Psychology in the News

Measure to Legalize Marijuana Fails in California

LOS ANGELES, November 3, 2010. An initiative to make California the first state to legalize small amounts of marijuana for recreational use failed yesterday at the polls. The vote was 54 percent opposed to legalization versus 46 percent in favor.

The initiative, Proposition 19, would have allowed anyone 21 or older to possess up to an ounce of marijuana and to grow plants in an area up to 25 square feet, so long as the drug was for personal use. In addition, cities and counties would have been able to pass laws allowing the production and sale of marijuana and to tax profits on it. Most law enforcement groups, many clergy, the California League of Cities, and Mothers Against Drunk Driving opposed the measure. The California Young Democrats, the Republican Liberty Caucus, the California Council of Churches, some law enforcement officials, and several large labor unions supported it.

Despite the measure's defeat, Richard Lee, the wheelchair-bound medical-marijuana millionaire who largely bankrolled the measure, called the effort a "tremendous moral victory" because millions of Californians voted for it. Lee, who was paralyzed from the waist down after an accident in 1990, owns several medicinal- marijuana businesses in Oakland. He says that after his accident, marijuana helped control his severe back spasms. His successful dispensaries have contributed to the revival of part of downtown Oakland.

The use of pot for medical purposes has been legal in California since 1996, and in January, a new law will change possession of less than an ounce from a criminal misdemeanor to a civil infraction. But California law conflicts with federal law, and within the state, attitudes and policies often clash. Some cities permit pot clubs, some currently have moratoriums in effect until they can come up with regulations, and some prohibit them outright.

In San Diego, the District Attorney's office considers marijuana for any use to be illegal, yet a jury there recently acquitted a Navy veteran who was operating a medical-marijuana dispensary. In Los Angeles, the law caps the number of dispensaries at 70 and exempts another 100 that were in existence as of 2007, but now bans the more than 800 dispensaries established after that.

At a cannabis buyers cooperative in Oakland, California, customer Ken Estes chooses a marijuana muffin. Estes has been a quadriplegic for 22 years, due to a motorcycle accident.

CHAPTER

5

Body Rhythms and Mental States

Californians, who years ago voted to permit the use of marijuana for medical reasons, still prefer to keep its recreational use illegal. Whether the drug is legal or illegal, however, many people will continue to use marijuana and others will continue to try to prohibit it.

Marijuana is just one of many drugs used throughout the world to alter *consciousness*, our awareness of ourselves and the environment. But consciousness also changes in predictable ways without any help from drugs. Each day, we all experience swings in mood, alertness, and efficiency. Each night, we all undergo a dramatic shift in consciousness when the ordinary rules of logic are suspended in the dream world of sleep. And performance and mood may be subject to much longer cycles as well, stretching over a month or even a season.

In this chapter, we will see that fluctuations in subjective experience are accompanied by ups and downs in brain activity and hormone levels, and that the mental and physical aspects of consciousness are as intertwined as sunshine and shadow. We will begin with a discussion of the body's natural rhythms, which ebb and flow over time. Next we will zoom in on one fascinating state of consciousness: dreaming. And then we will explore what psychologists have learned about two techniques used to alter consciousness deliberately: hypnosis and the use of recreational drugs. Our goal is to give you a better understanding of the human fascination with altered states of consciousness and why some people use drugs to achieve them.

Are all drugs equally dangerous? Should there be different policies for medical, recreational, and religious use? Are current drug laws realistic? We will return to these issues at the end of the chapter.

YOU are about to learn...

- how biological rhythms affect our physiology and performance.
- why you feel out of sync when you fly across time zones or change shifts at work.
- why some people get the winter blues.
- how culture and learning affect reports of PMS and estimates of its incidence.

Biological Rhythms: The Tides of Experience

Do an Internet search on "biorhythm charts," and you'll get hundreds of sites advertising them. Such charts supposedly foretell daily fluctuations in mood, alertness, and physical performance over your entire lifetime, solely on the basis of when you were born. They even warn you about days when you will be susceptible to accidents, errors, and illness. But you can save your money: Whenever researchers have taken the trouble to test such claims scientifically, they have found biorhythm charts to be utterly useless (Hines, 1998).

Listen to **Brain Time** on **mypsychlab.com**

It *is* true, however, that the human body goes through dozens of ups and downs in physiological functioning over the course of a day, a week, a year, changes that are known as **biological rhythms**. A biological clock in our brains governs the waxing and waning of hormone levels, urine volume, blood pressure, and even the responsiveness of brain cells to stimulation. Biological rhythms are typically in tune with external time cues, such as changes in clock time, temperature, and daylight, but many rhythms continue to occur even in the absence of such cues; they are **endogenous**, or generated from within.

biological rhythms Periodic, more or less regular fluctuations in a biological system; they may or may not have psychological implications.

endogenous Generated from within rather than by external cues.

Circadian rhythms are biological rhythms that occur approximately every 24 hours. The best-known circadian rhythm is the sleep–wake cycle, but hundreds of others affect physiology and performance. For example, body temperature fluctuates about 1 degree centigrade each day, peaking, on average, in the late afternoon and hitting a low point, or trough, in the wee hours of the morning. Other rhythms occur less frequently than once a day—say, once a month, or once a season. In the animal world, seasonal rhythms are common. Birds migrate south in the fall, bears hibernate in the winter, and marine animals become active or inactive, depending on bimonthly changes in the tides. In human beings, the female menstrual cycle occurs every 28 days on average. And some rhythms occur more frequently than once a day, many of them on about a 90-minute cycle. These include physiological changes during sleep and (unless social customs intervene) stomach contractions, hormone levels, susceptibility to visual illusions, verbal and spatial performance, brain-wave responses during cognitive tasks, and daydreaming (Escera, Cilveti, & Grau, 1992; Klein & Armitage, 1979; Kripke, 1974; Lavie, 1976).

circadian [sur-CAY-dee-un] rhythms Biological rhythms with a period (from peak to peak or trough to trough) of about 24 hours; from the Latin *circa,* "about," and *dies,* "a day."

suprachiasmatic [soo-pruh-kye-az-MAT-ick] nucleus (SCN) An area of the brain containing a biological clock that governs circadian rhythms.

With a better understanding of our internal tempos, we may be able to design our days to take better advantage of our bodies' natural tempos.

Circadian Rhythms

Circadian rhythms exist in plants, animals, insects, and human beings. They reflect the adaptation of organisms to the many changes associated with the rotation of the earth on its axis, such as changes in light, air pressure, and temperature.

In most societies, clocks and other external time cues abound, and people's circadian rhythms become tied to them, following a strict 24-hour schedule. Therefore, to identify endogenous rhythms, scientists must isolate volunteers from sunlight, clocks, environmental sounds, and all other cues to time. Some hardy souls have spent weeks isolated in underground caves; usually, however, researchers have people live in specially designed rooms equipped with audio systems, comfortable furniture, and temperature controls.

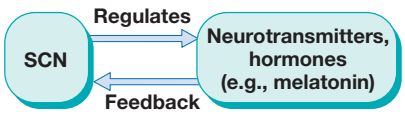
When participants in these studies have been allowed to sleep, eat, and work whenever they wished, free of the tyranny of the timepiece, a few have lived a "day" that is much shorter or longer than 24 hours. If allowed to take daytime naps, however, most people soon settle into a day that averages about 24.3 hours (Moore, 1997). And when people are put on an artificial 28-hour day, in an environment free of all time cues, their body temperature and hormone levels follow a cycle that is very close to 24 hours—24.18 hours, to be precise (Czeisler et al., 1999). These rhythms are remarkably similar in length from one person to the next. For many people, alertness, like temperature, peaks in the late afternoon and falls to a low point in the very early morning (Lavie, 2001). Listen

The Body's Clock Circadian rhythms are controlled by a biological clock, or overall coordinator, located in a tiny cluster of cells in the hypothalamus called the **suprachiasmatic nucleus (SCN)**. Neural pathways from special receptors in the back of the eye transmit information to the SCN and allow it

Stefania Follini (left) spent four months in a New Mexico cave (above), 30 feet underground, as part of an Italian study on biological rhythms. Her only companions were a computer and two friendly mice. In the absence of clocks, natural light, or changes in temperature, she tended to stay awake for 20 to 25 hours and then sleep for 10. Because her days were longer than usual, when she emerged, she thought she had been in the cave for only two months.

to respond to changes in light and dark. The SCN then sends out messages that cause the brain and body to adapt to these changes. Other clocks also exist, scattered around the body, but for most circadian rhythms, the SCN is regarded as the master pacemaker.

The SCN regulates fluctuating levels of hormones and neurotransmitters, and they in turn provide feedback that affects the SCN's functioning. During the dark hours, one hormone regulated by the SCN, **melatonin**, is secreted by the pineal gland, deep within the brain. Melatonin induces sleep. When you go to bed in a darkened room, your melatonin level rises; when light fills your room in the morning, it falls. Melatonin, in turn, appears to help keep the biological clock in phase with the light–dark cycle (Haimov & Lavie, 1996; Lewy et al., 1992).



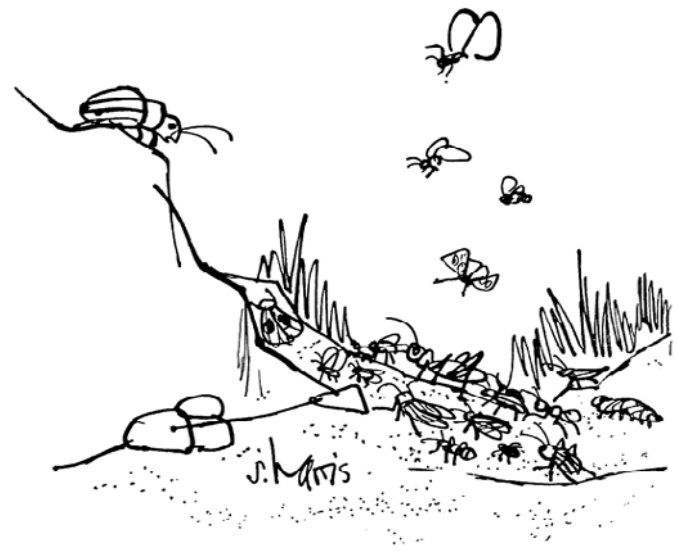
Melatonin treatments have been used to regulate the disturbed sleep–wake cycles of blind people who lack light perception and whose melatonin production does not cycle normally (Sack & Lewy, 1997).

When the Clock Is Out of Sync Under normal conditions, the rhythms governed by the SCN are in phase with one another. Their peaks may occur at different times, but if you know when one rhythm peaks, you can predict fairly well when another will. It is a little like knowing the time in London if you know the time in New York. But when your normal routine changes, your circadian rhythms may be thrown out of phase. Such **internal desynchronization** often occurs when people take airplane flights across several time zones. Sleep and wake patterns usually adjust quickly, but temperature and hormone cycles can take several

melatonin A hormone secreted by the pineal gland; it is involved in the regulation of circadian rhythms.

internal desynchronization A state in which biological rhythms are not in phase with one another.

Travel can be exhausting, and jet lag makes it worse.



days to return to normal. The resulting jet lag affects energy level, mental skills, and motor coordination.

Internal desynchronization also occurs when workers must adjust to a new shift. Efficiency drops, the person feels tired and irritable, accidents become more likely, and sleep disturbances and digestive disorders may occur. For police officers, emergency room personnel, airline pilots, truck drivers, and operators of nuclear power plants, the consequences can be a matter of life and death. Night work itself is not necessarily a problem: With a schedule that always stays the same, even on weekends, people often adapt. However, many swing- and night-shift assignments are made on a rotating basis, so a worker's circadian rhythms never have a chance to resynchronize.

Some scientists hope eventually to help rotating-shift workers adjust more quickly by using melatonin, drugs, or other techniques to "reset the clock" (Revell & Eastman, 2005), but so far these techniques do not seem ready for prime time. A comprehensive government-sponsored review of melatonin research, which took the quality of the research into account, found little or no support for melatonin's effectiveness in treating shift-work desynchronization (or for ordinary insomnia and sleep disturbances associated with jet lag) (Buscemi et al., 2004). The best approach at present is to follow circadian principles by switching workers from one shift to another as infrequently as possible.

One reason that a simple cure for desynchronization has so far eluded scientists is that circadian rhythms are not perfectly regular in daily life. They can be affected by illness, stress, fatigue, excitement, exercise, drugs, mealtimes, and ordinary daily experiences. In research with mice, these rhythms have even been influenced by diet. Mice usually sleep during the day, but putting them on a high-fat diet altered the activity of genes involved in appetite and metabolism, and the mice began waking up and eating during the day (Kohsaka et al., 2007).

Further, circadian rhythms can differ greatly from individual to individual because of genetic differences. A variation in a single gene seems to be the reason that some people are early birds, bouncing out of bed at the crack of dawn, whereas others are night owls who do their best work late at night and can't be pried out of bed until noon (Archer et al., 2003). (Schools are not designed to accommodate night owls.) You may be able to learn about your own personal pulses through careful self-observation, and you may want to try putting that information to use when planning your daily schedule.

Moods and Long-Term Rhythms

According to Ecclesiastes, "To every thing there is a season, and a time for every purpose under heaven." Modern science agrees: Long-term cycles

Get Involved! Measuring Your Alertness Cycles

For at least three days, except when you are sleeping, keep an hourly record of your mental alertness level, using this five-point scale: 1 = extremely drowsy or mentally lethargic, 2 = somewhat drowsy or mentally lethargic, 3 = moderately alert, 4 = alert and efficient, 5 = extremely alert and efficient. Does your alertness level appear to follow a circadian rhythm, reaching a high point and a low point once every 24 hours? Or does it follow a shorter rhythm, rising and falling several times during the day? Are your cycles the same on weekends as during the week? Most important, how well does your schedule mesh with your natural fluctuations in alertness?

have been observed in everything from the threshold for tooth pain to conception rates. Folklore holds that our moods follow similar rhythms, particularly in response to seasonal changes and, in women, menstrual changes. But do they?

Does the Season Affect Moods? Clinicians report that some people become depressed during particular seasons, typically winter, when periods of daylight are short. This pattern of depression has come to be known as **seasonal affective disorder (SAD)** (Rosenthal, 2006). During the winter months, patients with SAD report feelings of sadness, lethargy, drowsiness, and a craving for carbohydrates. To counteract the effects of sunless days, physicians and therapists often treat them with phototherapy, having them sit in front of bright fluorescent lights at specific times of the day, usually early in the morning. Some physicians also prescribe antidepressants.

Some therapists, generalizing from clinical cases of patients who report symptoms of SAD, believe the disorder may affect as much as 20 percent of the population, but this estimate is highly exaggerated. A national survey estimated the lifetime prevalence of major seasonal depression in the United States at only 0.4 percent, and the prevalence of major or minor seasonal depression at only 1 percent (Blazer, Kessler, & Swartz, 1998). Other estimates vary from about 1 to 9 percent, with the higher estimates usually associated with greater distance from the equator.

As for the effectiveness of light treatments, much of the research on this question has been flawed. A review of 173 light-treatment studies published between 1975 and 2003 found that only 20 studies—12 percent of the total—had used an acceptable design and suitable controls (Golden et al., 2005). But a meta-analysis of the data from those 20 studies did throw some light on the subject, so to speak. When people with SAD were exposed to either a brief period (e.g., 30 minutes) of bright light after waking or to light that slowly became brighter, simulating the dawn, their symptoms were in fact reduced. Light therapy even helped people with mild to moderate nonseasonal depression (see also Wirz-Justice et al., 2005).

Many researchers believe that the circadian rhythms of patients with SAD are out of sync—that, in essence, the individuals have a chronic form of jet lag (Lewy et al., 2006). Others argue that they must have some abnormality in the way they produce or respond to melatonin (Wehr et al., 2001). They may produce too much daytime melatonin in the winter, or their morning levels may not fall as quickly as other people's. However, it is not clear why light therapy also appears to help some people with *non*seasonal depression. True cases of SAD may have a biological basis, but if so, the mechanism remains unclear. Keep in mind, too, that many people get the winter blues because they hate cold weather, are physically inactive, do not get outside much, or feel lonely during the winter holidays.

These young Norwegian women are receiving light therapy for seasonal affective disorder (SAD). This type of treatment has become popular and appears to be effective. But fewer people actually have SAD than is commonly thought, and the causes remain uncertain.

Does the Menstrual Cycle Affect Moods? Controversy has persisted about another long-term rhythm, the female menstrual cycle, which occurs, on average, every 28 days. During the first half of this cycle, an increase in the hormone estrogen causes the lining of the uterus to thicken in preparation for a possible pregnancy. At mid-cycle, the ovaries release a mature egg, or ovum. Afterward, the ovarian sac that contained the egg begins to produce progesterone, which helps prepare the uterine lining to receive the egg. Then, if conception does not occur, estrogen and progesterone levels fall, the uterine lining sloughs off as the menstrual flow, and the cycle begins again. The interesting question for psychologists is whether these physical changes cause emotional or intellectual changes, as folklore and tradition would have us believe.

Most people are surprised to learn that it was not until the 1970s that a vague cluster of physical and emotional symptoms associated with the days preceding menstruation—including fatigue, headache, irritability, and depression—was packaged together and given a label: *premenstrual syndrome* ("PMS") (Parlee, 1994). Since then, most laypeople, doctors, and psychiatrists have assumed, uncritically, that many women "suffer" from PMS

seasonal affective disorder (SAD) A controversial disorder in which a person experiences depression during the winter and an improvement of mood in the spring.

Many women say they become more irritable or depressed premenstrually, and PMS remedies line the shelves of drugstores. But what does the evidence show about this so-called syndrome? How might attitudes and expectations affect reports of emotional symptoms? What happens when women report their daily moods and feelings to researchers without knowing that menstruation is being studied?

or from its supposedly more extreme and debilitating version, "premenstrual dysphoric disorder" (PMDD). What does the evidence actually show?

"PMS" symptoms have been reported most often in North America, western Europe, and Australia. In most tribal cultures, PMS has been virtually unknown; the concern has been with menstruation itself, which is often considered "unclean." In other cultures, women report physical symptoms but not emotional symptoms: For example, during the 1990s, research found that women in China reported fatigue, water retention, pain, and cold (American women rarely report cold), but not depression or irritability (Yu et al., 1996).

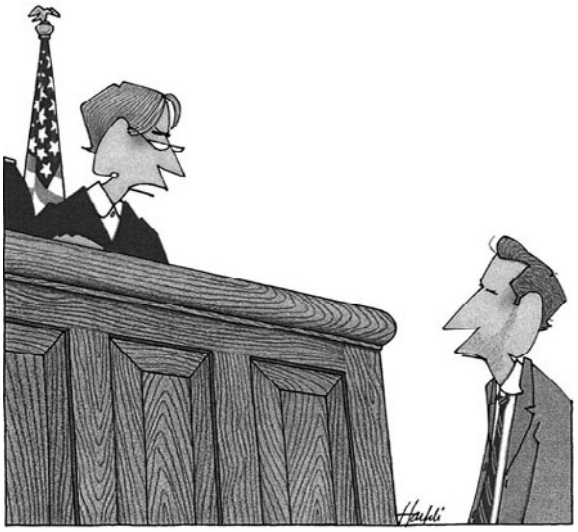
Many women do have physical symptoms associated with menstruation, including cramps, breast tenderness, and water retention, although women vary tremendously in this regard. And, of course, these physical symptoms can make some women feel grumpy or unhappy, just as pain can make men feel grumpy or unhappy. But emotional symptoms associated with menstruation—notably, irritability and depression—are pretty rare, which is why we put "PMS" in quotation marks. In reality, fewer than 5 percent of all women have such symptoms predictably over their cycles (Brooks-Gunn, 1986; Reid, 1991; Walker, 1994).

Then why do so many women think they have it? One possibility is that they tend to notice feelings of depression or irritability when these moods happen to occur premenstrually but overlook times when such moods are *absent* premenstrually. Or they may label symptoms that occur before a period as PMS ("I am irritable and cranky; I must be getting my period") and attribute the same symptoms at other times of the month to a stressful day or a low grade on an English paper ("No wonder I'm irritable and cranky; I worked really hard on that paper and only got a C"). Some studies have encouraged biases in the reporting of premenstrual and menstrual symptoms by using questionnaires with gloomy titles such as "Menstrual Distress Questionnaire."

To get around these problems, some psychologists have polled women about their psychological and physical well-being without revealing the true purpose of the study (e.g., AuBuchon & Calhoun, 1985; Chrisler, 2000; Englander-Golden, Whitmore, & Dienstbier, 1978; Gallant et al., 1991; Hardie, 1997; Parlee, 1982; Rapkin, Chang, & Reading, 1988; Slade, 1984; Vila & Beech, 1980; Walker, 1994). Using double-blind procedures, they have had women report symptoms for a single day and have then gone back to see what phase of the menstrual cycle the women were in; or they have had women keep daily records over an extended period of time.

Some studies have also included a control group that is usually excluded from research on hormones and moods: men. In one such study, men and women filled out a symptom questionnaire that made no mention of menstruation (Callaghan et al., 2009). The proportion of men who met the criteria for PMDD, the more extreme version of "PMS," did not differ significantly from the proportion of women who did so!

In another study, researchers examined changes in the pleasantness, arousal level, and stability of moods over time by having 15 women on



"You've been charged with driving under the influence of testosterone."

For both sexes, the hormonal excuse rarely applies.

birth control pills, 12 normally cycling women, and 15 men rate their moods every day for 70 days (McFarlane, Martin, & Williams, 1988). None of the participants knew that the study had anything to do with menstruation; they thought it was a straightforward study of mood and health. After the 70 days were up, the women then recalled their average moods for each week and phase of their menstrual cycle. In their daily reports, normally cycling women reported more pleasant moods than the other participants during the menstrual phase and the follicular phase (when an egg is forming). But there were no differences at all during the premenstrual phase. In fact, women's moods fluctuated less over the menstrual cycle than over days of the week. Mondays, it seems, are tough for most of us. Moreover, women and men did not differ significantly in their emotional symptoms or the number of mood swings they reported at any time of the month, as you can see in Figure 5.1. In their retrospective reports, however, women *recalled* feeling more angry, irritable, and depressed in the premenstrual and menstrual phases than they had reported in their daily journals.

Other investigations have confirmed that most women do not have typical PMS symptoms even when they firmly believe that they do (Hardie, 1997; McFarlane & Williams, 1994). For example, women often say they cry more premenstrually than at other times, but an interesting Dutch study had women keep "crying diaries" and found no association at all between crying and phase of the menstrual cycle (van Tilburg, Becht, & Vingerhoets, 2003).

The key question in all this is whether premenstrual symptoms of any kind affect women's ability to work, think, study, do brain surgery, run for office, or run a business. In the laboratory, some researchers have found that women tend to be faster on tasks such as reciting words quickly or sorting objects manually before and after ovulation, when their estrogen is high (e.g., Saucier & Kimura, 1998). But empirical research has failed to establish any connection between phase of the menstrual cycle and work efficiency, problem solving, college exam scores, creativity, or any other behavior that matters in real life (Golub, 1992; Richardson, 1992). In a British study, female college students *said* that PMS interfered with their academic work, but the researchers could find no association between the number of symptoms reported by the students and their actual grades and test scores (Earl-Novell & Jessop, 2005). In the workplace, men and women report similar levels of stress, well-being, and ability to do the work required of them—and it doesn't matter whether the women are premenstrual, menstrual, postmenstrual, or nonmenstrual (Hardie, 1997).

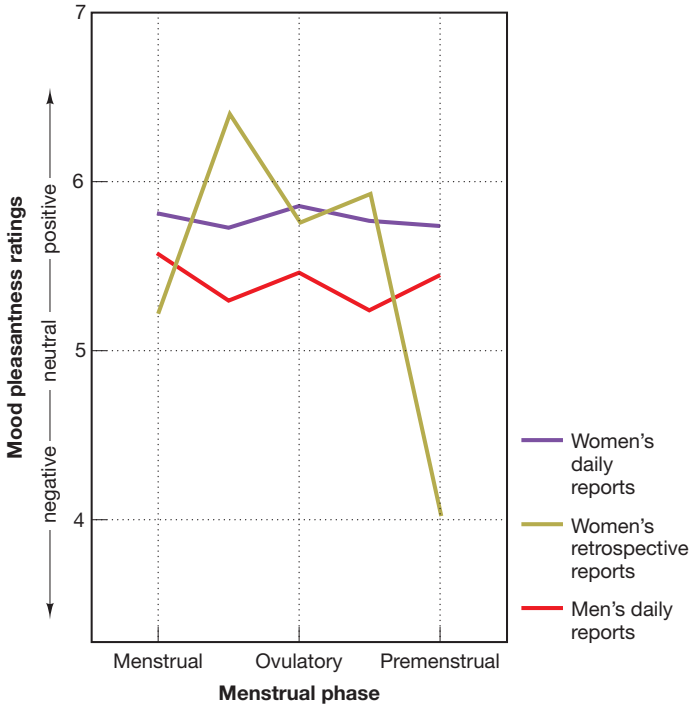


FIGURE 5.1
Mood Changes in Men and Women
In a study that challenged popular stereotypes about "PMS," college women and men recorded their moods daily for 70 days without knowing the purpose of the study. At the end of the study, the women thought their moods had been more negative premenstrually than during the rest of the month (green line), but their daily diaries showed otherwise (purple line). Both sexes experienced only moderate mood changes, and there were no significant differences between women and men at any time of the month (McFarlane, Martin, & Williams, 1988).

With the rise of globalization, the exporting of American media, and the influence of drug marketing worldwide, PMS symptoms are now increasing in cultures where previously there were no reports of them—from Mexico (Marvan et al., 1998) to Saudi Arabia (Rasheed & Al-Sowielem, 2003). The belief that PMS is universal, along with promotion of products to treat it, makes it more probable that women will interpret their premenstrual moods and symptoms as part of a syndrome that requires medicating.

In sum, the body only provides the clay for our symptoms and feelings. Learning and culture mold that clay by teaching us which symptoms are important or worrisome and which are not. Whether we are male or female, the impact of most of the changes associated with our biological rhythms depends on how we interpret and respond to them.

Study and Review on mypsychlab.com

Quick Quiz

There are no hormonal excuses for avoiding this quiz.

1. The functioning of the biological clock governing circadian rhythms is affected by the hormone _____.
2. Jet lag occurs because of _____.
3. For most women, the days before menstruation are reliably associated with (a) depression, (b) irritability, (c) elation, (d) creativity, (e) none of these, (f) a and b.
4. A researcher tells male subjects that testosterone usually peaks in the morning and that it probably causes hostility. She then asks them to fill out a "HyperTestosterone Syndrome Hostility Survey" in the morning and again at night. Based on your knowledge of menstrual cycle findings, what do you think her study will reveal? How could she improve her study?

Answers:

1. melatonin **2.** internal desynchronization **3.** e **4.** Because of the expectations that the men now have about testosterone, they may be biased to report more hostility in the morning. It would be better to keep them in the dark about the hypothesis and to measure their actual hormone levels at different points in the day, because individuals vary in their biological rhythms. Also, a control group of women could be added to see whether their hostility levels vary in the same way that men's do. Finally, the title on that questionnaire is pretty biased. A more neutral title, such as "Health and Mood Checklist," would be better.

YOU are about to learn...

- the stages of sleep.
- what happens when we go too long without enough sleep.
- how sleep disorders disrupt normal sleep.
- the mental benefits of sleep.

The Rhythms of Sleep

Perhaps the most perplexing of all our biological rhythms is the one governing sleep and wakefulness. Sleep, after all, puts us at risk: Muscles that are usually ready to respond to danger relax, and senses grow dull. As the British psychologist Christopher Evans (1984) once noted, "The behavior patterns involved in sleep are glaringly, almost insanely, at odds with common sense." Then why is sleep such a profound necessity?

Simulate Stages of Sleep on mypsychlab.com

The Realms of Sleep

Let's start with some of the changes that occur in the brain during sleep. Until the early 1950s, little was known about these changes. Then a breakthrough occurred in the laboratory of physiologist Nathaniel Kleitman, who at the time was the only person in the world who had spent his entire career studying sleep. Kleitman had given one of his graduate students, Eugene Aserinsky, the tedious task of finding out whether the slow, rolling eye movements that characterize the onset of sleep continue throughout the night. To both men's surprise, eye movements did occur but they were rapid, not slow (Aserinsky & Kleitman, 1955). Using the electroencephalograph (EEG) to measure the brain's electrical activity (see Chapter 4), these researchers, along with another of Kleitman's students, William Dement, were able to correlate the rapid eye movements with changes in sleepers' brain-wave patterns (Dement, 1992). Adult volunteers were soon spending their nights sleeping in laboratories, while scientists measured changes in their brain activity, muscle tension, breathing, and other physiological responses.

As a result of this research, today we know that during sleep, periods of **rapid eye movement (REM)** alternate with periods of fewer eye movements, or *non-REM (NREM) sleep*, in a cycle that recurs every 90 minutes or so. The REM periods last from a few minutes to as long as an hour, averaging about 20 minutes in length. Whenever they begin, the pattern of electrical activity from the sleeper's brain changes to resemble that of alert wakefulness. Non-REM periods are themselves divided into distinct stages, each associated with a particular brain-wave pattern (see Figure 5.2). Simulate

When you first climb into bed, close your eyes, and relax, your brain emits bursts of *alpha waves*. On an EEG recording, alpha waves have a regular, slow rhythm and high amplitude (height). Gradually, these waves slow down even further, and you drift into the Land of Nod, passing through four stages, each deeper than the previous one:

Stage 1. Your brain waves become small and irregular, and you feel yourself drifting on the edge of consciousness, in a state of light sleep. If

rapid eye movement (REM) sleep Sleep periods characterized by eye movement, loss of muscle tone, and vivid dreams.

awakened, you may recall fantasies or a few visual images.

Stage 2. Your brain emits occasional short bursts of rapid, high-peaking waves called *sleep spindles*. Minor noises probably won't disturb you.

Stage 3. In addition to the waves that are characteristic of Stage 2, your brain occasionally emits *delta waves*, very slow waves with very high peaks. Your breathing and pulse have slowed down, your muscles are relaxed, and you are hard to waken.

Stage 4. Delta waves have now largely taken over, and you are in deep sleep. It will probably take vigorous shaking or a loud noise to awaken you. Oddly, though, if you walk in your sleep, this is when you are likely to do so. No one yet knows what causes sleepwalking, which occurs more often in children than adults, but it seems to involve unusual patterns of delta-wave activity (Bassetti et al., 2000).

This sequence of stages takes about 30 to 45 minutes. Then you move back up the ladder from Stage 4 to 3 to 2 to 1. At that point, about 70 to 90 minutes after the onset of sleep, something peculiar happens. Stage 1 does not turn into drowsy wakefulness, as one might expect. Instead, your brain begins to emit long bursts of very rapid, somewhat irregular waves. Your heart rate increases, your blood pressure rises, and your breathing gets faster and more irregular. Small twitches in your face and fingers may occur. In men, the penis may become somewhat erect as vascular tissue relaxes and blood fills the genital area faster than it exits. In women, the clitoris may enlarge and vaginal lubrication may increase. At the same time, most skeletal muscles go limp, preventing your aroused brain from producing physical movement. You have entered the realm of REM.

Because the brain is extremely active while the body is entirely inactive, REM sleep has also been called "paradoxical sleep." During these periods, vivid dreams are most likely to occur. People report dreams when they are awakened from non-REM sleep, too; in one study, dream reports occurred 82 percent of the time when sleepers were awakened during REM sleep, but they also occurred 51 percent of the time when people were awakened during non-REM sleep (Foulkes, 1962). Non-REM dreams, however, tend to be shorter, less vivid, and more realistic than REM dreams, except in the hour or so before a person wakes up in the morning.

Occasionally, as the sleeper wakes up, a curious phenomenon occurs. The person emerges from REM sleep before the muscle paralysis characteristic of that stage has entirely disappeared, and becomes aware of an inability to move. About 30 percent of the general population has experienced at least one such episode, and about 5 percent have had a "waking dream" in this state. Their eyes are open, but what they "see" are dreamlike hallucinations, most often shadowy figures. They may even "see" a ghost or space alien sitting on their bed or hovering in a hallway, a scary image that they would regard as perfectly normal it if were part of a midnight nightmare.

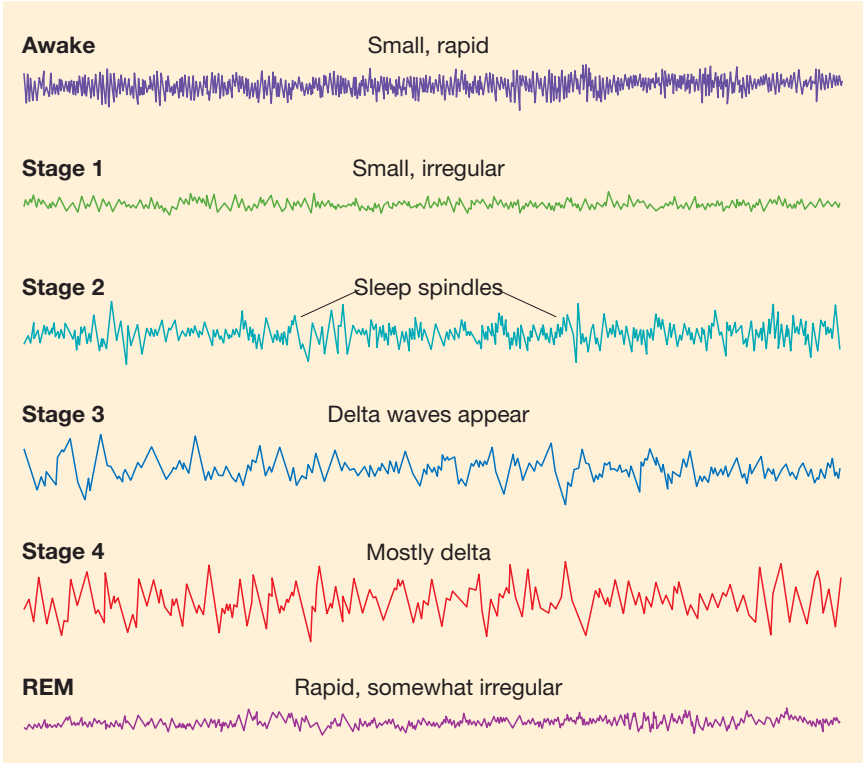


FIGURE 5.2
Brain-Wave Patterns During Wakefulness and Sleep
Most types of brain waves are present throughout sleep, but different ones predominate at different stages.

Thinking Critically about Waking Dream Images

Because cats sleep up to 80 percent of the time, it is easy to catch them in the various stages of slumber. A cat in non-REM sleep (left) remains upright, but during the REM phase (right), its muscles go limp and it flops onto its side.

Instead of saying, "Ah! How interesting! I am having a waking dream!" some people interpret this experience literally and come to believe they have been visited by aliens or are being haunted by ghosts (Clancy, 2005; McNally, 2003).

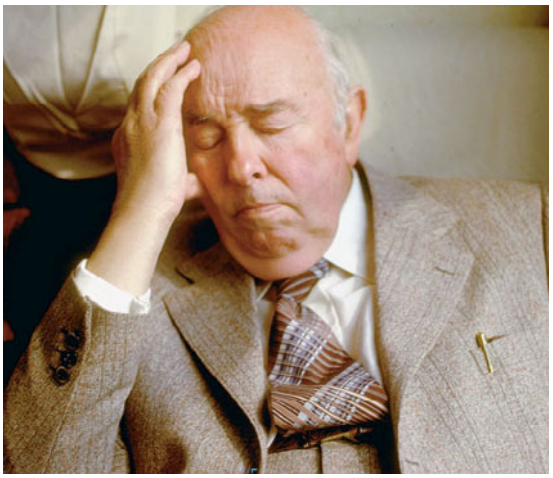
REM and non-REM sleep continue to alternate throughout the night. As the hours pass, Stages 3 and 4 tend to become shorter or even disappear and REM periods tend to get longer and closer together. This pattern may explain why you are likely to be dreaming when the alarm clock goes off in the morning. But the cycles are far from regular. An individual may bounce directly from Stage 4 back to Stage 2 or go from REM to Stage 2 and then back to REM. Also, the time between REM and non-REM is highly variable, differing from person to person and also within any given individual.

The reasons for REM sleep are still uncertain. If you wake people up every time they lapse into REM sleep, nothing dramatic will happen. When finally allowed to sleep normally, however, they will spend a longer time than usual in the REM phase, and it will be hard to rouse them. Electrical brain activity associated with REM may burst through into non-REM sleep and even into wakefulness, as if the person is making up for something he or she had been deprived of.

Some researchers have proposed that this "something" is connected with dreaming, but that idea has problems. For one thing, in rare cases, brain-damaged patients have lost the capacity to dream, yet they continue to show the normal sleep stages, including REM (Bischof & Bassetti, 2004). Moreover, although nearly all mammals experience REM sleep—the only known exceptions are the bottlenose dolphin and the porpoise—it seems unlikely that rats and anteaters have the cognitive abilities required to construct dreams. Moles, which can hardly move their eyes at all, nonetheless show EEG patterns associated with REM sleep. As William Domhoff, a prominent dream researcher, told us, "no one, but no one, has been able to come up with a convincing explanation for REM sleep."

Why We Sleep

A leading sleep scientist, Jerome Siegel (2009), observes that sleep falls along a continuum of states that range from one extreme, hibernation (bears, bats, and many rodents), to continuous activity for significant lengths of time (birds don't sleep while they are migrating, walruses may stop sleeping for days at a time, and whale mothers and their calves remain awake for several weeks after birth). The reason for this variation in sleep patterns, he



Whatever your age, sometimes the urge to sleep is irresistible, especially because in fast-paced modern societies, many people do not get as much sleep as they need. Late hours or inadequate sleep won't do anything for your grade point average. Daytime drowsiness can interfere with reaction time, concentration, and the ability to learn.

argues, has to do with which strategy is beneficial for the species. Lions sleep long and deeply, whereas their favorite prey, giraffes, have one of the lowest recorded sleep durations—giraffes had better not sleep deeply if they are going to survive!

Among species that do sleep, such as human beings, sleep increases efficiency, for example by decreasing muscle tone and brain and body metabolism during periods of inactivity. This process, says Siegel (2009), is "analogous to turning out the lights when you leave a room." Sleep provides a time-out period, so that the body can eliminate waste products from muscles, repair cells, conserve or replenish energy stores, strengthen the immune system, and recover abilities lost during the day. When we do not get enough sleep, our bodies operate abnormally. Although most people can still get along reasonably well after a day or two of sleeplessness, sleep deprivation that lasts for four days or longer becomes uncomfortable and soon becomes unbearable. (This is why forced sleeplessness is an especially cruel weapon of torturers.)

The Mental Consequences of Sleeplessness

Sleep is also necessary for normal mental functioning. Chronic sleep deprivation increases levels of the stress hormone cortisol, which may damage or impair brain cells that are necessary for learning and memory (Leproult, Copinschi et al., 1997). Also, new brain cells may either fail to develop or may mature abnormally (Guzman-Marin et al., 2005). Perhaps in part because of such damage, after the loss of even a single night's sleep, mental flexibility, attention, and creativity all suffer. After several days of staying awake, people may even begin to have hallucinations and delusions (Dement, 1978).

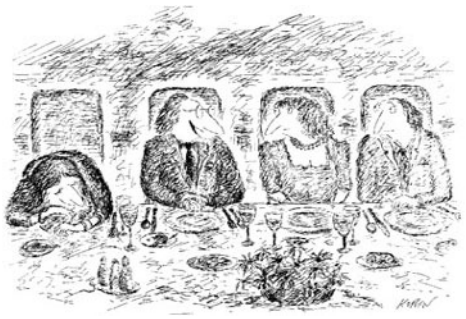
Of course, sleep deprivation rarely reaches that point, but people do frequently suffer from milder sleep problems. According to the National Sleep Foundation, about 10 percent of adults are plagued by difficulty in falling or staying asleep. The causes of their insomnia include worry and anxiety, psychological problems, physical problems such as arthritis, and irregular or overly demanding work and study schedules. In addition, many drugs interfere with the normal progression of sleep stages—not just the ones containing caffeine, but also alcohol and some tranquilizers. The result can be grogginess and lethargy the next day.

Another cause of daytime sleepiness is **sleep apnea**, a disorder in which breathing periodically stops for a few moments, causing the person to choke and gasp. Breathing may cease hundreds of times a night, often without the person knowing it. Sleep apnea is seen most often in older males and overweight people but also occurs in others. It has several causes, from blockage of air passages to failure of the brain to control respiration correctly. Over time it can cause high blood pressure and irregular heartbeat; it may gradually erode a person's health, and is associated with a shortened life expectancy (Young et al., 2008).

With **narcolepsy**, an even more serious disorder that often develops in the teenage years, an individual is subject to irresistible and unpredictable daytime attacks of sleepiness lasting from 5 to 30 minutes. When the person lapses into sleep, he or she is likely to fall immediately into the REM stage. A quarter of a million people in the United States suffer from this condition, many, again, without knowing it. Narcolepsy seems to be caused by the degeneration of neurons in the hypothalamus, possibly due to an autoimmune malfunction or genetic abnormalities (Lin, Hungs, & Mignot, 2001; Mieda et al., 2004).

Other disorders also disrupt sleep, including some that cause odd or dangerous behavior. In **REM behavior disorder**, the muscle paralysis associated with REM sleep does not occur, and the sleeper (most often an older male) becomes physically active, often acting out a dream without any awareness of what he is doing (Schenck & Mahowald, 2002). If he is dreaming about football, he may try to "tackle" a piece of furniture; if he is dreaming about a kitten, he may try to pet it. Other people may consider this disorder amusing, but it is no joke. Sufferers may hurt themselves or others, and they have an increased risk of later developing Parkinson's disease and dementia (Postuma et al., 2008).

However, the most common cause of daytime sleepiness is the most obvious one—not getting enough sleep. Some people do fine on relatively few hours, but most adults need more than six hours and many adolescents need ten hours for optimal performance. The National Transportation Safety Board estimates that drowsiness is



"Judith is someone who needs her sleep."

sleep apnea A disorder in which breathing briefly stops during sleep, causing the person to choke and gasp and momentarily awaken.

narcolepsy A sleep disorder involving sudden and unpredictable daytime attacks of sleepiness or lapses into REM sleep.

REM behavior disorder A disorder in which the muscle paralysis that normally occurs during REM sleep is absent or incomplete, and the sleeper is able to act out his or her dreams.

consolidation The process by which a memory becomes durable and stable.

involved in 100,000 vehicle accidents a year, causing 1,500 road deaths and 71,000 injuries. Sleep deprivation also leads to accidents and errors in the workplace, a concern especially for first-year doctors doing their medical residency. In the United States, federal law limits work hours for airline pilots, truck drivers, and operators of nuclear plants, but medical residents still often work 24- to 30-hour shifts (Landrigan et al., 2008).

Don't doze off as we tell you this, but lack of sleep has also been linked to lower grades. Researchers had a group of elementary and middle school students go to sleep at their normal time for a week, earlier than usual for a week, and much later than usual for a week. Their teachers, who were blind to which condition a child was in during any given week, reported more academic and attention problems when the children stayed up late (Fallone et al., 2005). These results probably apply to high school and college students as well.

Watch **How to Get a Good Night's Sleep** on **mypsychlab.com**

Watch

The Mental Benefits of Sleep

Just as sleepiness can interfere with good mental functioning, a good night's sleep can promote it, and not just because you are well rested. In a classic study conducted nearly a century ago, students who slept for eight hours after learning lists of nonsense syllables retained them better than students who went about their usual business (Jenkins & Dallenbach, 1924). For years, researchers attributed this result to the lack of new information coming into the brain during sleep, information that could interfere with already-established memories. Today, however, many scientists believe that sleep plays a more active role by contributing to **consolidation**, in which synaptic changes associated with recently stored memories become durable and stable (Racsmány, Conway, & Demeter, 2010). One theory is that during sleep, the neural changes involved in a recent memory are reactivated, making those changes more permanent (Rasch et al., 2007).

Improvements in memory have been associated most closely with REM sleep and slow-wave sleep (Stages 3 and 4), and with memory for specific motor and perceptual skills. In one study, when people or animals learned a perceptual task and were allowed to get normal REM sleep, their memory for the task was better the next day, even when they had been awakened during non-REM periods. When they were deprived of REM sleep, however, their memories were impaired (Karni et al., 1994). But sleep also seems to strengthen other kinds of memories, including the recollection of events, locations, and facts (Rasch & Born, 2008). Emotional memories, especially, are improved with sleep. When people look at emotionally arousing scenes in the morning or evening and are then tested for their memory of the materials after 12 hours of daytime wakefulness or normal nighttime sleep, those tested after sleeping rather than wakefulness recall the emotional scenes more reliably than the neutral ones (Hu, Stylos-Allan, & Walker, 2006). They also do better at remembering negative emotional scenes than other participants do (Payne et al., 2008). (See Figure 5.3.)

If sleep enhances memory, perhaps it also enhances problem solving, which relies on information stored in memory. To find out, German researchers gave volunteers a math test that required them to use two mathematical rules to generate one string of numbers from another and to deduce the final digit in the new sequence as quickly as possible. The volunteers were not told about a hidden shortcut that would enable them to calculate the final digit almost immediately. One group was trained in the evening and then got to snooze for eight hours before returning to the problem. Another group was also trained in the evening but then stayed awake for eight hours before coming back to the problem. A third group was trained in the morning and stayed awake all day, as they normally would, before taking the test. Those people who got the nighttime sleep were nearly three times likelier

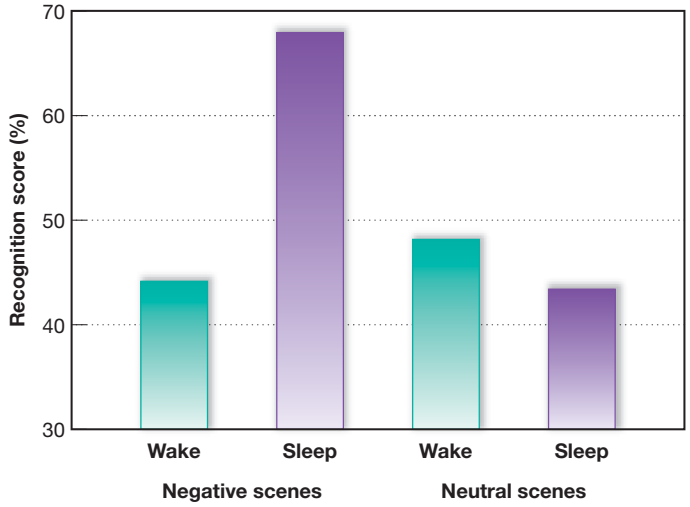


FIGURE 5.3
Sleep and Consolidation in Memory
When college students studied neutral scenes (e.g., an ordinary car) and emotionally negative scenes (e.g., a car totaled in an accident), sleep affected how well they later recognized the objects in the scenes. Students who studied the scenes in the evening and then got a night's sleep before being tested did better at recognizing emotional objects than did those who studied the scenes in the morning and were tested after 12 hours of daytime wakefulness (Payne et al., 2008).

to discover the hidden shortcut as those in the other two groups (Wagner et al., 2004).

Researchers are not unanimous on the role of sleep in learning; some studies have failed to find that sleep improves memory (Vertes & Siegel, 2005). In one study, researchers who believe that sleep promotes consolidation found, to their surprise, that depriving people of REM sleep actually *improved* memory for motor and perceptual skills involving finger tapping and mirror tracing (Rasch et al., 2009). Of course, not many of us have much occasion to use these particular skills!

Nonetheless, the evidence for the importance of sleep in human memory and problem solving is mounting (Cai et al., 2009). The underlying biology may involve the formation of new synaptic connections in the brain and also the weakening of connections that are no longer needed (Donlea, Ramanan, & Shaw, 2009; Gilestro, Tononi, & Cirelli, 2009). In other words, we sleep to remember, but we also sleep to forget, so that the brain will have space and energy for new learning. Remember that the next time you are tempted to pull an all-nighter. Even a quick nap may help your mental functioning and increase your ability to put together separately learned facts in new ways (Lau, Alger, & Fishbein, 2008; Mednick et al., 2002). Sleep on it.

Quick Quiz

Now wake up and take this quiz.

A. Match each term with the appropriate phrase:

1. REM periods	**a.** delta waves and sleepwalking
2. alpha	**b.** irregular brain waves and light sleep
3. Stage 4 sleep	**c.** relaxed but awake
4. Stage 1 sleep	**d.** active brain but inactive muscles

B. Sleep is necessary for normal (a) physical and mental functioning, (b) mental functioning but not physical functioning, (c) physical functioning but not mental functioning.

C. *True or false:* Most people need more than six hours of sleep a night.

D. *True or false:* Only REM sleep has been associated with dreaming and memory consolidation.

Answers:

A. 1. d 2. c 3. a 4. b **B.** a **C.** true **D.** false

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YOU are about to learn...

- **Freud's theory that dreams are the "royal road to the unconscious."**
- **how dreams might be related to your current problems and concerns.**
- **how dreams might be related to ordinary daytime thoughts.**
- **how dreams could be caused by meaningless brainstem signals.**

Exploring the Dream World

For years, researchers believed that everyone dreams, and indeed most people who claim they never have dreams will report them if they are awakened during REM sleep. There are rare cases of people who apparently do not dream at all (Pagel, 2003; Solms, 1997). Most, but not all, of these individuals have suffered some brain injury.

In dreaming, the focus of attention is inward, though occasionally an external event, such as a wailing siren, can influence the dream's content. While a dream is in progress, it may be vivid or vague, terrifying or peaceful. It may also seem to make perfect sense—until you wake up and recall it as illogical, bizarre, and disjointed. Although most of us are unaware of our bodies or where we are while we are dreaming, some people say that they occasionally have **lucid dreams**, in which they know they are dreaming and feel as though they are conscious (LaBerge & Levitan, 1995). A few even claim that they can control the action in these dreams, much as a scriptwriter decides what will happen in a movie, although this ability is probably uncommon.

lucid dreams Dreams in which the dreamer is aware of dreaming.

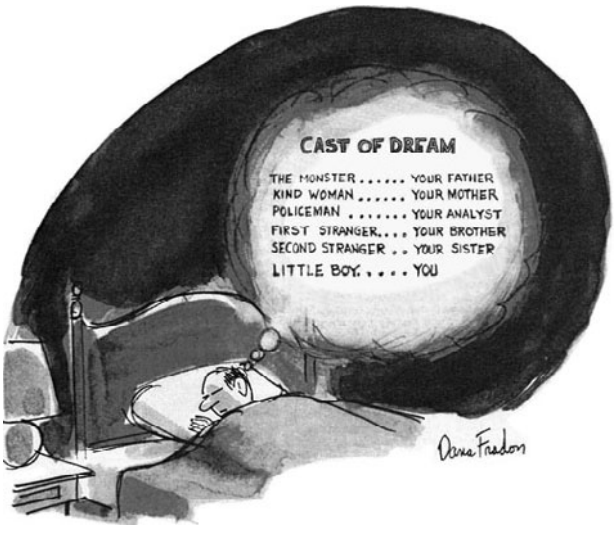
Watch Lucid Dreaming on mypsychlab.com

Why do the images in dreams arise at all? Why doesn't the brain just rest, switching off all thoughts and images and launching us into a coma? Why, instead, do we spend our nights taking a chemistry exam, reliving an old love affair, flying through the air, or fleeing from dangerous strangers or animals in the fantasy world of our dreams? We will consider four leading explanations and then evaluate them. Watch

Dreams as Unconscious Wishes

One of the first psychological theorists to take dreams seriously was Sigmund Freud, the founder of psychoanalysis. After analyzing many of his patients' dreams and some of his own, Freud (1900/1953) concluded that our nighttime fantasies provide insight into desires, motives, and conflicts of which we are unaware. Because dreams allow us to express our unconscious wishes and desires, which are often sexual or violent in nature, they provide a "royal road to the unconscious."

According to Freud, every dream is meaningful, no matter how absurd the images might seem. But if a dream's message arouses anxiety, the rational part of the mind must disguise and distort it. Otherwise, the dream would intrude into consciousness and waken the dreamer. In dreams, therefore, one person is often disguised as another: A brother may be disguised as a father or may even be represented by several different characters. Similarly, thoughts and objects are translated into symbolic images. A penis may be disguised as a snake, umbrella, or dagger; a vagina as a tunnel or cave; and the human body as a house. Because reality is distorted in such ways, a dream resembles a psychosis, a severe mental disturbance; each night, we must become temporarily delusional so that our anxiety will be kept at bay and our sleep will not be disrupted.



To understand a dream, said Freud, we must distinguish its *manifest content*, the aspects of it that we consciously experience during sleep and may remember upon wakening, from its *latent* (hidden) *content*, the unconscious wishes and thoughts being expressed symbolically. Freud warned against the simpleminded translation of symbols (the kind that today often turn up in magazines and pop-psych books promising to tell you exactly what your dreams mean). Each dream, said Freud, should be analyzed in the context of the dreamer's waking life, as well as the person's associations to the dream's contents. Not everything in a dream is symbolic. Sometimes, Freud cautioned, "A cigar is only a cigar."

Dreams as Efforts to Deal with Problems

Another explanation holds that dreams reflect the ongoing *conscious* preoccupations of waking life, such as concerns over relationships, work, sex, or health (Cartwright, 2010; Hall, 1953a, 1953b). In this *problem-focused approach* to dreaming, the symbols and metaphors in a dream do not disguise its true meaning; they convey it. Psychologist Gayle Delaney told of a woman who dreamed she was swimming underwater. The woman's 8-year-old son was on her back, his head above the water. Her husband was supposed to take a picture of them, but for some reason he wasn't doing it, and she was starting to feel as if she were going to drown. To Delaney, the message was obvious: The woman was "drowning" under the responsibilities of child care and her husband wasn't "getting the picture" (in Dolnick, 1990).

The problem-focused explanation of dreaming is supported by findings that dreams are more likely to contain material related to a person's current concerns—such as a breakup or exams—than chance would predict (Cartwright et al., 2006; Domhoff, 1996). Among college students, who are often worried about grades and tests, test-anxiety dreams are common: The dreamer is unprepared for or unable to finish an exam, or shows up for the wrong exam, or can't find the room where the exam is being given. (Sound familiar?) For their part, instructors sometimes dream that they have left their lecture notes at home, or that they are expected to give a lecture in a foreign language on a subject they know nothing about. Traumatic experiences can also affect people's dreams. In a cross-cultural study in which children kept dream diaries for a

These drawings from dream journals show that the images in dreams can be either abstract or literal. In either case, the dream may reflect a person's concerns, problems, and interests. The two fanciful paintings (left and center) represent the dreams of a person who worked all day long with brain tissue, which the drawings rather resemble. The desk was sketched in 1939 by a scientist to illustrate his dream about a mechanical device for instantly retrieving quotations—a sort of early desktop computer!

week, Palestinian children living in neighborhoods under threat of violence reported more themes of persecution and violence than did Finnish or Palestinian children living in peaceful environments (Punamaeki & Joustie, 1998).

Some psychologists believe that dreams not only reflect our waking concerns but also provide us with an opportunity to resolve them (Cartwright, 2010). In people suffering from the grief of divorce, recovery is related to a particular pattern of dreaming: The first dream of the night often comes sooner than it ordinarily would, lasts longer, and is more emotional and story-like. Depressed people's dreams tend to become less negative and more positive as the night wears on, and this pattern, too, predicts recovery (Cartwright et al., 1998). The researchers concluded that getting through a crisis or a rough period in life takes "time, good friends, good genes, good luck, and a good dream system."

Dreams as Thinking

Like the problem-focused approach, the *cognitive approach* to dreaming emphasizes current concerns, but it makes no claims about problem solving during sleep. In this view, dreaming is simply a modification of the cognitive activity that goes on when we are awake. In dreams, we construct reasonable simulations of the real world, drawing on the same kinds of memories, knowledge, metaphors, and assumptions about the world that we do when we are not sleeping (Antrobus, 1991, 2000; Domhoff, 2003; Foulkes, 1999). Thus, the content of our dreams may include thoughts, concepts, and scenarios that may or may not be related to our daily problems. We are most likely to dream about our families, friends, studies, jobs, or recreational interests—topics that also occupy our waking thoughts.

In the cognitive view, the brain is doing the same kind of work during dreams as it does when we are awake; indeed, parts of the cerebral cortex involved in perceptual and cognitive processing during the waking hours are highly active during dreaming. The difference is that when we are asleep we are cut off from sensory input and feedback from the world and from our bodily movements; the only input to the brain is its own output. That is why our dreaming thoughts tend to be more unfocused and diffuse than our waking ones—unless of course we're daydreaming!

This view predicts that if a person could be totally cut off from all external stimulation while awake, mental activity would be much like that during dreaming, with the same hallucinatory quality. In Chapter 6, we will see that this is, in fact, the case. The cognitive approach also predicts that as cognitive abilities and brain connections mature during childhood, dreams should change in nature, and they do. Toddlers may not dream at all in the sense that adults do. And although young children may experience visual images during sleep, their cognitive limitations keep them from creating true narratives until age 7 or 8 (Foulkes, 1999). Their dreams are infrequent and tend to be bland and static, often about everyday things ("I saw a dog; I was sitting"). But as they grow up, their dreams gradually become more and more intricate and story-like.

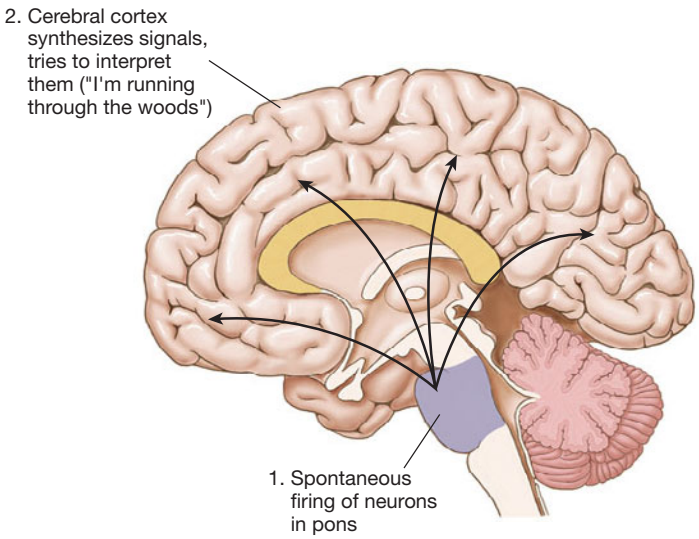
activation–synthesis theory The theory that dreaming results from the cortical synthesis and interpretation of neural signals triggered by activity in the lower part of the brain.

Dreams as Interpreted Brain Activity

A fourth approach to dreaming, the **activation–synthesis theory,** draws heavily on physiological research. According to this explanation, first proposed by psychiatrist J. Allan Hobson (1988, 1990), dreams are not "children of an idle brain," as Shakespeare called them. Rather, they are largely the result of neurons firing spontaneously in the pons (in the lower part of the brain) during REM sleep. These neurons control eye movement, gaze, balance, and posture, and they send messages to sensory and motor areas of the cortex responsible for visual processing and voluntary action during wakefulness.

According to the activation–synthesis theory, the signals originating in the pons have no psychological meaning in themselves. But the cortex tries to make sense of them by *synthesizing*, or integrating, them with existing knowledge and memories to produce some sort of coherent interpretation. This is just what the cortex does when signals come from sense organs during ordinary wakefulness. The idea that one part of the brain interprets what has gone on in other parts, whether you are awake or asleep, is consistent with many modern theories of how the brain works (see Chapter 4).

ACTIVATION–SYNTHESIS THEORY OF DREAMS



When neurons fire in the part of the brain that handles balance, for instance, the cortex may generate a dream about falling. When signals occur that would ordinarily produce running, the cortex may manufacture a dream about being chased. Because the signals from the pons occur randomly, the cortex's interpretation—the dream—is likely to be incoherent and confusing. And because the cortical neurons that control the initial storage of new memories are turned off during sleep, we typically forget our dreams upon waking unless we write them down or immediately recount them to someone else.

Since Hobson's original formulation, he and his colleagues have added further details and modifications (Hobson, Pace-Schott, & Stickgold, 2000). The brain stem, they say, sets off responses in emotional and visual parts of the brain. At the same time, brain regions that handle logical thought and sensations from the external world shut down. These changes could account for the fact that dreams are often emotionally charged, hallucinatory, and illogical.

In this view, wishes do not cause dreams; brain mechanisms do. Dream content, says Hobson (2002), may be "as much dross as gold, as much cognitive trash as treasure, and as much informational noise as a signal of something." But that does not mean dreams are *always* meaningless. Hobson (1988) has argued that the brain "is so inexorably bent upon the quest for meaning that it attributes and even creates meaning when there is little or none to be found in the data it is asked to process." By studying these attributed meanings, you can learn about your unique perceptions, conflicts, and concerns—not by trying to dig below the surface of the dream, as Freud would, but by examining the surface itself. Or you can relax and enjoy the nightly entertainment that dreams provide.

Evaluating Dream Theories

How are we to evaluate these attempts to explain dreaming? All four approaches account for some of the evidence, but each one also has its drawbacks.

Most psychologists today accept Freud's notion that dreams are more than incoherent ramblings of the mind and that they can have psychological meaning. But most also consider the traditional psychoanalytic interpretations of dreams to be far-fetched. No reliable rules exist for interpreting the supposedly latent content of dreams, and there is no objective way to know whether a particular interpretation is correct. Nor is there any convincing empirical support for most of Freud's specific claims. Freudian interpretations are common in popular books and on the Internet, but they reflect the writers' imaginations, not your life.

Thinking Critically about Dream Theories

Get Involved! Keep a Dream Diary

It can be fun to record your dreams. Keep a notebook or a recorder by your bedside. As soon as you wake up in the morning (or if you awaken during the night while dreaming), record everything you can remember about your dreams, even short fragments. After you have collected several dreams, see which theory or theories discussed in this chapter seem to best explain them. Do your dreams contain any recurring themes? Do you think they provide any clues to your current problems, activities, or concerns? (By the way, if you are curious about other people's dreams, you can find lots of them online at www.dreambank.net.)

As for dreaming as a way of solving problems, it seems pretty clear that some dreams are related to current worries and concerns, but skeptics doubt that people can actually solve problems or resolve conflicts while sound asleep (Blagrove, 1996; Squier & Domhoff, 1998). Dreams, they say, merely give expression to our problems. The insights into those problems that people attribute to dreaming could be occurring after they wake up and have a chance to think about what is troubling them.

The activation–synthesis theory has also come in for criticism (Domhoff, 2003). Not all dreams are as disjointed or as bizarre as the theory predicts; in fact, many tell a coherent, if fanciful, story. Moreover, the activation–synthesis approach does not account well for dreaming that goes on outside of REM sleep. Some neuropsychologists emphasize different brain mechanisms involved in dreams, and many believe that dreams do reflect a person's goals and desires.

Finally, the cognitive approach to dreams is fairly new, so some of its claims remain to be tested against neurological and cognitive evidence. At present, however, it is a leading contender because it incorporates many elements of other theories and fits what we currently know about waking cognition and cognitive development.

Perhaps it will turn out that different kinds of dreams have different purposes and origins. We all know from experience that some of our dreams seem to be related to daily problems, some are vague and incoherent, and some are anxiety dreams that occur when we are worried or depressed. But whatever the source of the images in our sleeping brains may be, we need to be cautious about interpreting our own dreams or anyone else's. A study of people in India, South Korea, and the United States showed that individuals are biased and self-serving in their dream interpretations, accepting those that fit in with their preexisting beliefs or needs and rejecting those that do not. For example, they will give more weight to a dream in which God commands them to take a year off to travel the world than one in which God commands them to take a year off to work in a leper colony (Morewedge & Norton, 2009). Our biased interpretations may tell us more about ourselves than do our actual dreams. Explore

Explore Theories of Dreaming on mypsychlab.com

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Quick Quiz

See if you can dream up an answer to this question.

In his dreams, Andy is an infant crawling through a dark tunnel looking for something he has lost. Which theory of dreams would be most receptive to each of the following explanations?

1. Andy recently found a valuable watch he had misplaced.
2. While Andy was sleeping, neurons in his pons that would ordinarily stimulate parts of the brain involved in leg-muscle movements were active.
3. Andy has repressed an early sexual attraction to his mother; the tunnel symbolizes her vagina.
4. Andy has broken up with his lover and is working through the emotional loss.

Answers:

1. the cognitive approach (the dreamer is thinking about a recent experience) 2. the activation–synthesis theory 3. psychoanalytic theory 4. the problem-focused approach

YOU are about to learn...

- common misconceptions about what hypnosis can do.
- the legitimate uses of hypnosis in psychology and medicine.
- two ways of explaining what happens during hypnosis.

The Riddle of Hypnosis

For many years, stage hypnotists, "past-lives channelers," and some psychotherapists have been reporting that they can "age regress" hypnotized people to earlier years or even earlier centuries. Some therapists claim that hypnosis helps their patients accurately retrieve long-buried memories, and a few even claim that hypnosis has helped their patients recall alleged abductions by extraterrestrials. What are we to make of all this?

Hypnosis is a procedure in which a practitioner suggests changes in the sensations, perceptions, thoughts, feelings, or behavior of the subject (Kirsch & Lynn, 1995). The hypnotized person, in turn, tries to alter his or her cognitive processes in accordance with the hypnotist's suggestions (Nash & Nadon, 1997). Hypnotic suggestions typically involve performance of an action ("Your arm will slowly rise"), an inability to perform an act ("You will be unable to bend your arm"), or a distortion of normal perception or memory ("You will feel no pain," "You will forget being hypnotized until I give you a signal"). People usually report that their response to a suggestion feels involuntary, as if it happened without their willing it.

To induce hypnosis, the hypnotist typically suggests that the person being hypnotized feels relaxed, is getting sleepy, and feels the eyelids getting heavier and heavier. In a singsong or monotonous voice, the hypnotist assures the subject that he or she is sinking "deeper and deeper." Sometimes the hypnotist has the person concentrate on a color or a small object, or on a particular bodily sensation. People who have been hypnotized report that the focus of attention turns outward, toward the hypnotist's voice. They sometimes compare the experience to being totally absorbed in a good movie or favorite piece of music. The hypnotized person almost always remains fully aware of what is happening and remembers the experience later unless explicitly instructed to forget it. Even then, the memory can be restored by a prearranged signal.

Because hypnosis has been used for everything from parlor tricks and stage shows to medical and psychological treatments, it is important to understand just what this procedure can and cannot achieve. We will begin with the major findings on hypnosis and then consider two leading explanations of hypnotic effects.

hypnosis A procedure in which the practitioner suggests changes in a subject's sensations, perceptions, thoughts, feelings, or behavior.

The Nature of Hypnosis

Thousands of controlled laboratory and clinical studies support the following conclusions about hypnosis (Kirsch & Lynn, 1995; Nash, 2001; Nash & Nadon, 1997):

1 Hypnotic responsiveness depends more on the efforts and qualities of the person being hypnotized than on the skill of the hypnotist. Some people are more responsive to hypnosis than others, but why they are is unknown. Surprisingly, hypnotic susceptibility is unrelated to general personality traits such as gullibility, trust, submissiveness, or conformity (Nash & Nadon, 1997). And it is only weakly related to the ability to become easily absorbed in activities and the world of imagination (Council, Kirsch, & Grant, 1996; Nash & Nadon, 1997).

2 Hypnotized people cannot be forced to do things against their will. Like drunkenness, hypnosis can be used to justify letting go of inhibitions ("I know this looks silly, but after all, I'm hypnotized"). Hypnotized individuals may even comply with a suggestion to do something that looks embarrassing or dangerous. But the individual is choosing to turn responsibility over to the hypnotist and to cooperate with the hypnotist's suggestions (Lynn, Rhue, & Weekes, 1990). There is no evidence that hypnotized people will do anything that actually violates their morals or constitutes a real danger to themselves or others.

3 Feats performed under hypnosis can be performed by motivated people without hypnosis. Hypnotized subjects sometimes perform what seem like extraordinary mental or physical feats, but most research finds that hypnosis does not actually enable people to do things that would otherwise be impossible. With proper motivation, support, and encouragement, the same people could do the same things even without being hypnotized (Chaves, 1989; Spanos, Stenstrom, & Johnson, 1988).

4 Hypnosis does not increase the accuracy of memory. In rare cases, hypnosis has been used successfully to jog the memories of crime victims, but usually the memories of hypnotized witnesses have been completely mistaken. Although hypnosis does sometimes boost the amount of information recalled, it also increases *errors*, perhaps because hypnotized people are more willing than others to

Is it hypnosis that enables the man stretched out between two chairs to hold the weight of the man standing on him, without flinching? This audience assumes so, but the only way to find out whether hypnosis produces unique abilities is to do research with control groups. It turns out that people can do the same thing even when they are not hypnotized.

guess, or because they mistake vividly imagined possibilities for actual memories (Dinges et al., 1992; Kihlstrom, 1994). Because pseudomemories and errors are so common in hypnotically induced recall, the American Psychological Association and the American Medical Association oppose the use of "hypnotically refreshed" testimony in courts of law.

5 Hypnosis does not produce a literal reexperiencing of long-ago events. Many people believe that hypnosis can be used to recover memories from as far back as birth. When one clinical psychologist who uses hypnosis in his own practice surveyed over 800 marriage and family therapists, he was dismayed to find that more than half agreed with this common belief (Yapko, 1994). However, it is just plain wrong. When people are regressed to an earlier age, their mental and moral performance remains adultlike (Nash, 1987). Their brain-wave patterns and reflexes do not become childish; they do not reason as children do or show child-sized IQs. They may use baby talk or report that they feel 4 years old again, but the reason is not that they are actually reliving the experience of being 4; they are just willing to play the role.

6 Hypnotic suggestions have been used effectively for many medical and psychological purposes. Although hypnosis is not of much use for finding out what happened in the past, it can be useful in the treatment of psychological and medical problems. Its greatest success is in pain management; some people experience dramatic relief of pain resulting from conditions as diverse as burns, cancer, and childbirth, and others have learned to cope better emotionally with chronic pain. Hypnotic suggestions have also been used in the treatment of stress, anxiety, obesity, asthma, irritable bowel syndrome, chemotherapy-induced nausea, and even skin disorders (Nash & Barnier, 2007; Patterson & Jensen, 2003).

Theories of Hypnosis

Over the years, people have proposed many explanations of what hypnosis is and how it produces its effects. Today, two competing theories predominate.

Dissociation Theories One leading approach was originally proposed by Ernest Hilgard (1977, 1986), who argued that hypnosis, like lucid dreaming and even simple distraction, involves **dissociation**, a split in consciousness in which one part of the mind operates independently of the rest of consciousness. In many hypnotized people, said Hilgard, although most of the mind is subject to hypnotic suggestion, one part is a *hidden observer*, watching but not participating. Unless given special instructions, the hypnotized part remains unaware of the observer.

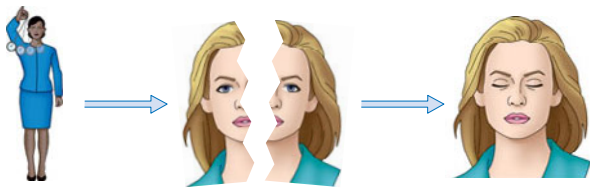
In his research, Hilgard attempted to question the hidden observer directly. In one procedure, hypnotized volunteers had to submerge an arm in ice water for several seconds, an experience that is normally excruciating. They were told that they would feel no pain, but that the unsubmerged hand would be able to signal the level of any hidden pain by pressing a key. In this situation, many people said they felt little or no pain—yet at the same time, their free hand was busily pressing the key. After the session, these people continued to insist that they had been painfree unless the hypnotist asked the hidden observer to issue a separate report.

A related theory holds that during hypnosis, dissociation occurs between an executive-control system in the frontal lobes of the brain and other brain systems involved in thinking and acting (Woody & Bowers, 1994). The result is an altered state of consciousness similar to that found in patients with frontal lobe disorders. Because the dissociated systems are freed from control by the executive, they are more easily influenced by suggestions from the hypnotist. Like the

dissociation A split in consciousness in which one part of the mind operates independently of others.

activation–synthesis theory of dreaming, dissociation theories of hypnosis are consistent with modern brain theories, which hold that one part of the brain operates as a reporter and interpreter of activities carried out unconsciously by other brain parts (see Chapter 4).

DISSOCIATION THEORIES OF HYPNOSIS



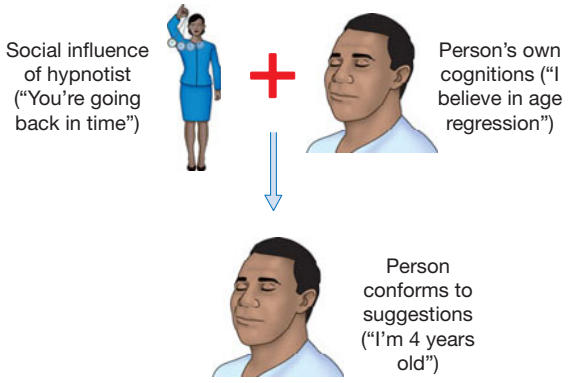
Hypnotist induces hypnotic state

Split between hidden observer or executive control system and rest of mind

Person responds to suggestions ("I'm 4 years old")

The Sociocognitive Approach The second major approach to hypnosis, the *sociocognitive explanation*, holds that the effects of hypnosis result from an interaction between the social influence of the hypnotist (the "socio" part) and the abilities, beliefs, and expectations of the subject (the "cognitive" part) (Kirsch, 1997; Sarbin, 1991; Spanos, 1991). The hypnotized person is basically playing a role. This role has analogies in ordinary life, where we willingly submit to the suggestions of parents, teachers, doctors, therapists, and television commercials. In this view, even the "hidden observer" is simply a reaction to the social demands of the situation and the suggestions of the hypnotist (Kirsch & Lynn, 1998).

SOCIOCOGNITIVE THEORIES OF HYPNOSIS



Social influence of hypnotist ("You're going back in time")

Person's own cognitions ("I believe in age regression")

Person conforms to suggestions ("I'm 4 years old")

The hypnotized person is not merely faking or playacting, however. A person who has been instructed to fool an observer by faking a hypnotic state will tend to overplay the role and will stop playing it as soon as the other person leaves the room. In contrast, hypnotized subjects continue to follow the hypnotic suggestions even when they think they are not being watched (Kirsch et al., 1989; Spanos et al., 1993). Like many social roles, the role of hypnotized person is so engrossing and involving that actions required by the role may occur without the person's conscious intent.

Sociocognitive views explain why some people under hypnosis have reported having memories of alien abductions (Clancy, 2005; Spanos, 1996). The individual goes to a therapist or hypnotist looking for an explanation of his or her loneliness, unhappiness, nightmares, puzzling symptoms (such as waking up in the middle of the night in a cold sweat), or the waking dreams we described earlier. If the therapist already believes in alien abduction, he or she may hypnotize the person and then shape the client's story by giving subtle and not-so-subtle cues about what the person should say.

The sociocognitive view can also explain apparent cases of past-life regression. In a fascinating program of research, Nicholas Spanos and his colleagues (1991) directed hypnotized Canadian university students to regress past their own births to previous lives. About a third of the students (who already believed in reincarnation) reported being able to do so. But when they were asked, while supposedly reliving a past life, to name the leader of their country, say whether the country was at peace or at war, or describe the money used in their community, the students could not do it. (One young man, who thought he was Julius Caesar, said the year was A.D. 50 and he was emperor of Rome. But Caesar died in 44 B.C. and was never crowned emperor, and,

besides, dating years as A.D. or B.C. did not begin until several centuries later.) Not knowing anything about the language, dates, customs, and events of their "previous life" did not deter the students from constructing a story about it. They tried to fulfill the requirements of the role by weaving events, places, and people from their *present* lives into their accounts, and by picking up cues from the experimenter.

Thinking Critically about Hypnosis and "Past Lives"

The researchers concluded that the act of "remembering" another self involves the construction of a fantasy that accords with the rememberer's own beliefs and also the beliefs of others—in this case, those of the authoritative hypnotist. Watch

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Further work may tell us whether or not there is something special about hypnosis. But whatever the outcome of this debate, all hypnosis researchers agree on certain things—for example, that hypnosis does not cause memories to become sharper or allow early experiences to be replayed with perfect accuracy. The study of hypnosis is teaching us much about human suggestibility, the power of imagination, and the way we perceive the present and remember the past.

Quick Quiz

We'd like to plant a suggestion in your mind: You'd be wise to take this quiz. . . .

A. True or false:

1. A hypnotized person is usually aware of what is going on and remembers the experience later.
2. Hypnosis gives us special powers that we do not ordinarily have.
3. Hypnosis reduces errors in memory.
4. Hypnotized people play no active part in controlling their behavior and thoughts.
5. According to Hilgard, hypnosis is a state of consciousness involving a "hidden observer."
6. Sociocognitive theorists view hypnosis as mere faking or conscious playacting.

B. Some people believe that hypnotic suggestions can bolster the immune system and help a person fight disease, but the findings have been mixed and many studies have been flawed (Miller & Cohen, 2001). One therapist dismissed these concerns by saying that a negative result just means that the hypnotist isn't skilled enough. As a critical thinker, can you spot what is wrong with his reasoning? (Think back to Chapter 1 and the way a scientific hypothesis must be stated.)

Answers:

A. 1. true **2.** false **3.** false **4.** false **5.** true **6.** false **B.** The therapist's argument violates the principle of falsifiability. If a result is positive, he counts it as evidence. But if a result is negative, he refuses to count it as counterevidence ("Maybe the hypnotist just wasn't good enough"). With this kind of reasoning, there is no way to tell whether the hypothesis is right or wrong.

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- **the major types of psychoactive drugs.**
- **how recreational drugs affect the brain.**
- **how people's prior drug experiences, individual characteristics, expectations, and mental sets influence their reactions to drugs.**

Consciousness-Altering Drugs

In Jerusalem, hundreds of Hasidic men celebrate the completion of the annual reading of the holy Torah by dancing for hours in the streets. For them, dancing is not a diversion; it is a path to religious ecstasy. In South Dakota, several Lakota (Sioux) adults sit naked in the darkness and crushing heat of the sweat lodge; their goal is euphoria, the transcendence of pain, and connection with the Great Spirit of the Universe. In the Amazon jungle, a young man training to be a shaman, a religious leader, takes a whiff of hallucinogenic snuff made from the bark of the virola tree; his goal is to enter a trance and communicate with animals, spirits, and supernatural forces.

These three rituals, seemingly quite different, are all aimed at release from the confines of ordinary consciousness. Because cultures around the world have devised such practices, some writers believe they reflect a human need, one as basic as



All cultures have found ways to alter consciousness. The Maulavis of Turkey (left), the famous whirling dervishes, spin in an energetic but controlled manner to achieve religious rapture. People in many cultures meditate (center) as a way to quiet the mind and achieve spiritual enlightenment. And in some cultures, psychoactive drugs are used for religious or artistic inspiration, as in the case of the Huichol Indians of western Mexico, shown here harvesting hallucinogenic mushrooms.

the need for food and water (Siegel, 1989). William James (1902/1936), who was fascinated by alterations in consciousness, would have agreed. After inhaling nitrous oxide ("laughing gas"), he wrote, "Our normal waking consciousness, rational consciousness as we call it, is but one special type of consciousness, whilst all about it, parted from it by the filmiest of screens, there lie potential forms of consciousness entirely different." But it was not until the 1960s, as millions of people began to seek ways to deliberately produce *altered states of consciousness*, that researchers became interested in the psychology, as well as the physiology, of psychoactive drugs. The filmy screen described by James finally began to lift.

Classifying Drugs

A **psychoactive drug** is a substance that alters perception, mood, thinking, memory, or behavior by changing the body's biochemistry. Around the world and throughout history, the most common ones have been tobacco, alcohol, marijuana, mescaline, opium, cocaine, peyote—and, of course, tea and coffee. The reasons for taking psychoactive drugs have varied: to alter consciousness, as part of a religious ritual, for recreation, to decrease physical pain or discomfort, and for psychological escape.

psychoactive drugs Drugs capable of influencing perception, mood, cognition, or behavior.

stimulants Drugs that speed up activity in the central nervous system.

depressants Drugs that slow activity in the central nervous system.

In Western societies, a whole pharmacopeia of recreational drugs exists, and every few years seem to see the introduction of new ones, both natural and synthetic. Most of these drugs can be classified as *stimulants*, *depressants*, *opiates*, or *psychedelics*, depending on their effects on the central nervous system and their impact on behavior and mood (see Table 5.1 on page 170). Chapter 11 discusses addiction and Chapter 12 covers drugs used in the treatment of mental and emotional disorders; here we describe only their physiological and psychological effects:

1 Stimulants speed up activity in the central nervous system. They include, among other drugs, nicotine, caffeine, cocaine, amphetamines ("uppers"), and methamphetamine ("meth"). In moderate amounts, stimulants produce feelings of excitement, confidence, and well-being or euphoria. In large amounts, they make a person anxious, jittery, and hyperalert. In very large doses, they may cause convulsions, heart failure, and death.

Amphetamines are synthetic drugs taken in pill form, injected, smoked, or inhaled. Methamphetamine is structurally similar to amphetamines and is used in the same ways; it comes in two forms, as a powder ("crank," "speed") or in a purer form, a crystalline solid ("glass," "ice"). Cocaine ("coke") is a natural drug, derived from the leaves of the coca plant. Rural workers in Bolivia and Peru chew coca leaf every day without apparent ill effects. In North America, the drug is usually inhaled, injected, or smoked in the highly refined form known as *crack*. These methods give the drug a more immediate, powerful, and dangerous effect than when coca leaf is chewed. Amphetamines, methamphetamine, and cocaine make users feel charged up but do not actually increase energy reserves. Fatigue, irritability, and depression may occur when the effects of these drugs wear off.

2 Depressants slow down activity in the central nervous system. They include alcohol, tranquilizers, barbiturates, and common chemicals that some people inhale ("huffing"). Depressants usually

make a person feel calm or drowsy, and they may reduce anxiety, guilt, tension, and inhibitions. In large amounts, they may produce insensitivity to pain and other sensations. Like stimulants, in very large doses they can cause irregular heartbeats, convulsions, and death.

People are often surprised to learn that alcohol is a central nervous system depressant. In small amounts, alcohol has some of the effects of a stimulant because it suppresses activity in parts of the brain that normally inhibit impulsive behavior, such as loud laughter and clowning around. In the long run, however, it slows down nervous system activity. Like barbiturates and opiates, alcohol can be used as an anesthetic; if you drink enough, you will eventually pass out. Explore

Over time, alcohol damages the liver, heart, and brain. Extremely large amounts of alcohol can kill by inhibiting the nerve cells in brain areas that control breathing and heartbeat. Every so often, a news report announces the death of a college student who had large amounts of alcohol "funneled" into him as part of an initiation or drinking competition. On the other hand, *moderate* drinking—a daily drink or two of wine, beer, or liquor—is associated with a variety of health benefits, including antidiabetic effects and a reduced risk of heart attack and stroke (Brand-Miller et al., 2007; Mukamal et al., 2003; Reynolds et al., 2003).

3 Opiates relieve pain. They include opium, derived from the opium poppy; morphine, a derivative of opium; heroin, a derivative of morphine; synthetic drugs such as methadone; and codeine and codone-based pain relievers such as oxycodone and hydrocodone. These drugs mimic the action of endorphins, and some have a powerful effect on the emotions. When injected, they may produce a rush, a sudden feeling of euphoria. They may also decrease anxiety and motivation. Opiates are highly addictive and when taken in large amounts, they can cause coma and death.

4 Psychedelic drugs disrupt normal thought processes, such as the perception of time and space. Sometimes they produce hallucinations, especially visual ones. Some psychedelics, such as lysergic acid diethylamide (LSD), are made in the laboratory. Others, such as mescaline (from the peyote cactus), *Salvia divinorum* (from an herb native to Mexico), and psilocybin (from a species of mushroom), are natural substances. Emotional reactions to psychedelics vary from person to person and from one time to another for any individual. A trip may be mildly pleasant or unpleasant, a mystical revelation or a nightmare. For decades, research on psychedelics languished because of a lack of funding, but a few clinical researchers are now exploring their potential usefulness in psychotherapy, the relief of psychological distress, and the treatment of anxiety disorders (Griffiths et al., 2008).

Some commonly used drugs fall outside these four classifications or combine elements of more than one category. One is *marijuana* ("pot," "grass," "weed"), which is smoked or, less commonly, eaten

opiates Drugs, derived from the opium poppy, that relieve pain and commonly produce euphoria.

psychedelic drugs Consciousness-altering drugs that produce hallucinations, change thought processes, or disrupt the normal perception of time and space.

Explore **Behavioral Effects Associated with Various Blood Alcohol Levels** on **mypsychlab.com**

An LSD trip can be a ticket to agony or ecstasy. These drawings were done under the influence of the drug as part of a test conducted by the U.S. government in the late 1950s. Before the drug had taken effect, the artist drew the charcoal self-portrait on the left. Within a few hours after taking the first dose, he had become agitated and inarticulate and drew the "portrait" in the center. Three hours later, as the drug was wearing off ("I can feel my knees again"), he made the crayon drawing on the right, complaining that the "pencil" in his hand was hard to hold.

Table 5.1

Some Psychoactive Drugs and Their Effects

Class of Drug	Type	Common Effects	Some Results of Abuse/Addiction
Amphetamines Methamphetamine	Stimulants	Wakefulness, alertness, raised metabolism, elevated mood	Nervousness, headaches, loss of appetite, high blood pressure, delusions, psychosis, heart damage, convulsions, death
Cocaine	Stimulant	Euphoria, excitation, feelings of energy, suppressed appetite	Excitability, sleeplessness, sweating, paranoia, anxiety, panic, depression, heart damage, heart failure, injury to nose if sniffed
Tobacco (nicotine)	Stimulant	Varies from alertness to calmness, depending on mental set, setting, and prior arousal; decreases appetite for carbohydrates	*Nicotine:* heart disease, high blood pressure, impaired circulation, erectile problems in men, damage throughout the body due to lowering of a key enzyme; *Tar:* lung cancer, emphysema, mouth and throat cancer, many other health risks
Caffeine	Stimulant	Wakefulness, alertness, shortened reaction time	Restlessness, insomnia, muscle tension, heartbeat irregularities, high blood pressure
Alcohol (1–2 drinks)	Depressant	Depends on setting and mental set; tends to act like a stimulant because it reduces inhibitions and anxiety	
Alcohol (several/ many drinks)	Depressant	Slowed reaction time, tension, depression, reduced ability to store new memories or to retrieve old ones, poor coordination	Blackouts, cirrhosis of the liver, other organ damage, mental and neurological impairment, psychosis, death with very large amounts
Tranquilizers (e.g., Valium); barbiturates (e.g., phenobarbital)	Depressants	Reduced anxiety and tension, sedation	Increased dosage needed for effects; impaired motor and sensory functions, impaired permanent storage of new information, withdrawal symptoms; possibly convulsions, coma, death (especially when taken with other drugs)
Opium, heroin, morphine, codeine, codone-based pain relievers	Opiates	Euphoria, relief of pain	Loss of appetite, nausea, constipation, withdrawal symptoms, convulsions, coma, possibly death
LSD, psilocybin, mescaline, *Salvia divinorum*	Psychedelics	Depending on the drug: exhilaration, visions and hallucinations, insightful experiences	Psychosis, paranoia, panic reactions
Marijuana	Mild psychedelic (classification controversial)	Relaxation, euphoria, increased appetite, reduced ability to store new memories, other effects depending on mental set and setting	Throat and lung irritation, possible lung damage if smoked heavily

in foods such as brownies; it is the most widely used illicit drug in North America and Europe. Some researchers classify it as a psychedelic, but others feel that its chemical makeup and its psychological effects place it outside the major classifications. The main active ingredient in marijuana is tetrahydrocannabinol (THC), derived from the hemp plant, *Cannabis sativa*. In some respects, THC appears to be a mild stimulant, increasing heart rate and making tastes, sounds, and colors seem more intense. But users often report reactions ranging from mild euphoria to relaxation or even sleepiness.

Some researchers believe that very heavy smoking of marijuana (which is high in tar) may increase the risk of lung damage (Barsky et al., 1998; Zhu et al., 2000). In moderate doses, it can interfere with the transfer of information to long-term memory and impair coordination and reaction times, characteristics it shares with alcohol. In large doses, it can cause hallucinations and a sense of unreality. However, a meta-analysis found only a small impairment in memory and learning among long-term users versus nonusers, less than that typically found in users of alcohol and other drugs (Grant et al., 2003).

Marijuana also has some medical benefits. It reduces the nausea and vomiting that often accompany chemotherapy treatment for cancer and AIDS treatments; it reduces the physical tremors, loss of appetite, and other symptoms caused by multiple sclerosis; it helps reduce the frequency of seizures in some patients with epilepsy; and it alleviates the retinal swelling caused by glaucoma (Grinspoon & Bakalar, 1993; Zimmer & Morgan, 1997).

The Physiology of Drug Effects

Psychoactive drugs produce their effects primarily by acting on brain neurotransmitters, the chemical substances that carry messages from one nerve cell to another. A drug may increase or decrease the release of neurotransmitters at the synapse, prevent the reabsorption of excess neurotransmitter molecules by the cells that have released them, block the effects of a neurotransmitter on a receiving nerve cell, or bind to receptors that would ordinarily be triggered by a neurotransmitter (see Chapter 4). Figure 5.4 shows how one drug, cocaine, increases the amount of norepinephrine and dopamine in the brain by blocking the reabsorption of these substances.

These biochemical changes affect cognitive and emotional functioning, but users are often unable to gauge their own competence. In the case of alcohol, just a couple of drinks can affect perception, response time, coordination, and balance,

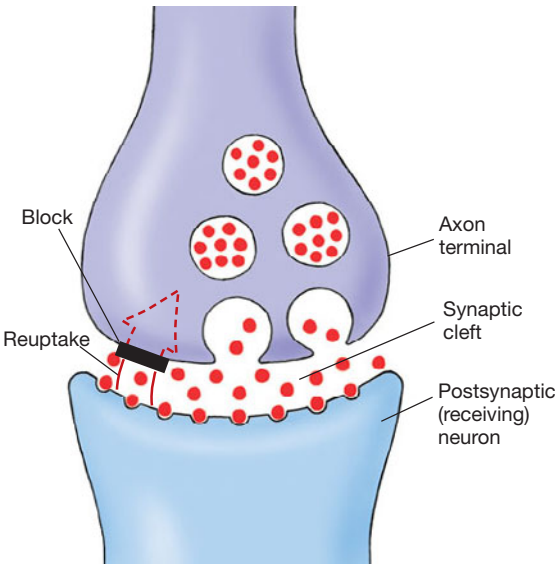

FIGURE 5.4
Cocaine's Effect on the Brain
Cocaine blocks the brain's reabsorption ("reuptake") of the neurotransmitters dopamine and norepinephrine, so levels of these substances rise. The result is overstimulation of brain circuits and a brief euphoric high. Then, when the drug wears off, a depletion of dopamine may cause the user to crash, becoming sleepy and depressed.

despite the drinker's own impression of unchanged or even improved performance. In fact, one research team reported that "Alcohol increases mind wandering while simultaneously reducing the likelihood of noticing one's mind wandering" (Sayette, Reichle, & Schooler, 2009). Liquor also affects memory, possibly by interfering with the work of serotonin. Information stored before a drinking session remains intact during the session but is retrieved more slowly (Haut et al., 1989). Consuming small amounts does not seem to affect *sober* mental performance, but even occasional heavy drinking impairs later abstract thought. In other words, a Saturday night binge is potentially more dangerous than a daily drink.

As for other recreational drugs, there is little evidence that *light* or *moderate* use can damage the human brain enough to affect cognitive functioning, but nearly all researchers agree that heavy or very frequent use is another matter (see Chapter 11). Heavy drug use may interfere with a person's social functioning because of its effects on the frontal lobes (Homer et al., 2008) and also may affect cognitive functioning. In one study, heavy users of methamphetamine had damage to dopamine cells and performed more poorly than other people on tests of memory, attention, and

tolerance Increased resistance to a drug's effects accompanying continued use.

withdrawal Physical and psychological symptoms that occur when someone addicted to a drug stops taking it.

movement, even though they had not used the drug for at least 11 months (Volkow et al., 2001).

The use of some psychoactive drugs, such as heroin and tranquilizers, can lead to **tolerance**: Over time, more and more of the drug is needed to get the same effect. When habitual heavy users stop taking a drug, they may suffer severe **withdrawal** symptoms, which may include nausea, abdominal cramps, sweating, muscle spasms, depression, and disturbed sleep.

The Psychology of Drug Effects

People often assume that the effects of a drug are automatic, the inevitable result of the drug's chemistry. But reactions to a psychoactive drug involve more than the drug's chemical properties. They also depend on a person's experience with the drug, individual characteristics, environmental setting, and mental set.

Thinking Critically about Drug Effects

1 Experience with the drug refers to the number of times a person has taken it. Trying a drug—a cigarette, an alcoholic drink, a stimulant—for the first time is often a neutral or unpleasant experience. But reactions typically change once a person has used the drug for a while and has become familiar with the drug's effects.

2 Individual characteristics include body weight, metabolism, initial state of emotional arousal, personality characteristics, and physical tolerance for the drug. Women generally get drunker than men on the same amount of alcohol because women are smaller, on average, and their bodies metabolize alcohol differently (Fuchs et al., 1995). Similarly, many Asians have a genetically determined adverse reaction to even small amounts of alcohol, which can cause severe headaches, facial flushing, and diarrhea (Cloninger, 1990). For individuals, a drug may have one effect after a tiring day and a different one after a rousing quarrel, or the effect may vary with the time of day because of the body's circadian rhythms. And some differences among individuals in their responses to a drug may be due to their personality traits. When people who are prone to anger and irritability wear nicotine patches, dramatic bursts of activity occur in the brain while they are working on competitive or aggressive tasks. These changes do not occur, however, in more relaxed and cheerful people (Fallon et al., 2004).

3 "Environmental setting" refers to the context in which a person takes the drug. A person might have one glass of wine at home alone and feel sleepy but have three glasses of wine at a party and feel full of energy. Someone might feel happy and

Attitudes about drugs vary with the times. Cigarette smoking was once promoted as healthy and glamorous, and though no doctor would pose in an ad like this one anymore, smoking is still portrayed glamorously in many current films. Before cocaine was banned in the United States in the 1920s, it was widely touted as a cure for everything from toothaches to timidity. It was used in teas, tonics, throat lozenges, and even soft drinks (including, briefly, Coca-Cola, which derived its name from the coca plant).

high drinking with good friends but fearful and nervous drinking with strangers. In an early study of reactions to alcohol, most of the drinkers became depressed, angry, confused, and unfriendly. Then it dawned on the researchers that anyone might become depressed, angry, confused, and unfriendly if asked to drink bourbon at 9:00 A.M. in a bleak hospital room, which was the setting for the experiment (Warren & Raynes, 1972).

4 "Mental set" refers to a person's expectations about the drug's effects and reasons for taking it. Some people drink to become more sociable, friendly, or seductive; some drink to try to reduce feelings of anxiety or depression; and some drink to have an excuse for abusiveness or violence. Addicts use drugs to escape from the real world; people living with chronic pain use the same drugs to function in the real world. As we will see again in Chapter 11, the motives for taking a drug greatly influence its effects.

Expectations can sometimes have a more powerful effect than the chemical properties of the drug itself. In several imaginative studies, researchers compared people who were drinking liquor (vodka and tonic) with those who *thought* they were drinking liquor but were actually getting only tonic and lime juice. (Vodka has a subtle taste, and most people could not tell the real and phony drinks apart.) The experimenters found a *"think–drink" effect:* Men behaved more belligerently when they thought they were drinking vodka than when they thought they were drinking plain tonic water, regardless of the actual content of the drinks. And both sexes reported feeling sexually aroused when they thought they were drinking vodka, whether or not they actually received vodka (Abrams & Wilson, 1983; Marlatt & Rohsenow, 1980). Expectations and beliefs about drugs are, in turn, shaped by the culture in which you live. The belief that alcohol "releases" anger and aggression, for example, often justifies drunken acts of violence, but alcohol alone doesn't cause them; the link weakens when people believe they will be held responsible for their actions while drunk (Critchlow, 1983). In the nineteenth century, Americans regarded marijuana as a mild sedative. They did not expect it to give them a high, and it didn't; it put them to sleep. Today, motives for using marijuana have changed, and these changes have affected how people respond to it. We will discuss the cultural influences on responses to drugs in Chapter 11.

None of this means that alcohol and other drugs are merely placebos. Psychoactive drugs, as we have seen, have physiological effects, many of them extremely potent. By understanding the psychological factors involved in drug use, we can think more critically about the ongoing debate over which drugs, if any, should be legal.

Quick Quiz

There is no debate about whether you should take this quiz.

A. Name the following:

1. Three stimulants used illegally
2. Two drugs that interfere with the formation of new long-term memories
3. Three types of depressant drugs
4. A legal recreational drug that acts as a depressant on the central nervous system
5. Four factors that influence a person's reactions to a psychoactive drug

B. A bodybuilder who has been taking anabolic steroids says the drugs make him more aggressive. What are some other possible interpretations?

Answers:

A. 1. cocaine, amphetamines, and methamphetamine **2.** marijuana and alcohol **3.** barbiturates, tranquilizers, and alcohol **4.** alcohol **5.** prior experience with the drug; the person's physical, emotional, and personality traits; the person's mental set; and the environmental setting **B.** The bodybuilder's increased aggressiveness could be due to his expectations (a placebo effect); bodybuilding itself may increase aggressiveness; the culture of the bodybuilding gym may encourage aggressiveness; other influences in his life or other drugs he is taking may be making him more aggressive; or he may only think he is more aggressive, and his behavior may contradict his self-perceptions.

Psychology in the News REVISITED


Psychology in the News

Measure to Legalize Marijuana Fails in California

LOS ANGELES, November 3, 2010. An initiative to make California the first state to legalize small amounts of marijuana for recreational use failed yesterday at the polls. The vote was 54 percent opposed to legalization versus 46 percent in favor.

The initiative, Proposition 19, would have allowed anyone 21 or older to possess up to an ounce of marijuana and to grow plants in an area up to 25 square feet, so long as the drug was for personal use. In addition, cities and counties would have been able to pass laws allowing the production and sale of marijuana and to tax profits on it. Most law enforcement groups, many clergy, the California League of Cities, and Mothers Against Drunk Driving opposed the measure. The California Young Democrats, the Republican Liberty Caucus, the California Council of Churches, some law enforcement officials, and several large labor unions supported it.

Despite the measure's defeat, Richard Lee, the wheelchair-bound medical-marijuana millionaire who largely bankrolled the measure, called the effort a "tremendous moral victory" because millions of Californians voted for it. Lee, who was paralyzed from the waist down after an accident in 1990, owns several medicinal- marijuana businesses in Oakland. He says that after his accident, marijuana helped control his severe back spasms. His successful dispensaries have contributed to the revival of part of downtown Oakland.

The use of pot for medical purposes has been legal in California since 1996, and in January, a new law will change possession of less than an ounce from a criminal misdemeanor to a civil infraction. But California law conflicts with federal law, and within the state, attitudes and policies often clash. Some cities permit pot clubs, some currently have moratoriums in effect until they can come up with regulations, and some prohibit them outright.

In San Diego, the District Attorney's office considers marijuana for any use to be illegal, yet a jury there recently acquitted a Navy veteran who was operating a medical-marijuana dispensary. In Los Angeles, the law caps the number of dispensaries at 70 and exempts another 100 that were in existence as of 2007, but now bans the more than 800 dispensaries established after that.

At a cannabis buyers cooperative in Oakland, California, customer Ken Estes chooses a marijuana muffin. Estes has been a quadriplegic for 22 years, due to a motorcycle accident.

Let us return now to the emotional debate raised by the news story at the beginning of this chapter, about whether marijuana should be legalized. What was your reaction to this story?

This chapter has reported on the universal human longing to experience altered states of consciousness. As we have seen, throughout history, human beings have sought ways to improve their moods and mental states when their biological rhythms temporarily ebb, and many have used drugs to seek spiritual enlightenment or seek connection with a divine power. And, of course, many people use them to relax, get high, or for medical reasons.

Because the consequences of drug *abuse* are so devastating to individuals and to society, people often have trouble thinking critically about drug laws and policies: Which drugs should be legal, which should be illegal, and which should be decriminalized (that is, not made legal, but not used as a reason for arresting and jailing their users)? What if an otherwise illegal drug has medicinal or religious uses? Native Americans are allowed to use peyote in religious rituals, and in 2006, the U.S. Supreme Court ruled unanimously that a small church in New Mexico could use hoasca tea, which contains a prohibited narcotic, in its ceremonies.

This alarmist poster from the 1930s seems funny and exaggerated today, but even in current debates over drug policy, emotional reasoning often takes precedence over logic and evidence. Should any drugs be decriminalized, or permitted for medical or religious use? Why or why not?

At one extreme, some people cannot accept evidence that their favorite drug—be it coffee, tobacco, alcohol, or marijuana—might have harmful effects. At the other extreme, some cannot accept the evidence that their most hated drug—be it alcohol, morphine, marijuana, or the coca leaf—might not be dangerous in all forms or amounts and might even have some beneficial effects. Both sides often confuse potent drugs with others that have only subtle effects and confuse light or moderate use with heavy or excessive use.

Once a drug is declared illegal, many people assume it is deadly, even though some legal drugs are more dangerous than illegal ones. Addiction to prescription painkillers and sedatives used for recreational rather than medical purposes ("pharming") has risen dramatically among teenagers and adults. Nicotine, which of course is legal, is as addictive as heroin and cocaine, which are illegal. No one has ever died from smoking marijuana, but tobacco use contributes to between 400,000 and 500,000 deaths in the United States every year, 24 times the number of deaths from all illegal forms of drug use combined, and worldwide it is the largest single cause of preventable deaths (Brandt, 2007). Yet most people have a far more negative view of marijuana, heroin, and cocaine than of nicotine and prescription painkillers.

Emotions run especially high in the debate about marijuana. Heavy use has some physical risks, just as heavy use of any drug does. However, a review of studies done between 1975 and 2003 failed to find any compelling evidence that marijuana causes chronic mental or behavioral problems in teenagers or young adults. The researchers observed that cause and effect could just as well work in the other direction; that is, people with problems could be more likely to abuse the drug (Macleod et al., 2004). Because marijuana has medical benefits, Canada, Spain, Italy, Portugal, Israel, Austria, Finland, the Netherlands, and Belgium have either decriminalized it or made it legally available for patients who demonstrate a medical need for it. In the United States, voters in 14 states (as of 2010) have approved the

medical use of marijuana; but in other states, possession of any amount of pot remains illegal, and punishment even for first offenses can be years in prison. In many states, a person who has been convicted of marijuana possession cannot later get food stamps or welfare, which even convicted rapists and murderers are entitled to.

There are, however, alternatives to the extreme positions of "eradicate all illegal drugs" versus "legalize them all." One is to develop programs to reduce or at least delay drug use by young teens, because multiple drug use before age 15 increases the risk of drug dependence, criminal activity, and other problems in adulthood (Odgers et al., 2008). Another approach would legalize narcotics for people who are in chronic pain and marijuana for recreational and medicinal use, but would ban tobacco and most hard drugs. A third approach, instead of punishing or incarcerating people who use drugs, would regulate where drugs are used (never at work or when driving, for example), provide treatment for addicts, and educate people about the benefits and hazards of particular drugs.

Where, given the research findings, do you stand in this debate? Which illegal psychoactive drugs, if any, do you think should be legalized? Can we create mental sets and environmental settings that promote safe recreational use of some drugs, minimize the likelihood of drug abuse, and permit the medicinal use of beneficial drugs? What do you think?

Taking Psychology with You

How to Get a Good Night's Sleep

You hop into bed, turn out the lights, close your eyes, and wait for slumber. An hour later, you're still waiting. Finally you drop off, but at 3:00 A.M., to your chagrin, you're awake again. By the time the rooster crows, you have put in a hard day's night.

Insomnia affects most people at one time or another, and many people most of the time. No wonder that sleeping pills are a multimillion-dollar business. But many of these pills have side effects, such as making you feel a little foggy-headed the next day. Many hasten sleep only slightly, and lose their effectiveness over time. Some can actually make matters worse; barbiturates greatly suppress REM sleep, a result that eventually causes wakefulness, and they also suppress Stages 3 and 4, the deeper stages of sleep. Although pills can be helpful on a temporary basis, they do not get at stress and anxiety that may be at the root of your insomnia, and your insomnia is likely to return once you stop taking the pills. Sleep research suggests some alternatives:

Be sure you actually have a sleep problem. Many people only *think* they sleep poorly. They overestimate how long it takes them to doze off and underestimate how much sleep they are getting. When they are observed in the laboratory, they usually fall asleep in less than 30 minutes and are awake only for very short periods during the night (Bonnet, 1990; Carskadon, Mitler, & Dement, 1974). The real test for diagnosing a sleep deficit is not how many hours you sleep—as we saw, people vary in how much they need—but how you feel during the day. Do you doze off without intending to? Do you feel drowsy in class or at meetings?

Get a correct diagnosis of the sleep problem. Do you suffer from sleep apnea? Do you have a physical disorder that is interfering with sleep? Do you live in a noisy place? Are you fighting your personal biological rhythms by going to bed too early or too late? Do you go to bed early one night and late another? It's better to go to bed at about the same time every night and get up at the same time every morning.

Avoid excessive use of alcohol or other drugs. Many drugs interfere with sleep, and so do coffee, tea, cola, "energy drinks," and chocolate, which all contain caffeine. Alcohol suppresses REM sleep; tranquilizers such as Valium and Librium reduce Stage 4 sleep.

Use relaxation techniques. Listening to soft music at bedtime slows down the heartbeat and breathing, thereby helping older people sleep better and longer (Lai & Good, 2005). Relaxation and meditation techniques help younger people as well.

Avoid lying awake for hours waiting for sleep. Your frustration will cause arousal that will keep you awake. If you can't sleep, get up and do something else, preferably something dull and relaxing, in another room. When you feel drowsy, try sleeping again.

When insomnia is related to anxiety and worry, it makes sense to get to the source of your problems, and that may mean a brief round of cognitive-behavior therapy (CBT), which teaches you how to change the negative thoughts that are keeping you awake. (We discuss this form of therapy in Chapter 12.) A placebo-controlled study that compared the effectiveness of a leading sleep pill and a six-week course of CBT found that both approaches helped alleviate chronic insomnia, but CBT worked better both in the short run and the long run (Jacobs at al., 2004). Other research, too, finds that CBT helps people fall asleep sooner and stay asleep longer than pills do (Morin, 2004).

Woody Allen once said, "The lamb and the lion shall lie down together, but the lamb will not be very sleepy." Like a lamb trying to sleep with a lion, you cannot expect to sleep well with stress hormones pouring through your bloodstream and worries crowding your mind. In an evolutionary sense, sleeplessness is an adaptive response to danger and threat. When your anxieties decrease, so may your sleepless nights.

Summary

Biological Rhythms: The Tides of Experience

- *Consciousness* is the awareness of oneself and the environment. Changing states of consciousness are often associated with *biological rhythms*—periodic fluctuations in physiological functioning. These rhythms are typically tied to external time cues, but many are also *endogenous,* generated from within even in the absence of such cues. *Circadian* fluctuations occur about once a day; other rhythms occur less frequently or more frequently than that.
- When people live in isolation from all time cues, they tend to live a day that is slightly longer than 24 hours. Circadian rhythms are governed by a biological clock in the *suprachiasmatic nucleus (SCN)* of the hypothalamus. The SCN regulates and, in turn, is affected by the hormone *melatonin,* which is responsive to changes in light and dark and which increases during the dark hours. When a person's normal routine changes, the person may experience *internal desynchronization*, in which the usual circadian rhythms are thrown out of phase with one another. The result may be fatigue, mental inefficiency, and an increased risk of accidents.
- Some people experience depression every winter in a pattern that has been labeled *seasonal affective disorder (SAD)*, but serious seasonal depression is rare. The causes of SAD are not yet clear but may involve biological rhythms that are out of phase and/or an abnormality in the secretion of melatonin, although there can also be other, nonbiological causes. Light treatments can be effective.
- Another long-term rhythm is the menstrual cycle, during which various hormones rise and fall. Well-controlled, double-blind studies on PMS do not support claims that emotional symptoms are reliably and universally tied to the menstrual cycle. Overall, women and men do not differ in the emotional symptoms they report or in the number of mood swings they experience over the course of a month.
- Expectations and learning affect how both sexes interpret bodily and emotional changes. Few people of either sex are likely to undergo dramatic monthly mood swings or personality changes because of hormones.

The Rhythms of Sleep

- During sleep, periods of *rapid eye movement (REM)* alternate with *non-REM sleep* in approximately a 90-minute rhythm. Non-REM sleep is divided into four stages on the basis of characteristic brain-wave patterns. During REM sleep, the brain is active, and there are other signs of arousal, yet most of the skeletal muscles are limp; vivid dreams are reported most often during REM sleep. Some people have had "waking dreams" when they emerge from REM sleep before the paralysis of that stage has subsided, and occasionally, people have interpreted the resulting hallucinations as real. The purposes of REM are still a mystery.
- Sleep is necessary not only for bodily restoration but also for normal mental functioning. Many people get less than the optimal amount of sleep. Some suffer from insomnia, *sleep apnea*, *narcolepsy,* or *REM behavior disorder*, but the most common reason for daytime sleepiness is probably a simple lack of sleep.
- Sleep may contribute to the *consolidation* of memories and subsequent insight and problem solving. These benefits have been associated most closely with REM sleep and slow-wave sleep.

Exploring the Dream World

- Dreams are sometimes recalled as illogical and disjointed. Some people say they have *lucid dreams* in which they know they are dreaming.
- The *psychoanalytic theory of dreams* holds that they allow us to express forbidden or unrealistic wishes and desires that have been forced into the unconscious part of the mind and disguised as symbolic images. The *problem-solving approach to dreams* holds that dreams express current concerns and may even help us solve current problems and work through emotional issues, especially during times of crisis. The *cognitive approach to dreams* holds that they are simply a modification of the cognitive activity that goes on when we are awake. The difference is that during sleep we are cut off from sensory input from the world and our bodily movements, so our thoughts tend to be more diffuse and unfocused. The *activation–synthesis theory of dreaming* holds that dreams occur when the cortex tries to make sense of, or interpret, spontaneous neural firing initiated in the pons. The resulting synthesis of these signals with existing knowledge and memories results in a dream.
- All of the current theories of dreams have some support, and all have weaknesses. Most psychologists today accept the notion that dreams are more than incoherent ramblings of the mind, but many psychologists quarrel with psychoanalytic interpretations. Some psychologists doubt that people can solve problems during sleep. The activation–synthesis theory does not seem to explain coherent, story-like dreams or non-REM dreams. The cognitive approach is now a leading

contender, although some of its specific claims remain to be tested.

The Riddle of Hypnosis

- *Hypnosis* is a procedure in which the practitioner suggests changes in a subject's sensations, perceptions, thoughts, feelings, or behavior, and the subject tries to comply. Although hypnosis has been used successfully for many medical and psychological purposes, there are many misconceptions about what it can accomplish. It cannot force people to do things against their will, confer special abilities that are otherwise impossible, increase the accuracy of memory, or produce a literal reexperiencing of long-ago events.
- A leading explanation of hypnosis is that it involves *dissociation*, a split in consciousness. In one version of this approach, the split is between a part of consciousness that is hypnotized and a *hidden observer* that watches but does not participate. In another version, the split is between an executive-control system in the brain and other brain systems responsible for thinking and acting.
- Another leading approach, the *sociocognitive explanation*, regards hypnosis as a product of normal social and cognitive processes. In this view, hypnosis is a form of role-playing in which the hypnotized person uses active cognitive strategies, including imagination, to comply with the hypnotist's suggestions. The role is so engrossing that the person interprets it as real. Sociocognitive processes can account for the apparent age and past-life "regressions" of people under hypnosis and their reports of alien abductions.

Consciousness-Altering Drugs

- In all cultures, people have found ways to produce *altered states of consciousness*, often by using *psychoactive drugs*, which alter cognition and emotion by acting on neurotransmitters in the brain. Most psychoactive drugs are classified as *stimulants*, *depressants*, *opiates*, or *psychedelics*, depending on their central nervous system effects and their impact on behavior and mood. Some common drugs, such as marijuana, fall outside these categories.
- When used frequently and in large amounts, some psychoactive drugs can damage neurons in the brain and impair learning and memory. Their use may lead to *tolerance*, in which increasing dosages are needed for the same effect, and *withdrawal* symptoms if a person tries to quit. But some drugs, such as alcohol and marijuana, are also associated with health benefits when used in moderation.
- Reactions to a psychoactive drug are influenced not only by its chemical properties but also by the user's prior experience with the drug, individual characteristics, environmental setting, and *mental set*—the person's expectations and motives for taking the drug. Expectations can be even more powerful than the drug itself, as shown by the *"think–drink" effect.*

Psychology in the News, Revisited

- People often find it difficult to distinguish drug use from drug abuse, to differentiate between heavy use and light or moderate use, and to separate a drug's legality or illegality from its potential dangers and benefits.

Key Terms

consciousness **147**
biological rhythm **148**
endogenous **148**
circadian rhythm **148**
suprachiasmatic nucleus (SCN) **148**
melatonin **149**
internal desynchronization **149**
seasonal affective disorder (SAD) **151**
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Consciousness is the awareness of oneself and the environment.

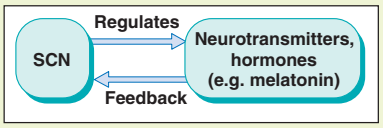
Biological Rhythms: The Tides of Experience

Biological rhythms are periodic fluctuations in physiological functioning, synchronized to external cues or **endogenous** (generated from within).

Circadian Rhythms

Circadian rhythms occur about once a day.

Circadian rhythms are governed by a biological clock in the **suprachiasmatic nucleus** (**SCN**) in the hypothalamus.



Melatonin, secreted by the pineal gland, helps keep the biological clock in phase with the light-dark cycle.

Internal desynchronization occurs when circadian rhythms are out of phase with one another.

Moods and Long-Term Rhythms

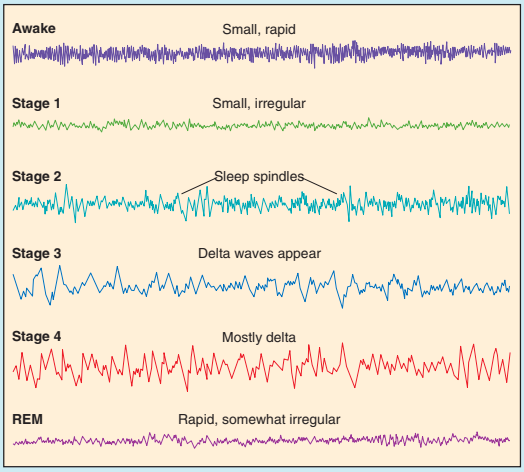
- In the treatment of **seasonal affective disorder** (**SAD**), a placebo effect may play a role, but light treatments are somewhat effective.
- Well-controlled double-blind studies of "PMS" do not support claims that emotional symptoms are tied to the menstrual cycle in most women, or that the menstrual cycle affects the ability to work or study.
- Expectations and learning affect interpretations of bodily and emotional changes.

The Rhythms of Sleep

Periods of **rapid eye movement** (**REM**) alternate with non-REM sleep in a 90-minute rhythm.

- The body is limp.
- The brain is active.
- Vivid dreams occur.

The reasons for REM sleep are still a matter of controversy.



Why We Sleep

Across species, sleep falls along a continuum from hibernation to continuous activity for long lengths of time. In humans, sleep is necessary not only for bodily restoration but for normal mental functioning.

Mental Consequences of Sleeplessness

Sleep deprivation of even one night can result in reduced:

- Mental flexibility
- Attention
- Creativity

Longer periods of sleep deprivation can result in:

- Hallucinations
- Delusions

Sleep disorders include:

- **Sleep apnea**, in which breathing periodically stops for a few moments, causing the person to choke or gasp
- **Narcolepsy**, in which an individual is subject to irresistible and unpredictable daytime attacks of sleepiness or actual sleep, lasting from 5 to 30 minutes
- **REM behavior disorder**, in which muscle paralysis characteristic of REM sleep does not occur and people become physically active while asleep

Mental Benefits of Sleep

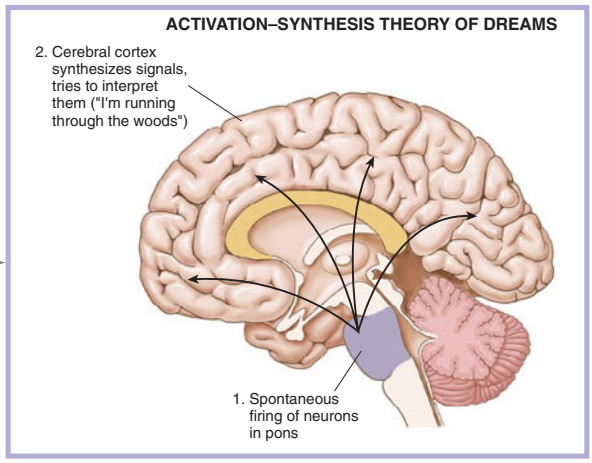
Many scientists believe that sleep:

- Contributes to **consolidation** and retention of memories.
- Enhances problem-solving ability.

Exploring the Dream World

Dreams are a fascinating psychological mystery. They seem to be out of our control, although some people say they have **lucid dreams**, in which they control the action. There are four leading theories of dreams:

1. The psychoanalytic theory holds that dreams provide insight into unconscious motives, forbidden desires, and mental conflicts.
2. The problem-solving approach holds that dreams reflect the ongoing conscious concerns of waking life and may help us resolve them.
3. The cognitive approach holds that dreams are a modification of normal waking cognitive activity.
4. The **activation–synthesis theory** holds that dreams occur when the cortex tries to make sense of spontaneous neural firing initiated in the pons during REM sleep.



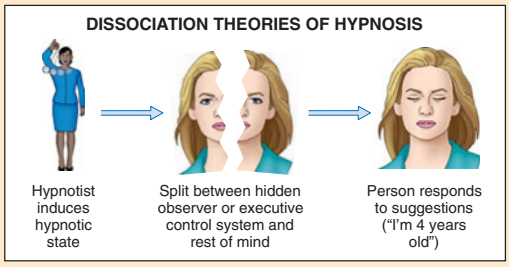
The Riddle of Hypnosis

Hypnosis is a procedure in which the practitioner suggests changes in the sensations, perceptions, thoughts, feelings, or behavior of the subject.

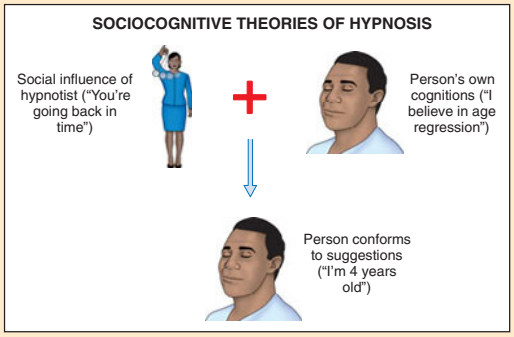
- Hypnotic responsiveness depends more on the efforts and qualities of the person being hypnotized than on the skill of the hypnotist.
- Hypnotized people cannot be forced to do things against their will.
- Feats performed under hypnosis can be performed by motivated people without hypnosis.
- Hypnosis does not increase the accuracy of memory or produce a literal reexperiencing of long-ago events.
- Hypnotic suggestions have been used effectively for many medical and psychological purposes.

Theories of Hypnosis

1. The **dissociation** view is that hypnosis is a split in consciousness between a hypnotized part of the mind and a hidden observer or an executive control system.



2. The **sociocognitive** view regards the hypnotized person as using cognitive strategies, such as imagination, to comply with the hypnotist's suggestions.



Consciousness-Altering Drugs

Psychoactive drugs alter perception, mood, thinking, memory, or behavior by changing the body's biochemistry.

Classifying Drugs

Drug classifications, based on their effects on the central nervous system, include:

- **Stimulants**
- **Depressants**
- **Opiates**
- **Psychedelics**

Marijuana may fall outside of these classifications.

The Physiology and Psychology of Drug Effects

The physiology of drug effects:

- The use of some psychoactive drugs can lead to **tolerance**: increased resistance to a drug's effects.
- When heavy users stop taking a drug, they may suffer severe **withdrawal symptoms**.

The psychology of drug effects may vary, depending on:

- A person's experience with the drug
- A person's physical condition
- The environmental setting
- The person's *mental set*, or expectations