control and social expectations often converge in sexual situations. More than 600 studies have explored the link between drinking and risky sex, with "the overwhelming majority" finding the two correlated (Cooper, 2006). But of course correlations do not come with causal arrows attached. In this case, three factors appear to influence the correlation.

1. Underlying “third variables,” such as sensation-seeking and peer influences, simultaneously push people toward both drinking and risky sex.
2. The desire for sex leads people to drink and to get their partners to drink. Sexually coercive college men, for example, may lower their dates’ sexual inhibitions by getting them to drink (Abbey, 1991; Mosher & Anderson, 1986).
3. Drinking disinhibits, and when sexually aroused, men become more disposed to sexual aggression, and men and women more disposed to casual sex (Davis et al., 2006; Grello et al., 2006). University women under alcohol’s influence find an attractive but sexually promiscuous man a more appealing potential date than they do when sober. It seems, surmise Sheila Murphy and her colleagues (1998), “that when people have been drinking, the restraining forces of reason may weaken and yield under the pressure of their desires.”

A University of Illinois campus survey showed that before sexual assaults, 80 percent of the male assailants and 70 percent of the female victims had been drinking (Camper, 1990). Another survey of 89,874 American collegians found alcohol or drugs involved in 79 percent of unwanted sexual intercourse experiences (Presley et al., 1997).

Barbiturates The **barbiturate** drugs, or *tranquilizers*, mimic the effects of alcohol. Because they depress nervous system activity, barbiturates such as Nembutal, Seconal, and Amytal are sometimes prescribed to induce sleep or reduce anxiety. In larger doses, they can lead to impaired memory and judgment or even death. If combined with alcohol—as sometimes happens when people take a sleeping pill after an evening of heavy drinking—the total depressive effect on body functions can be lethal.

Opiates The **opiates**—opium and its derivatives—also depress neural functioning. When abusing the opiates, which include *heroin*, a user’s pupils constrict, breathing slows, and lethargy sets in, as blissful pleasure replaces pain and anxiety. But for this short-term pleasure the user may pay a long-term price: a gnawing craving for another fix, a need for progressively larger doses, and the extreme discomfort of withdrawal. When repeatedly flooded with an artificial opiate, the brain eventually stops producing its own opiates, the *endorphins*. If the artificial opiate is then withdrawn, the brain lacks the normal level of these painkilling neurotransmitters. Those who cannot or choose not to tolerate this state may pay an ultimate price—death by overdose. Opiates include the *narcotics*, such as codeine and morphine, which physicians prescribe for pain relief.

Stimulants

12: What are stimulants, and what are their effects?

Stimulants such as caffeine and nicotine temporarily excite neural activity and arouse body functions. People use these substances to stay awake, lose weight, or boost mood or athletic performance. This category of drugs also includes **amphetamines,** the even more powerful cocaine, *Ecstasy* (a stimulant as well as a mild hallucinogen), and **methamphetamine** (“speed”), which is chemically related to its parent drug, *amphetamine* (NIDA, 2002, 2005). All strong stimulants increase heart and breathing rates and cause pupils to dilate, appetite to diminish (because blood sugar increases), and energy and self-confidence to rise. And, as with other drugs, the benefits of stimulants come with a price. These substances can be addictive and may induce an aftermath crash into fatigue, headaches, irritability, and depression (Silverman et al., 1992).

Methamphetamine Methamphetamine has even greater effects, which can include eight hours or so of heightened energy and euphoria. The drug triggers the release of the neurotransmitter dopamine, which stimulates brain cells that enhance energy and mood. In response to a typical amphetamine dose, men show a higher rate of dopamine release than do women, which helps explain their higher addiction rate (Munro et al., 2006).

Dramatic drug-induced decline This woman's methamphetamine addiction led to obvious physical changes. Her decline is evident in these two photos, taken at age 36 (left) and, after four years of addiction, at age 40 (right). National Pictures/Topham/The Image Works

Over time, methamphetamine may reduce baseline dopamine levels, leaving the user with permanently depressed functioning. This drug is highly addictive, and its possible aftereffects include irritability, insomnia, hypertension, seizures, social isolation, depression, and occasional violent outbursts (Homer et al., 2008). The British government now classifies *crystal meth*, the highly addictive crystalized form of methamphetamine, alongside cocaine and heroin as one of the most dangerous drugs (BBC, 2006).

Meth bust As use of the dangerously addictive stimulant methamphetamine has increased, enforcement agencies have increased their efforts to snuff out the labs that produce it. Newscom—Rights managed

> "There is an overwhelming medical and scientific consensus that cigarette smoking causes lung cancer, heart disease, emphysema, and other serious diseases in smokers. Smokers are far more likely to develop serious diseases, like lung cancer, than nonsmokers."
>
> Philip Morris Companies Inc., 1999

Caffeine Caffeine, the world's most widely consumed psychoactive substance, can now be found not only in coffee, tea, and soda but also in fruit juices, mints, energy drinks, bars, and gels—and even in soap. Coffees and teas vary in their caffeine content, with a cup of drip coffee surprisingly having more caffeine than a shot of espresso, and teas having less. A mild dose of caffeine typically lasts three or four hours, which—if taken in the evening—may be long enough to impair sleep. Like other drugs, caffeine used regularly and in heavy doses produces tolerance: Its stimulating effects lessen. And discontinuing heavy caffeine intake often produces withdrawal symptoms, including fatigue and headache.

Nicotine Imagine that cigarettes were harmless—except, once in every 25,000 packs, an occasional innocent-looking one is filled with dynamite instead of tobacco. Not such a bad risk of having your head blown off. But with 250 million packs a day consumed worldwide, we could expect more than 10,000 gruesome daily deaths (more than three times the 9/11 fatalities each and every day)—surely enough to have cigarettes banned everywhere.[1]

The lost lives from these dynamite-loaded cigarettes approximate those from today's actual cigarettes. Each year throughout the world, tobacco kills nearly 5.4 million of its 1.3 billion customers, reports the World Health Organization (WHO). (Imagine the outrage if terrorists took down an equivalent of 25 loaded jumbo jets today, let alone tomorrow and every day thereafter.) And by 2030, annual deaths will increase to 8 million, according to WHO predictions. That means that *1 billion* (say that number slowly) twenty-first-century people may be killed by tobacco (WHO, 2008).

Smoke a cigarette and nature will charge you 12 minutes—ironically, just about the length of time you spend smoking it (Discover, 1996).

A teen-to-the-grave smoker has a 50 percent chance of dying from the habit, and the death is often agonizing and premature, as the Philip Morris company acknowledged in 2001. Responding to Czech Republic complaints about the health-care costs of tobacco, Philip Morris reassured the Czechs that there was actually a net "health-care cost savings due to early mortality" and the resulting savings on pensions and elderly housing (Herbert, 2001).

Eliminating smoking would increase life expectancy more than any other preventive measure. Why, then, do so many people smoke?

Nic-a-teen Aware that virtually all smokers start as teenagers—and that sales would plummet if no teens were enticed to smoke—cigarette companies target teens. They have portrayed tough, appealing, socially adept smokers in hopes that teens will imitate. Teen smoking went up in the 1990s (Brody, 2001), coinciding with an increased number of appealing smokers in popular films, including a younger Johnny Depp in this 1999 film, The Source. Russel Einhorn/The Gamma Liaison Network

Smoking usually begins during early adolescence. (If you make it to college without the cigarette manufacturers attracting your business, they almost surely never will.) Adolescents, self-conscious and often thinking the world is watching their every move, are vulnerable to smoking's allure. They may first light up to imitate glamorous celebrities, or to project a mature image, or to get the social reward of being accepted by other smokers (Cin et al., 2007; Tickle et al., 2006). Mindful of these tendencies, cigarette companies have effectively modeled smoking with themes that appeal to youths: sophistication, independence, adventure-seeking, social approval. Typically, teens who start smoking also have friends who smoke, who suggest its pleasures, and who offer them cigarettes (Eiser, 1985; Evans et al., 1988; Rose et al., 1999). Among teens whose parents and best friends are nonsmokers, the smoking rate is close to zero (Moss et al., 1992; also see **Figure 5.13**).

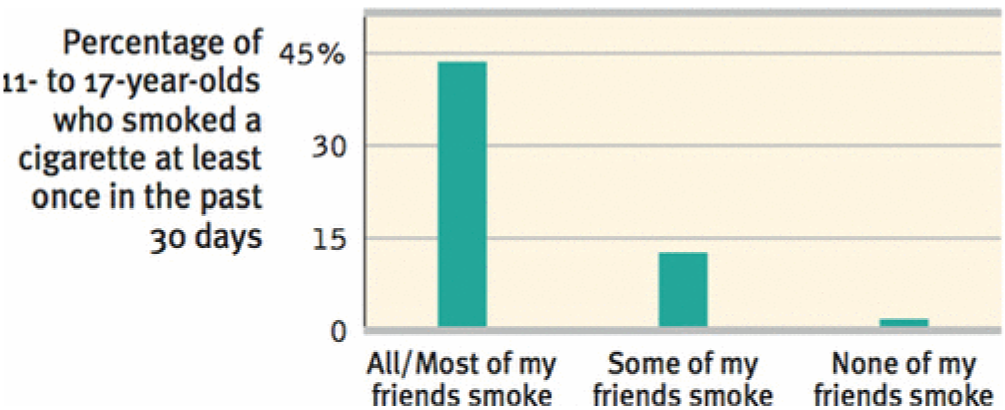


Figure 5.13 **Peer influence** Kids don't smoke if their friends don't (Philip Morris, 2003). A correlation-causation question: Does the close link between teen smoking and friends' smoking reflect peer influence? Teens seeking similar friends? Or both?

"A cigarette in the hands of a Hollywood star on screen is a gun aimed at a 12- or 14-year-old."

Screenwriter Joe Eszterhas, 2002

Humorist Dave Barry (1995) recalling why he smoked his first cigarette the summer he turned 15: "Arguments against smoking: 'It's a repulsive addiction that slowly but surely turns you into a gasping, gray-skinned, tumor-ridden invalid, hacking up brownish gobs of toxic waste from your one remaining lung.' Arguments for smoking: 'Other teenagers are doing it.' Case closed! Let's light up!"

Those addicted to nicotine find it very hard to quit because tobacco products are as powerfully and quickly addictive as heroin and cocaine. As with other addictions, a smoker becomes dependent; each year fewer than one of every seven smokers who want to quit will do so. Smokers also develop tolerance, eventually needing larger and larger doses to get the same effect. Quitting causes nicotine-withdrawal symptoms, including craving, insomnia, anxiety, and irritability. Even attempts to quit within the first weeks of smoking often fail as nicotine cravings set in (DiFranza, 2008). And all it takes to relieve this aversive state is a cigarette—a portable nicotine dispenser.

• Asked "If you had to do it all over again, would you start smoking?" more than 85 percent of adult smokers answer No (Slovic et al., 2002). •

Nicotine, like other addictive drugs, is not only compulsive and mood-altering, it is also reinforcing. Smoking delivers its hit of nicotine within 7 seconds, triggering the release of epinephrine and norepinephrine, which in turn diminish appetite and boost alertness and mental efficiency (**Figure 5.14**). At the same time, nicotine stimulates the central nervous system to release neurotransmitters that calm anxiety and reduce sensitivity to pain. For example, nicotine stimulates the release of dopamine and (like heroin and morphine) opioids (Nowak, 1994; Scott et al., 2004). These rewards keep people smoking even when they wish they could stop—indeed, even when they know they are committing slow-motion suicide (Saad, 2002). An informative exception: Brain-injured patients who have lost a prune-size frontal lobe region called the *insula*—an area that lights up when people crave drugs—are able to give up cigarettes instantly (Naqvi et al., 2007).

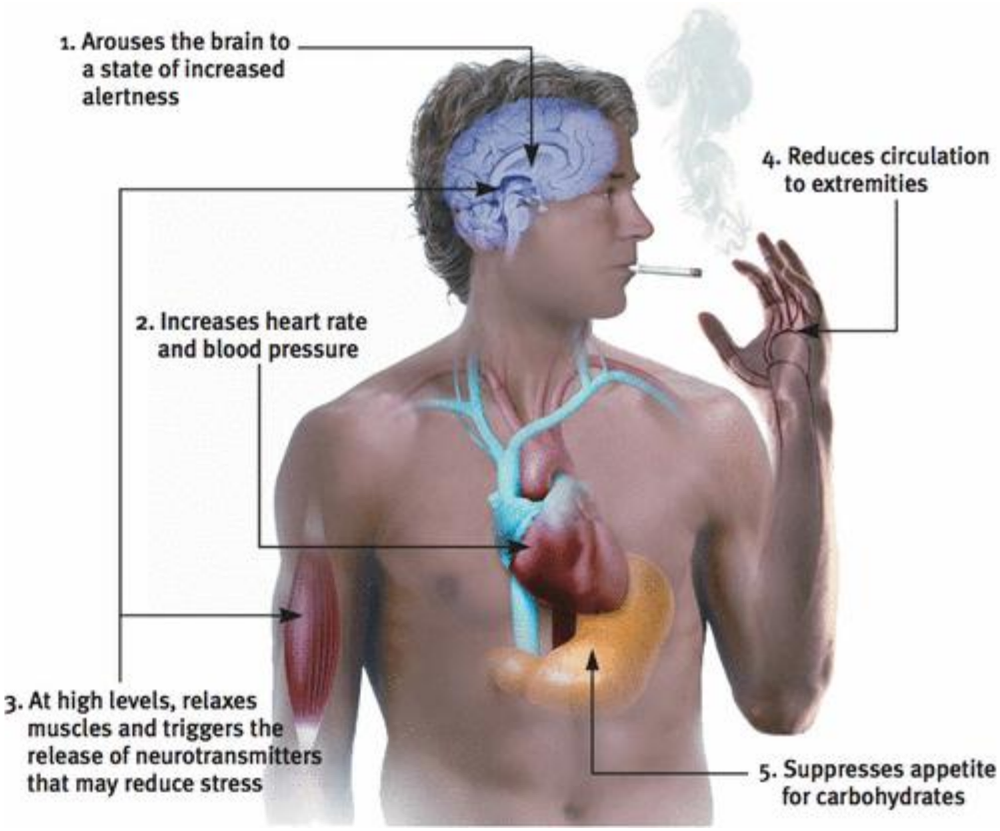


Figure 5.14 **Where there's smoke...: The physiological effects of nicotine Nicotine** reaches the brain within 7 seconds, twice as fast as intravenous heroin. Within minutes, the amount in the blood soars.

"To cease smoking is the easiest thing I ever did; I ought to know because I've done it a thousand times."

Mark Twain, 1835–1910

The recipe for Coca-Cola originally included an extract of the coca plant, creating a cocaine tonic for tired older people. Between 1896 and 1905, Coke was indeed "the real thing."

Nevertheless, half of all Americans who have ever smoked have quit, and 81 percent of those who haven't yet quit wish to (Jones, 2007). For those who endure, the acute craving and withdrawal symptoms gradually dissipate over the ensuing six months

(Ward et al., 1997). These nonsmokers may live not only healthier but also happier. Smoking correlates with higher rates of depression, chronic disabilities, and divorce (Doherty & Doherty, 1998; Vita et al., 1998). Healthy living seems to add both years to life and life to years.

Cocaine Cocaine use offers a fast track from euphoria to crash. When sniffed ("snorted"), and especially when injected or smoked ("free-based"), cocaine enters the bloodstream quickly. The result: a "rush" of euphoria that depletes the brain's supply of the neurotransmitters dopamine, serotonin, and norepinephrine (**Figure 5.15**). Within 15 to 30 minutes, a crash of agitated depression follows as the drug's effect wears off.

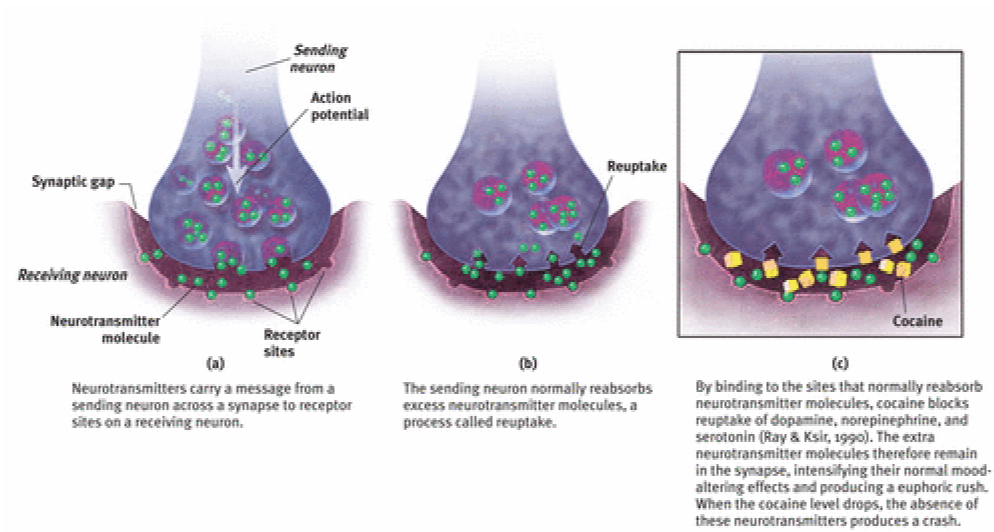


Figure 5.15 Cocaine euphoria and crash

In national surveys, 5 percent of U.S. high school seniors and 4 percent of British 18- to 24-year-olds reported having tried cocaine during the past year (Home Office, 2003; Johnston et al., 2009). Nearly half of the drug-using seniors had smoked *crack*, a crystallized form of cocaine. This faster-working, potent form of the drug produces a briefer but more intense high, a more intense crash, and a craving for more, which wanes after several hours only to return several days later (Gawin, 1991).

> "Cocaine makes you a new man. And the first thing that new man wants is more cocaine."
>
> Comedian George Carlin (1937–2008)

Cocaine-addicted monkeys have pressed levers more than 12,000 times to gain one cocaine injection (Siegel, 1990). Many regular cocaine users—animal and human—do become addicted. In situations that trigger aggression, ingesting cocaine may heighten reactions. Caged rats fight when given foot shocks, and they fight even more when given cocaine and foot shocks. Likewise, humans who voluntarily ingest high cocaine doses in laboratory experiments impose higher shock levels on a presumed opponent than do those receiving a placebo (Licata et al., 1993). Cocaine use may also lead to emotional disturbances, suspiciousness, convulsions, cardiac arrest, or respiratory failure.

As with all psychoactive drugs, cocaine's psychological effects depend not only on the dosage and form consumed but also on the situation and the user's expectations and personality. Given a placebo, cocaine users who *think* they are taking cocaine often have a cocainelike experience (Van Dyke & Byck, 1982).

Ecstasy Ecstasy, a street name for **MDMA** (methylenedioxymethamphetamine), is both a stimulant and a mild hallucinogen. As an amphetamine derivative, it triggers dopamine release. But its major effect is releasing stored serotonin and blocking its reabsorption, thus prolonging serotonin's feel-good flood (Braun, 2001). About a half-hour after taking an Ecstasy pill, users enter a threeto four-hour period of feelings of emotional elevation and, given a social context, connectedness with those around them ("I love everyone").

During the late 1990s, Ecstasy's popularity soared as a "club drug" taken at night-clubs and all-night raves (Landry, 2002). There are, however, reasons not to be ecstatic about Ecstasy. One is its dehydrating effect, which—when combined with prolonged dancing—can lead to severe overheating, increased blood pressure, and death. Another is that long-term, repeated leaching of brain serotonin can damage serotonin-producing neurons, leading to decreased output and increased risk of permanently depressed mood (Croft et al., 2001; McCann et al., 2001; Roiser et al., 2005). Ecstasy also suppresses the disease-fighting immune system, impairs memory and other cognitive functions, and disrupts sleep by interfering with serotonin's control of the circadian clock (Laws & Kokkalis, 2007; Pacifici et al., 2001; Schilt et al., 2007). Ecstasy delights for the night but dispirits the morrow.

Hallucinogens

13: What are hallucinogens, and what are their effects?

Hallucinogens distort perceptions and evoke sensory images in the absence of sensory input (which is why these drugs are also called *psychedelics*, meaning "mind-manifesting"). Some, such as LSD and MDMA (Ecstasy), are synthetic. Others, including the mild hallucinogen marijuana, are natural substances.

LSD In 1943, Albert Hofmann reported perceiving "an uninterrupted stream of fantastic pictures, extraordinary shapes with intense, kaleidoscopic play of colors" (Siegel, 1984). Hofmann, a chemist, created—and on one Friday afternoon in April 1943 accidentally ingested—**LSD** (lysergic acid diethylamide). The result reminded him of a childhood mystical experience that had left him longing for another glimpse of "a miraculous, powerful, unfathomable reality" (Smith, 2006).

LSD and other powerful hallucinogens are chemically similar to (and therefore block the actions of) a subtype of the neurotransmitter serotonin (Jacobs, 1987). The emotions of an LSD trip vary from euphoria to detachment to panic. The user's current mood and expectations color the emotional experience, but the perceptual distortions and hallucinations have some commonalities. Psychologist Ronald Siegel (1982) reports that whether you provoke your brain to hallucinate by drugs, loss of oxygen, or extreme sensory deprivation, "it will hallucinate in basically the same way." The experience typically begins with simple geometric forms, such as a lattice, a cobweb, or a spiral. The next phase consists of more meaningful images; some may be superimposed on a tunnel or funnel, others may be replays of past emotional experiences. As the hallucination peaks, people frequently feel separated from their body and experience dreamlike scenes so real that they may become panic-stricken or harm themselves.

These sensations are strikingly similar to the **near-death experience,** an altered state of consciousness reported by about one-third of those who survive a brush with death, as when revived from cardiac arrest (Moody, 1976; Ring, 1980; Schnaper, 1980). Many experience visions of tunnels (**Figure 5.16**), bright lights or beings of light, a replay of old memories, and out-of-body sensations (Siegel, 1980). Given that oxygen deprivation and other insults to the brain are known to produce hallucinations, it is difficult to resist wondering whether a brain under stress manufactures the near-death experiences. Patients who have experienced temporal lobe seizures have reported similarly profound mystical experiences, as have solitary sailors and polar explorers while enduring monotony, isolation, and cold (Suedfeld & Mocellin, 1987).

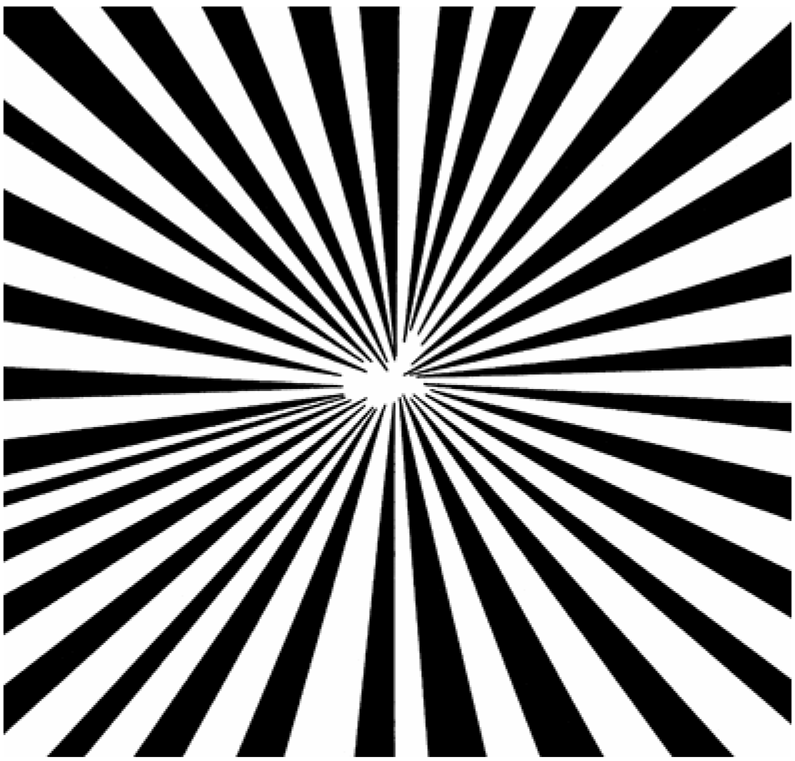


Figure 5.16 **Near-death vision or hallucination?** Psychologist Ronald Siegel (1977) reported that people under the influence of hallucinogenic drugs often see "a bright light in the center of the field of vision…. The location of this point of light create[s] a tunnel-like perspective."

Marijuana Marijuana consists of the leaves and flowers of the hemp plant, which for 5000 years has been cultivated for its fiber. Whether smoked or eaten, marijuana's major active ingredient, **THC** (delta-9-tetrahydrocannabinol), produces a mix of effects. (Smoking gets the drug into the brain in about 7 seconds, producing a greater effect than does eating the drug, which causes its peak concentration to be reached at a slower, unpredictable rate.) Like alcohol, marijuana relaxes, disinhibits, and may produce a euphoric high. But marijuana is also a mild hallucinogen, amplifying sensitivity to colors, sounds, tastes, and smells. And unlike alcohol, which the body eliminates within hours, THC and its by-products linger in the body for a month or more. Thus, contrary to the usual tolerance phenomenon, regular users may achieve a high with smaller amounts of the drug than occasional users would need to get the same effect.

A user's experience can vary with the situation. If the person feels anxious or depressed, using marijuana may intensify these feelings. And studies controlling for other drug use and personal traits have found that the more one uses marijuana, the greater one's risk of anxiety, depression, or possibly schizophrenia (Hall, 2006; Murray et al., 2007; Patton et al., 2002). Daily use bodes a worse outcome than infrequent use.

The National Academy of Sciences (1982, 1999) and National Institute on Drug Abuse (2004) have identified other marijuana consequences. Like alcohol, marijuana impairs the motor coordination, perceptual skills, and reaction time necessary for safely operating an automobile or other machine. "THC causes animals to misjudge events," reported Ronald Siegel (1990, p. 163). "Pigeons wait too long to respond to buzzers or lights that tell them food is available for brief periods; and rats turn the wrong way in mazes." Marijuana also disrupts memory formation and interferes with immediate recall of information learned only a few minutes before. Such cognitive effects outlast the period of smoking (Messinis et al., 2006). Prenatal exposure through maternal marijuana use also impairs brain development (Berghuis et al., 2007; Huizink & Mulder, 2006). Heavy adult use for over 20 years is associated with a shrinkage of brain areas that process memories and emotions (Yücel et al., 2008).

Scientists have shed light on marijuana's cognitive, mood, and motor effects with the discovery of concentrations of THC-sensitive receptors in the brain's frontal lobes, limbic system, and motor cortex (Iversen, 2000). As the 1970s discovery of receptors for morphine put researchers on the trail of morphinelike neurotransmitters (the endorphins), so the recent discovery of *cannabinoid receptors* has led to a successful hunt for naturally occurring THC-like molecules that bind with cannabinoid receptors. These molecules may naturally control pain. If so, this may help explain why marijuana can be therapeutic for those who suffer the pain, nausea, and severe weight loss associated with AIDS (Watson et al., 2000). Such uses have motivated legislation in some states to make the drug legally available for medical purposes. To avoid the toxicity of marijuana smoke—which, like cigarette smoke, can cause cancer, lung damage, and pregnancy complications—the Institute of Medicine recommends medical inhalers to deliver the THC.

> "How strange would appear to be this thing that men call pleasure! And how curiously it is related to what is thought to be its opposite, pain!…Wherever the one is found, the other follows up behind."
>
> Plato, Phaedo, fourth century b.c.e.

* * *

Despite their differences, the psychoactive drugs summarized in **Table 5.3** share a common feature: They trigger negative aftereffects that offset their immediate positive effects and grow stronger with repetition. And that helps explain both tolerance and withdrawal. As the opposing, negative aftereffects grow stronger, it takes larger and larger doses to produce the desired high (tolerance), causing the aftereffects to worsen in the drug's absence (withdrawal). This in turn creates a need to switch off the withdrawal symptoms by taking yet more of the drug.

Table 5.3

A GUIDE TO SELECTED PSYCHOACTIVE DRUGS

Drug	Type	Pleasurable Effects	Adverse Effects
Alcohol	Depressant	Initial high followed by relaxation and disinhibition	Depression, memory loss, organ damage, impaired reactions
Heroin	Depressant	Rush of euphoria, relief from pain	Depressed physiology, agonizing withdrawal
Caffeine	Stimulant	Increased alertness and wakefulness	Anxiety, restlessness, and insomnia in high doses; uncomfortable withdrawal
Methamphetamine	Stimulant	Euphoria, alertness, energy	Irritability, insomnia, hypertension, seizures
Cocaine	Stimulant	Rush of euphoria, confidence, energy	Cardiovascular stress, suspiciousness, depressive crash
Nicotine	Stimulant	Arousal and relaxation, sense of well-being	Heart disease, cancer
Ecstasy (MDMA)	Stimulant; mild hallucinogen	Emotional elevation, disinhibition	Dehydration, overheating, depressed mood, impaired cognitive and immune functioning
Marijuana	Mild hallucinogen	Enhanced sensation, relief of pain, distortion of time, relaxation	Impaired learning and memory, increased risk of psychological disorders, lung damage from smoke

[1] This analogy, adapted here with world-based numbers, was suggested by mathematician Sam Saunders, as reported by K. C. Cole (1998).

5.3.3 Influences on Drug Use

14: Why do some people become regular users of consciousness-altering drugs?

Drug use by North American youths increased during the 1970s. Then, with increased drug education and a more realistic and deglamorized media depiction of taking drugs, drug use declined sharply. After the early 1990s, the cultural antidrug voice softened, and drugs for a time were again glamorized in some music and films. Consider these marijuana-related trends:

- In the University of Michigan's annual survey of 15,000 U.S. high school seniors, the proportion who believe there is "great risk" in regular marijuana use rose from 35 percent in 1978 to 79 percent in 1991, then retreated to 52 percent in 2008 (Johnston et al., 2009).
- After peaking in 1978, marijuana use by U.S. high school seniors declined through 1992, then rose, but has recently been tapering off (**Figure 5.17**). Among Canadian 15- to 24-year-olds, 23 percent report using marijuana monthly, weekly, or daily (Health Canada, 2007).

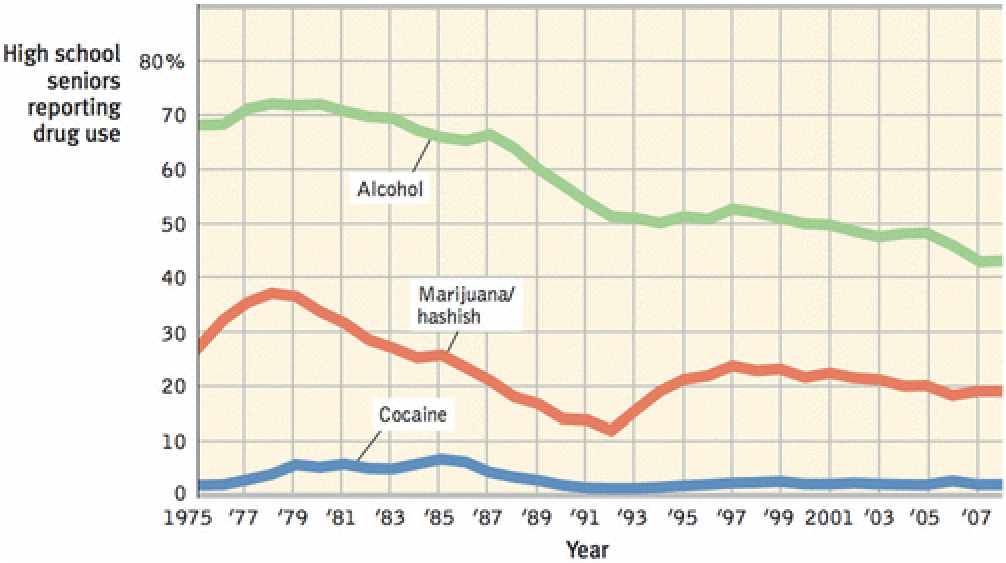


Figure 5.17 **Trends in drug use** The percentage of U.S. high school seniors who report having used alcohol, marijuana, or cocaine during the past 30 days declined from the late 1970s to 1992, when it partially rebounded for a few years. (From Johnston et al., 2009.)

Warning signs of alcohol dependence

- Drinking binges
- Regretting things done or said when drunk
- Feeling low or guilty after drinking
- Failing to honor a resolve to drink less
- Drinking to alleviate depression or anxiety
- Avoiding family or friends when drinking

For some adolescents, occasional drug use represents thrill seeking. Why, though, do other adolescents become regular drug users? In search of answers, researchers have engaged biological, psychological, and social-cultural levels of analysis.

Biological Influences

Some people may be biologically vulnerable to particular drugs. For example, evidence accumulates that heredity influences some aspects of alcohol abuse problems, especially those appearing by early adulthood (Crabbe, 2002):

- Adopted individuals are more susceptible to alcohol dependence if one or both biological parents have a history of it.
- Having an identical rather than fraternal twin with alcohol dependence puts one at increased risk for alcohol problems (Kendler et al., 2002). (In marijuana use also, identical twins more closely resemble one another than do fraternal twins.)
- Boys who at age 6 are excitable, impulsive, and fearless (genetically influenced traits) are more likely as teens to smoke, drink, and use other drugs (Masse & Tremblay, 1997).
- Researchers have bred rats and mice that prefer alcoholic drinks to water. One such strain has reduced levels of the brain chemical NPY. Mice engineered to

overproduce NPY are very sensitive to alcohol's sedating effect and drink little (Thiele et al., 1998).

- Researchers have identified genes that are more common among people and animals predisposed to alcohol dependence, and they are seeking genes that contribute to tobacco addiction (NIH, 2006; Nurnberger & Bierut, 2007). These culprit genes seemingly produce deficiencies in the brain's natural dopamine reward system, which is impacted by addictive drugs. When repeated, the drugs trigger dopamine-produced pleasure but also disrupt normal dopamine balance. Studies of how drugs reprogram the brain's reward systems raise hopes for anti-addiction drugs that might block or blunt the effects of alcohol and other drugs (Miller, 2008; Wilson & Kuhn, 2005).

Psychological and Social-Cultural Influences

Psychological and social-cultural influences also contribute to drug use (**Figure 5.18**). In their studies of youths and young adults, Michael Newcomb and L. L. Harlow (1986) found that one psychological factor is the feeling that one's life is meaningless and directionless, a common feeling among school dropouts who subsist without job skills, without privilege, and with little hope. When young unmarried adults leave home, alcohol and other drug use increases; when they marry and have children, it decreases (Bachman et al., 1997).

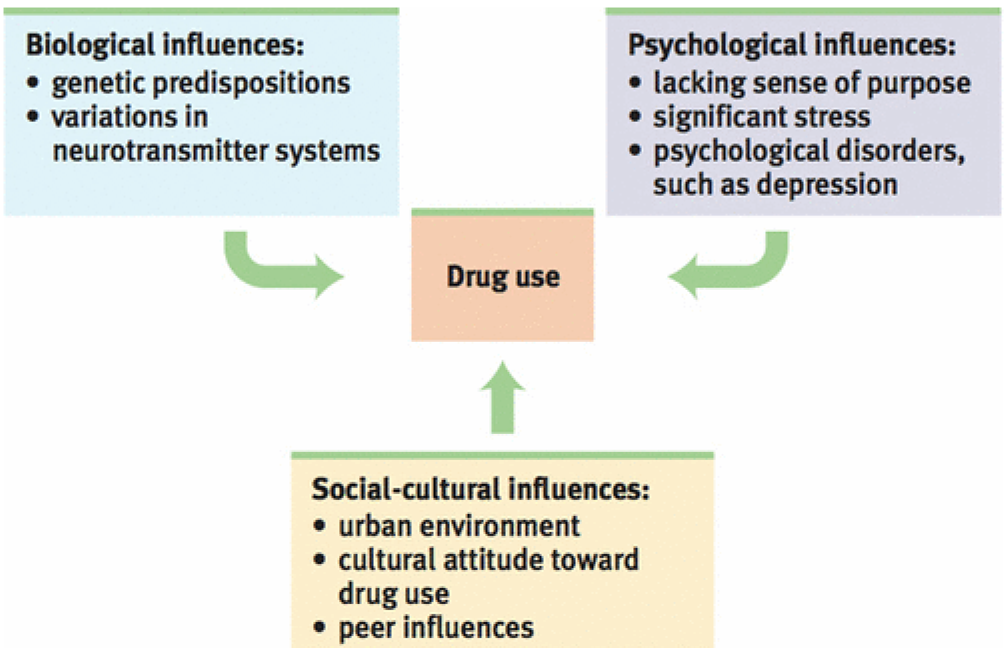


Figure 5.18 Levels of analysis for drug use The biopsychosocial approach enables researchers to investigate drug use from complementary perspectives.

In the real world, alcohol accounts for one-sixth or less of beverage use. In TV land, drinking alcohol occurs more often than the combined drinking of coffee, tea, soft drinks, and water (Gerbner, 1990).

Heavy users of alcohol, marijuana, and cocaine often display other psychological influences. Many have experienced significant stress or failure and are depressed. Females with a history of depression, eating disorders, or sexual or physical abuse are at risk for substance addiction, as are those undergoing school or neighborhood transitions (CASA, 2003; Logan et al., 2002). Monkeys, too, develop a taste for alcohol when stressed by permanent separation from their mother at birth (Small, 2002). By temporarily dulling the pain of self-awareness, alcohol may offer a way to avoid coping with depression, anger, anxiety, or insomnia. As **Unit 6** explains, behavior is often controlled more by its immediate consequences than by its later ones.

Culture and alcohol

Percentage of adults drinking weekly or more:

United States	30%
Canada	40%
Britain	58%

(Gallup Poll, from Moore, 2006)

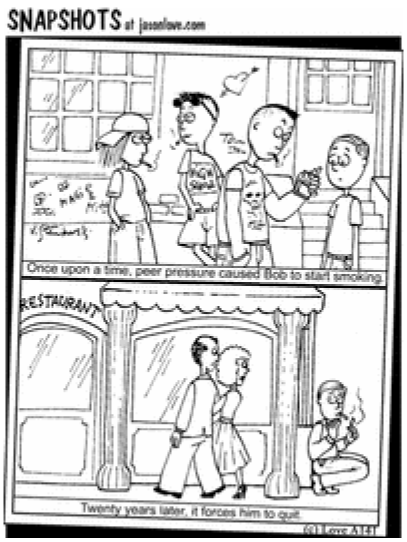
Especially for teenagers, drug use also has social roots. Most teen drinking is done for social reasons, not as a way to cope with problems (Kuntsche et al., 2005). Social influence also appears in the differing rates of drug use across cultural and ethnic groups. For example, a 2003 survey of 100,000 teens in 35 European countries found that marijuana use in the prior 30 days ranged from zero to 1 percent in Romania and Sweden to 20 to 22 percent in Britain, Switzerland, and France (ESPAD, 2003). Independent U.S. government studies of drug use in households nationwide and among high schoolers in all regions reveal that African-American teens have sharply lower rates of drinking, smoking, and cocaine use (Johnston et al., 2007). Alcohol and other drug addiction rates have also been extremely low in the United States among Orthodox Jews, Mormons, the Amish, and Mennonites (Trimble, 1994). Relatively drug-free small towns and rural areas tend to constrain any genetic predisposition to drug use, report Lisa Legrand and her colleagues (2005). For those whose genetic predispositions nudge them toward substance use, "cities offer more opportunities" and less supervision.

Whether in cities or rural areas, peers influence attitudes about drugs. They also throw the parties and provide the drugs. If an adolescent's friends use drugs, the odds are that he or she will, too. If the friends do not, the opportunity may not even arise. Teens who come from happy families, who do not begin drinking before age 14, and who do well in school tend not to use drugs, largely because they rarely associate with those who do (Bachman et al., 2007; Hingson et al., 2006; Oetting & Beauvais, 1987, 1990).

Peer influence, however, is not just a matter of what friends do and say but also of what adolescents *believe* friends are doing and favoring. In one survey of sixth graders in 22 U.S. states, 14 percent believed their friends had smoked marijuana, though only 4 percent acknowledged doing so (Wren, 1999). University students are not immune to such misperceptions: Drinking dominates social occasions partly because students overestimate their fellow students' enthusiasm for alcohol and underestimate their views of its risks (Prentice & Miller, 1993; Self, 1994) (**Table 5.4**).

Table 5.4

Facts About "Higher" Education
College and university students drink more alcohol than their nonstudent peers and exhibit 2.5 times the general population's rate of substance abuse.
Fraternity and sorority members report nearly twice the binge drinking rate of nonmembers.
Since 1993, campus smoking rates have declined, alcohol use has been steady, and abuse of prescription opioids, stimulants, tranquilizers, and sedatives has increased, as has marijuana use.
Source: NCASA, 2007.



People whose beginning use was influenced by their peers are more likely to stop using drugs when friends stop or the social network changes (Kandel & Raveis, 1989). One study that followed 12,000 adults over 32 years found that smokers tend to quit in clusters (Christakis & Fowler, 2008). Within a social network, the odds of a person's quitting increased when a spouse, friend, or co-worker stopped smoking. Similarly, most soldiers who became drug-addicted while in Vietnam ceased their drug use after returning home (Robins et al., 1974).

As always with correlations, the traffic between friends' drug use and our own may be two-way: Our friends influence us. Social networks matter. But we also select as friends those who share our likes and dislikes.

What do the findings on drug use suggest for drug prevention and treatment programs? Three channels of influence seem possible:

- Educate young people about the long-term costs of a drug's temporary pleasures.
- Help young people find other ways to boost their self-esteem and purpose in life.
- Attempt to modify peer associations or to "inoculate" youths against peer pressures by training them in refusal skills.

People rarely abuse drugs if they understand the physical and psychological costs, feel good about themselves and the direction their lives are taking, and are in a peer group that disapproves of using drugs. These educational, psychological, and social factors may help explain why 42 percent of U.S. high school dropouts, but only 15 percent of college graduates, smoke (Ladd, 1998).