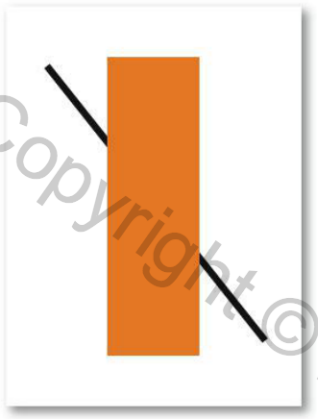

Researchers have used the Poggendorf illusion, shown above, to study the effects of hypnotic age regression. Adults tend to see the two segments of the black line as misaligned (in reality, they're perfectly aligned), whereas children don't. When adult participants are age-regressed to childhood, they still see the two segments of the black line as misaligned, suggesting that hypnotic age regression doesn't make adults' perceptions more childlike (Ascher, Barber, & Spanos, 1972; Nash, 1987).

psychomythology

AGE REGRESSION AND PAST LIVES

One of the most popular myths of hypnosis is that it can help people retrieve memories of events as far back in time as birth. A televised documentary (Bikel, 1995) showed a group therapy session in which a woman was age-regressed through childhood, to the womb, and eventually to being trapped in her mother's fallopian tube. The woman provided a highly emotional demonstration of the discomfort that one would experience if one were indeed stuck in such an uncomfortable position. Although the woman may have believed in the reality of her experience, we can be quite certain that it wasn't memory based (after all, she didn't have a brain yet, because she wasn't even a fertilized egg at this point). Instead, age-regressed participants behave the way they think children should behave. Age-regressed adults don't show the expected patterns on many indices of development. For example, when regressed to childhood, they exhibit the brain waves (EEGs; see Chapter 3) typical of adults rather than of children. No matter how compelling, age-regressed experiences aren't exact mental replicas of childhood experiences (Nash, 1987).

Some therapists believe that they can trace their patients' current problems to previous lives and practice **past-life regression therapy** (Weiss, 1988). Typically, they hypnotize and age-regressed patients to "go back to" the source of their present-day problems. For example, some practitioners of past-life regression therapy claim that neck and shoulder pains may be signs of having been executed by hanging or by a guillotine in a previous life.

With rare exceptions (Stevenson, 1974), researchers believe that reports of a past life are the products of imagination and what hypnotized participants know about a given time period. When checked against known facts (such as whether the country was at war or peace, the face on the coin of the time), participants' descriptions of the historical circumstances of their supposed past lives are rarely accurate. When they are, we can often explain this accuracy by "educated guesses" and knowledge of history (Spanos et al., 1991). For example, one participant regressed to ancient times claimed to be Julius Caesar, emperor of Rome, in 50 B.C., even though the designations of B.C. and A.D. weren't adopted until centuries later and even though Julius Caesar died decades before the first Roman emperor came to power.

past-life regression therapy
therapeutic approach that hypnotizes and supposedly age-regresses patients to a previous life to identify the source of a present-day problem

dissociation theory
approach to explaining hypnosis based on a separation between personality functions that are normally well integrated

as a function of what they're told about hypnosis provide more convincing evidence of causality. Participants told that hypnotized people can resist suggestions find themselves able to resist, whereas those told that hypnotized people can't resist suggestions often fail to resist (Lynn et al., 1984; Spanos, Cobb, & Gorassini, 1985).

Studies show that a training program that increases people's positive feelings and expectancies about hypnosis and their willingness to imagine along with suggestions increases their ability to respond to hypnosis (Gorassini & Spanos, 1998). About half of participants who initially scored at the lowest range of suggestibility tested at the top range after training. These findings both challenge the idea that hypnotic suggestibility is a stable trait that can't be modified (Piccione, Hilgard, & Zimbardo, 1989) and offer support for sociocognitive theory.

RULING OUT RIVAL HYPOTHESES ▶
Have important alternative explanations for the findings been excluded?

Dissociation Theory. Ernest Hilgard's (1977, 1986, 1994) **dissociation theory** is an influential alternative to sociocognitive theories of hypnosis (Kihlstrom, 1992, 1998; Woody & Sadler, 2008). Hilgard (1977) defined *dissociation* as a division of consciousness, in which attention, effort, and planning are carried out without awareness. He hypothesized that hypnotic suggestions result in a separation between personality functions that are normally well integrated.

Hilgard (1977) happened on a discovery that played a key role in the development of his theory. During a demonstration of hypnotically suggested deafness, a student asked whether some part of the person could hear. Hilgard then told the participant that when he

touched the participant's arm he'd be able to talk to the part that could hear if such a part existed. When Hilgard placed his hand on the participant's arm, the participant described what people in the room said. However, when Hilgard removed his hand, the participant was again "deaf." Hilgard invented the metaphor of the *hidden observer* to describe the dissociated, unhypnotized "part" of the mind that he could access on cue.

Later researchers suggested an alternative explanation for the hidden observer phenomenon (Kirsch & Lynn, 1998; Spanos, 1986, 1991). Nicholas Spanos (1991) believed that the hidden observer arises because the hypnotist suggests it directly or indirectly. That is, participants pick up on the fact that the instructions used to bring forth the hidden observer imply they should act as though a separate, nonhypnotized part of the person can communicate with the hypnotist. Spanos hypothesized that changing the instructions should change what the hidden observer reports. That's exactly what he found. Changing the instructions led hidden observers to experience more pain or less pain, or to perceive a number normally or in reverse (Spanos & Hewitt, 1980). In short, the hidden observer appears to be no different from any other suggested hypnotic response: It's shaped by what we expect and believe.

RULING OUT RIVAL HYPOTHESES
Have important alternative explanations for the findings been excluded?

According to a revision of Hilgard's dissociation theory (Woody & Bowers, 1994), hypnosis bypasses the ordinary sense of control we exert over our behaviors. Thus, suggestions directly bring about responses with little or no sense of effort or conscious control (Jamieson & Sheehan, 2004; Sadler & Woody, 2010). This theory does a good job of describing what people experience during hypnosis and fits nicely with sociocognitive theories that emphasize the unconscious, automatic nature of most behaviors both within and apart from the context of hypnosis (Lynn & Green, 2011; see Chapter 1).

Assess Your Knowledge FACT or FICTION?

1. College students rarely, if ever, report that they hallucinate. **True / False**
2. OBEs are related to the ability to fantasize. **True / False**
3. Many of the experiences associated with a NDE can be created in circumstances that have nothing to do with being "near death." **True / False**
4. Déjà vu experiences often last for as long as an hour. **True / False**
5. A hypnosis induction greatly increases suggestibility beyond waking suggestibility. **True / False**

Answers: 1. F (p. 183); 2. T (p. 183); 3. T (pp. 184–185); 4. F (p. 185); 5. F (p. 187)

Study and **Review** in **MyPsychLab**

Drugs and Consciousness

5.8 Identify possible influences on substance use.

5.9 Distinguish different types of drugs and their effects on consciousness.

Virtually every culture has discovered that certain plants can alter consciousness, often dramatically. Knowledge of the mind-bending qualities of fermented fruits and grains, the juice of the poppy, boiled coffee beans and tea leaves, the burning tobacco or marijuana leaf, certain molds that grow on crops, and the granulated extract of the coca leaf has been handed down to us from ancient times. We now know that these **psychoactive drugs** contain chemicals similar to those found naturally in our brains and that their molecules alter consciousness by changing chemical processes in neurons (see Chapter 3). Some psychoactive drugs are used to treat physical and mental illness, but others are used almost exclusively for recreational purposes. The precise psychological and physical effects depend on the type of drug and dosage, as we've summarized in **TABLE 5.3** (see page 192).

psychoactive drug
substance that contains chemicals similar to those found naturally in our brains that alter consciousness by changing chemical processes in neurons

TABLE 5.3 Major Drug Types and Their Effects.

DRUG TYPE	EXAMPLES	EFFECT ON BEHAVIOR
Depressants	Alcohol, barbiturates, Quaaludes, Valium	Decreased activity of the central nervous system (initial high followed by sleepiness, slower thinking, and impaired concentration)
Stimulants	Tobacco, cocaine, amphetamines, methamphetamine	Increased activity of the central nervous system (sense of alertness, well-being, energy)
Opiates	Heroin, morphine, codeine	Sense of euphoria, decreased pain
Psychedelics	Marijuana, LSD, Ecstasy	Dramatically altered perception, mood, and thoughts

But as we'll see, the effects of drugs depend on far more than their chemical properties. *Mental set*—beliefs and expectancies about the effects of drugs—the settings in which people take these drugs, and their cultural heritage and genetic endowment all play a part in accounting for the highs and lows of drug use.

Substance Use Disorders

Drugs are substances that change the way we think, feel, or act. It's easy to forget that alcohol and nicotine are drugs, because they're typically commonplace and legal. Still, the misuse of both legal and illegal drugs is a serious societal problem. According to a national survey (Johnston et al., 2009a), 66 percent of young people (ages 29–30) reported having tried marijuana, and 48 percent report having tried other illegal drugs, like cocaine, heroin, and hallucinogens.

DIAGNOSIS OF SUBSTANCE USE DISORDER. Generally speaking, people qualify for a diagnosis of *substance use disorder* when they experience recurrent significant impairment or distress associated with one or more drugs (APA, 2013). Substance use disorder is a new diagnostic category to appear in the forthcoming editon of the American Psychiatric Association's diagnostic manual (see Chapter 15 for an in depth discussion). The new diagnosis combines the previous diagnostic categories of substance abuse, which encompasses recurrent problems with substances in the home, work, school, or with the law, and substance dependence, which includes symptoms of tolerance and withdrawal. The new diagnostic scheme considers the full range of alcohol-related problems and emphasizes the severity of these problems, rather than a sharp distinction between the former categories of substance abuse and dependence.

tolerance
reduction in the effect of a drug as a result of repeated use, requiring users to consume greater quantities to achieve the same effect

withdrawal
unpleasant effects of reducing or stopping consumption of a drug that users had consumed habitually

physical dependence
dependence on a drug that occurs when people continue to take it to avoid withdrawal symptoms

psychological dependence
dependence on a drug that occurs when continued use of the drug is motivated by intense cravings

Tolerance, a key feature of substance use disorders, occurs when people need to consume an increased amount of a drug to achieve intoxication. Alternatively, people who develop tolerance may not obtain the same reaction or "kick" from a drug after using it for some time. Tolerance is often associated with increases in the amount of drugs people consume. When people use drugs for long periods of time and then either stop or cut down on their use, they're likely to experience **withdrawal** symptoms that vary with the drug they use. Alcohol withdrawal symptoms, for example, can range from insomnia and mild anxiety to more severe symptoms such as seizures, confusion, and bizarre visual hallucinations (Bayard et al., 2004). People exhibit **physical dependence** on a drug when they continue to take it to avoid withdrawal symptoms. In contrast, people can develop **psychological dependence** when their continued use of a drug is motivated by intense cravings. According to one survey (Knight et al., 2002), within a 12-month period, 6 percent of college students reported severe symptoms of alcohol use, including tolerance and withdrawal and 31 percent reported significant problems with alcohol that met criteria for substance abuse.

Watch in **MyPsychLab** the **Video:** Speaking Out: Chris: Alcoholism

EXPLANATIONS FOR SUBSTANCE USE. People often begin using drugs when they become available, when their family or peers approve of them, and when they don't anticipate serious consequences from their use (Pihl, 1999). Illegal drug use typically starts in early adolescence, peaks in early adulthood, and declines sharply thereafter. Fortunately, later in life, pressures to be employed and establish a family often counteract earlier pressures and attitudes associated with drug use (Newcomb & Bentler, 1988). In the sections to come, we'll focus on the causes of alcohol use disorders because they're the forms of drug misuse that scientists best understand.

Sociocultural Influences. Cultures or groups in which drinking is strictly prohibited, such as Muslims or Mormons, exhibit low rates of alcoholism (substance use disorder, with tolerance and withdrawal symptoms; Chentsova-Dutton & Tsai, 2006). In Egypt, the annual rate of alcohol dependence is only 0.2 percent (World Health Organization, 2004), whereas in France and Italy, where they view drinking as a healthy part of daily life, the rates are considerably higher. In Poland, the annual rate is 11.2 percent. Some researchers attribute these differences to cultural differences in attitudes toward alcohol and its abuse. Nevertheless, these differences could also be due in part to genetic influences, and the cultural attitudes themselves may reflect these differences.

◀ **RULING OUT RIVAL HYPOTHESES**
Have important alternative explanations for the findings been excluded?

Is There an Addictive Personality? Important as they are, sociocultural factors don't easily explain individual differences *within* cultures. We can find alcoholics in societies with strong sanctions against drinking and teetotalers in societies in which drinking is widespread. To explain these facts, popular and scientific psychologists alike have long wondered whether certain people have an "addictive personality" that predisposes them to abuse alcohol and other drugs (Shaffer, 2000). On the one hand, research suggests that common wisdom to the contrary, there's no single addictive personality profile (Rozin & Stoess, 1993). On the other hand, researchers have found that certain personality traits predispose to alcohol and drug abuse. In particular, studies have tied substance abuse to impulsivity (Baker & Yardley, 2002; Kanzler & Rosenthal, 2003; Kollins, 2003), sociability (Wennberg, 2002), and a propensity to experience negative emotions, like anxiety and hostility (Jackson & Sher, 2003). But some of these traits may partly result from, rather than cause, substance misuse. Also, as we'll soon learn, genetic influences appear to account at least in part for both antisocial behavior and alcoholism risk (Slutske et al., 1998).

◀ **CORRELATION VS. CAUSATION**
Can we be sure that A causes B?

Learning and Expectancies. According to the tension reduction hypothesis (Cappell & Herman, 1972; Sayette, 1999; Sher, 1987), people consume alcohol and other drugs to relieve anxiety. Such self-medication reinforces drug use, increasing the probability of continued use. Alcohol affects brain centers involved in reward (Koob, 2000) as well as dopamine, which plays a crucial role in reward (see Chapter 3). Nevertheless, people probably drink to relieve anxiety only when they believe alcohol is a stress reducer (Greeley & Oei, 1999), so expectancies almost certainly play a role, too. But once individuals become dependent on alcohol, the discomfort of their withdrawal symptoms can motivate drug-seeking behavior and continued use.

Genetic Influences. Alcoholism tends to run in families (Sher, Grekin, & Williams, 2005). But this doesn't tell us whether this finding is due to genes, shared environment, or both. Twin and adoption studies have resolved the issue: They show that genetic factors play a key role in the vulnerability to alcoholism (McGue, 1999). Multiple genes are probably involved (NIAAA, 2000), but what's inherited? No one knows for sure, but researchers have uncovered a genetic link between people's response to alcohol and their risk of developing alcoholism. A strong negative reaction to alcohol use decreases the risk of alcoholism, whereas a weak response increases this risk. A mutation in the aldehyde 2 (ALDH2) gene causes a distinctly unpleasant response to alcohol: facial flushing, heart palpitations (feeling one's heart beating), and nausea (Higuchi et al., 1995). This gene is present in about 40 percent of people of Asian descent, who are at low risk for alcoholism and drink less alcohol than people in most other ethnic groups (Cook & Wall, 2005).

◀ **RULING OUT RIVAL HYPOTHESES**
Have important alternative explanations for the findings been excluded?

? Like some people of Asian heritage, this person shows a pronounced flushing response after having a drink, as seen in this before and after panel. Based on the research literature, is he likely to be at increased or decreased risk for alcohol problems in later life compared with most people? (See answer upside-down at bottom of page).

Marc Schuckit (1994) argued that a genetically influenced weak response to alcohol contributes to a desire to drink heavily to achieve the pleasurable effects of intoxication. To determine whether reactions to alcohol predict alcohol abuse, Schuckit (1998) followed 435 20-year-olds for 10 years. Those with an initial weak response to alcohol displayed a fourfold increase in their risk for alcoholism at age 30. Recently, researchers confirmed Schuckit's claim and identified a gene on chromosome 15 that, perhaps in conjunction with unknown environmental factors, may be associated with a weak response to alcohol (Joslyn et al., 2008).

Depressants

Alcohol and sedative-hypnotics (barbiturates and benzodiazepines) are depressant drugs, so-called because they depress the effects of the central nervous system. By the way, **sedative** means "calming," and **hypnotic** means "sleep-inducing" (despite its name, it doesn't mean "hypnosis-inducing"). In contrast, stimulant drugs, like nicotine and cocaine, which we'll review in the next section, rev up our central nervous systems. We'll learn that the effects of alcohol are remarkably wide-ranging, varying from stimulation at low doses to sedation at higher doses.

ALCOHOL. Humanity has long had an intimate relationship with alcohol. Some scientists speculate that a long-forgotten person from the late Stone Age, perhaps 10,000 years ago, accidentally partook of a jar of honey that had been left out too long (Vallee, 1988). He or she became the first human to drink alcohol, and the human race has never been quite the same since. Today, alcohol is the most widely used and abused drug. By late adolescence, 78.2 percent of young adults have consumed alcohol (Swendsen et al., 2012). The majority (51.8 percent) of adult men in our society report they regularly use alcohol (at least 12 drinks in the past year; Centers for Disease Control, 2011), and 39 percent of 8th graders report that they tried alcohol at one time (Johnston et al., 2009b).

We must look to the effects of alcohol to understand its powerful appeal. Although many people believe that alcohol is a stimulant, physiologically it's primarily a depressant. Alcohol behaves as an emotional and physiological stimulant only at relatively low doses because it depresses areas of the brain that inhibit emotion and behavior (Pohorecky, 1977; Tucker, Vucinich, & Sobell, 1982). Small amounts of alcohol can promote feelings of relaxation, elevate mood, increase talkativeness and activity, lower inhibitions, and impair judgment. In most states, a BAC of 0.08 is the cutoff for legal intoxication while operating a vehicle; at this point the operation of an automobile is hazardous. We'll explore other health risks associated with alcohol consumption in Chapter 12. At higher doses, when the blood alcohol content (BAC)—the concentration of alcohol in the blood—reaches 0.05 to 0.10, the sedating and depressant effects of alcohol generally become more apparent. Brain centers become depressed, slowing thinking and impairing concentration, walking, and muscular coordination (Erblich et al., 2003). At higher doses, users sometimes experience a mix of stimulating and sedating effects (King et al., 2002).

The short-term effects of intoxication are directly related to the BAC. Contrary to popular myth, switching among different types of alcohol—like beer, wine, and hard liquor—is no more likely to lead to drunkenness than sticking with one type of alcohol (see **TABLE 5.4**). The feeling of intoxication depends largely on the rate of absorption of alcohol by the bloodstream, mostly through the stomach and intestines. The more food in our stomach, the less quickly alcohol is absorbed. This fact explains why we feel more of an effect of alcohol on an empty stomach. Compared with men, women have more body fat (alcohol isn't fat-soluble) and less water in which to dilute alcohol. So a woman whose weight equals that of a man, and has consumed the same amount of alcohol, will have a higher BAC than he will (Kinney & Leaton, 1995). **FIGURE 5.6** shows the relationship between the amounts of beverage consumed and alcohol concentration in the blood. Because absorption varies as a function of variables like stomach contents and body weight, these effects vary across persons and occasions.

Although drug effects are influenced by the dose of the drug, the user's expectancies also play a substantial role. The *balanced placebo design* is a four-group

sedative
drug that exerts a calming effect

hypnotic
drug that exerts a sleep-inducing effect

Answer: Decreased.

TABLE 5.4 Six Other Alcohol Myths and Facts. Although we've addressed some popular misconceptions about alcohol in the text, there are scores of others. How many of these have you heard?

MISCONCEPTION	TRUTH
1. Every time we drink, we destroy about 10,000 brain cells.	Scientists haven't precisely determined the effect of a single drink on brain cell loss. Heavy drinking over time is associated with brain damage and memory problems.
2. It's okay to drive a few hours after drinking.	Coordination can be affected as much as 10–12 hours after drinking, so it's not safe to drink and drive. Binge-drinking (five or more drinks at a time if male; four, if female) is associated with 80 percent of traffic accidents (Marczinski, Harrison, & Fillmore, 2008).
3. To avoid a hangover, take two or three acetaminophen tablets, a common alternative to aspirin, or an energy drink with caffeine.	Taking acetaminophen tablets can increase the toxicity of alcohol to the liver. Energy drinks do not affect blood alcohol levels and increase the likelihood of binge drinking three-fold (Thombs et al., 2010).
4. Our judgment isn't impaired until we're extremely drunk.	Impaired judgment can occur well before obvious signs of intoxication appear.
5. A "blackout" is passing out from drinking.	A "blackout" is a loss of memory for a period of time while drunk, and has nothing to do with passing out.
6. Mixing diet drinks with alcohol reduces the risk of intoxication.	Mixing diet soda with alcohol increases breath alcohol concentrations by 18 percent, increasing the risk of intoxication (Marczinski & Stamates, 2012).

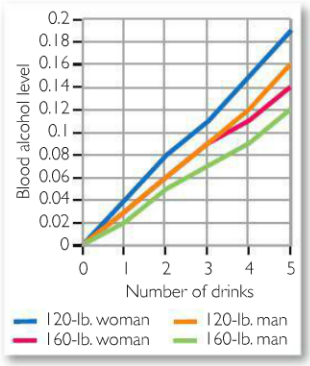

FIGURE 5.6 Influences on BAC. A person's blood alcohol content (BAC) depends on a variety of factors beyond the number of drinks consumed. The person's weight, gender, and stomach contents all play a role. This graph shows how body weight and gender influence BAC. For both men and women, heavier people have a lower BAC, but at both 120 pounds and 160 pounds, women have a higher BAC than men.

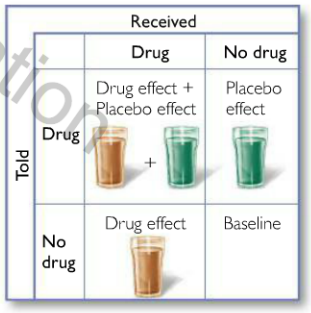

FIGURE 5.7 The Four Groups of the Balanced Placebo Design. The balanced-placebo design includes four groups in which participants (a) are told they're receiving a drug and in fact receive a drug, (b) are told they're receiving a drug but actually receive a placebo, (c) are told they're receiving a placebo but actually receive a drug, and (d) are told they're receiving a placebo and in fact receive a placebo.

design (see **FIGURE 5.7**) in which researchers tell participants they either are, or aren't, receiving an active drug and, in fact, either do or don't receive it (Kirsch, 2003). This clever design allows researchers to tease apart the relative influence of expectancies (placebo effects) and the physiological effects of alcohol and other drugs.

The results of balanced placebo studies show that at low alcohol dose levels, culturally learned expectancies influence mood and complex social behaviors. Remarkably, participants who ingest a placebo drink mixed to taste just like alcohol display many of the same subjective effects of drunkenness as participants who ingest an actual alcoholic drink. Expectancies are often more important than the physiological effects of alcohol in influencing social behaviors, such as aggression (Lang et al., 1975). Alcohol may provide some people with an excuse to engage in actions that are socially prohibited or discouraged, like flirting (Hull & Bond, 1986). In males, expectancies may override the pharmacological effects of alcohol in enhancing humor, anxiety reduction, and sexual responsivity. In contrast, nonsocial behaviors, such as reaction time and motor coordination, are more influenced by alcohol itself than by expectancies (Marlatt & Rosenow, 1980). Expectancies that drinking will produce positive outcomes predict who'll drink and how much they'll drink, and expectancies that drinking will produce negative outcomes predict who'll abstain (Goldman, Darkes, & Del Boca, 1999; Leigh & Stacy, 2004).

The *setting,* or social context in which people consume alcohol, also influences its effects. For example, participants tested in a barlike situation with drinking companions feel more friendly and elated when they drink, and consume nearly twice as much alcohol as participants who drink by themselves (Lindman, 1982; Sher et al., 2005).

THE SEDATIVE-HYPNOTICS. When people have problems falling asleep or are excessively anxious, they may consult a physician to obtain sedative-hypnotic drugs. Because these drugs produce depressant effects, they're dangerous at high dosages and can produce unconsciousness, coma, and even death.

Factoid

The Rolling Stones song "Mother's Little Helper" (released in 1966) is about Valium. The song's refrain refers to Valium as a little yellow pill to calm the mother.

For years, cigarette companies published advertisements claiming that smoking is good for people's health, as in this 1946 ad boasting of Camel's popularity among physicians.

Watch in **MyPsychLab** the **Video:** Smoking Damage

Watch in **MyPsychLab** the **Video:** Cocaine

Factoid

Recent research suggests that trace (tiny) amounts of cocaine are present on 90 percent of dollar bills (and other paper money) in the United States. These amounts are highest in U.S. cities with the highest prevalence of drug problems; in Washington, DC, for example, 96 percent of paper money contained at least some cocaine (Raloff, 2009).

stimulant
drug that increases activity in the central nervous system, including heart rate, respiration, and blood pressure

Researchers usually group sedative-hypnotics into three categories: *barbiturates* (for example, Seconal, Nembutal, and Tuinal); *nonbarbiturates* (for example, Sopor and Methaqualone, better known as Quaalude); and *benzodiazepines*. Benzodiazepines, including Valium, were extremely popular in the 1960s and 1970s and are still widely used today to relieve anxiety. Barbiturates produce a state of intoxication very similar to that of alcohol. Barbiturates have the greatest abuse potential, which is troubling because the consequences of overdose are often fatal.

Stimulants

Nicotine, cocaine, and amphetamines are **stimulants** because they rev up our central nervous system. In contrast to depressants, they increase heart rate, respiration, and blood pressure.

NICOTINE. Over the course of human history, people have consumed tobacco in various ways: smoking, chewing, dipping, licking, and even drinking (Gritz, 1980). As cigarette companies have long known but were reluctant to admit, the nicotine in tobacco is a potent and addictive drug. It reaches the brain about 10 seconds after it's inhaled. Nicotine activates receptors sensitive to the neurotransmitter acetylcholine, and smokers often report feelings of stimulation as well as relaxation and alertness.

Like many other drugs taken for nonmedical purposes, nicotine has *adjustive value,* meaning it can enhance positive emotional reactions and minimize negative emotional reactions, including the distress experienced when the nicotine level drops (Leventhal & Cleary, 1980). For many young people, positive images associated with smoking enhance its appeal. In Chapter 12, we'll examine the many negative health consequences of tobacco use.

COCAINE. Cocaine is the most powerful natural stimulant. Cocaine users commonly report euphoria, enhanced mental and physical capacity, stimulation, a decrease in hunger, indifference to pain, and a sense of well-being accompanied by diminished fatigue. Cocaine comes from a shrub that grows in abundance in South America. By the late 1800s, doctors prescribed cocaine for a wide range of illnesses. Around the turn of the century, many medicines, alcoholic tonics and even Coca-Cola contained cocaine. Cocaine came under strict government control in the United States in 1906.

According to surveys, 2.7 percent of 12th graders reported having used cocaine in the past year, and 40 percent of people by the age of 50 report having used cocaine at least once (Johnston et al, 2009a,b; Johnson et al., 2012). Cocaine is a powerful reinforcer. When conditioned to self-inject cocaine, rhesus monkeys remain intoxicated for long periods of time. They may even "dose themselves to death" when unlimited quantities of cocaine are available (Johanson, Balster, & Bonese, 1976). Heavy intake of cocaine by humans also produces an intense drive to use it (Spotts & Shontz, 1976, 1983). Cocaine increases the activity of the neurotransmitters dopamine and perhaps serotonin, which contribute to its reinforcing effects.

At the turn of the twentieth century, many nonprescription products, such as the then-new soft drink Coca-Cola, contained tiny amounts of cocaine.

Cocaine users can inject it intravenously. But they more commonly inhale or "snort" it through the nose, where the nasal mucous membranes absorb it. *Crack cocaine* is a highly concentrated dose of cocaine produced by dissolving cocaine in an alkaline (basic) solution and boiling it until a whitish lump, or "rock" remains that can be smoked. Crack's popularity is attributable to the intense euphoria it generates and its relative affordability. But

the "high" is short-lived and followed by unpleasant feelings, which often leads to consuming cocaine whenever available to regain the high (Gottheil & Weinstein, 1983).

Smoking crack, a highly concentrated form of cocaine, is more dangerous than snorting regular cocaine.

AMPHETAMINES. Amphetamines are among the most commonly abused of all drugs, with 37 percent of Americans trying them at least once by age 50 (Johnston et al., 2009a). Amphetamines illustrate how different patterns of use can produce different subjective effects. The first pattern involves occasional use of small doses of oral amphetamines to postpone fatigue, elevate mood while performing an unpleasant task, cram for a test, or experience well-being. In this case, intake of amphetamines doesn't become a routine part of the users' lifestyle. In the second pattern, users obtain amphetamines from a doctor, but ingest them on a regular basis for euphoria-producing effects rather than for their prescribed purpose. In these cases, a potent psychological dependence on the drug may occur, followed by depression if regular use is interrupted. The third pattern is associated with street users—"speed freaks"—who inject large doses of amphetamines intravenously to achieve the "rush" of pleasure immediately following the injection. These users are likely to be restless, talkative, and excited, and to inject amphetamines repeatedly to prolong euphoria. Inability to sleep and loss of appetite are also hallmarks of the so-called speed binge. Users may become increasingly suspicious and hostile and develop paranoid delusions (believing that others are out to get them).

In recent years, *methamphetamine,* a drug closely related chemically to amphetamines, has emerged as a widely abused drug. As many as 1 in 20 high school students report using methamphetamine (Johnston et al., 2009b). In its crystalline and highly addictive form, it's known as crystal meth or simply "meth." When users smoke it, they experience intense exhilaration, followed by euphoria that can last 12 to 16 hours. Crystal meth is more powerful than amphetamines, generally has a higher purity level, and carries a high risk of overdose and dependence. Meth can destroy tissues and blood vessels and cause acne; it can also lead to weight loss, tremors, and dental problems.

This billboard contrasts the appearance of a woman before (on the left) and after (on the right) she became addicted to methamphetamine.

Narcotics

The opiate drugs heroin, morphine, and codeine are derived from the opium poppy, a plant found in abundance in Asia. Morphine is the major ingredient in opium. The action of heroin is virtually identical to that of morphine, but heroin is about three times as powerful and now accounts for 90 percent of opiate abuse. The opiates often are called **narcotics** because they relieve pain and induce sleep.

At first glance, heroin's psychological effects might appear mostly pleasurable: "Heroin is the king of drugs…. It leaves you floating on a calm sea where nothing seems to matter and everything is okay…. Suddenly the emptiness disappears…. The terrible growing inadequacy has vanished. And in its place is the power and comfort that's called confidence. No one can get to you when you keep nodding" (Rosenberg, 1973, pp. 25–26). This description conveys a sense of the euphoria that opiate users may experience. But these pleasurable effects are limited to the three or four hours that the usual dose lasts. If people addicted to heroin don't take another dose within four to six hours, they experience withdrawal symptoms, which include abdominal cramps, vomiting, craving for the drug, yawning, runny nose, sweating, and chills. With continued use, the drug's euphoric effects gradually diminish. The addict may continue using heroin as much to avoid withdrawal symptoms as to experience the intense high of the first few injections (Hutcheson et al., 2001; Julien, 2004).

About 1 to 2 percent of young adults have tried heroin (Johnston, O'Malley, & Bachman, 2003; Johnston et al., 2012). The sleep-inducing properties of heroin derive largely from its depressant effects on the central nervous system: drowsiness follows injection, breathing and pulse rate slow, and pupils constrict. At higher doses, coma and death may follow.

Even infrequent users risk becoming addicted to heroin. But as we'll discover in Chapter 6, contrary to popular conception, heroin addiction isn't inevitable (Sullum, 2003). For example, people who use opiates for medical purposes don't necessarily become addicted.

narcotic
drug that relieves pain and induces sleep

The ground-up leaves of the hemp plant are the source of marijuana.

Factoid

Fake or synthetic marijuana, commonly called Spice, K2, Blaze, and Black Mamba, is made from herbs sprayed with chemicals touted to produce marijuana-like effects, and was recently sold at gas stations and tobacco stores. People who have used fake marijuana have reported panic attacks, breathing difficulties, seizures, hallucinations, and vomiting. Concerns about safety have led to legal prohibition of its sale and use and an ongoing investigation by the United States Department of Health and Human Services.

CORRELATION VS. CAUSATION ▶
Can we be sure that A causes B?

Since the introduction of the powerful opiate pain reliever OxyContin in the mid-1990s, drug abusers have turned to it increasingly for "highs." Unfortunately, injecting or taking OxyContin in pill form in combination with alcohol and other depressant drugs can be lethal (Cone et al., 2004).

Psychedelics

Scientists describe such drugs as LSD, mescaline, PCP, and Ecstasy as **hallucinogenic** or *psychedelic* because they produce dramatic alterations in perception, mood, and thought. Because the effects of marijuana aren't as "mind-bending" as those of LSD, some researchers don't classify marijuana as a hallucinogen. In contrast, others describe it as a "mild hallucinogen." Interestingly, marijuana may also have sedative or hypnotic qualities.

MARIJUANA. Marijuana is the most frequently used illegal drug in the United States. By the age of 50, 74 percent of adults report having used it at least once (Johnston et al., 2009a). Known in popular culture as pot, grass, herb, Mary Jane, 420, and weed, marijuana comes from the leaves and flowering part of the hemp plant (*Cannabis sativa*). The subjective effects of marijuana are produced by its primary ingredient, THC (delta-9-tetrahydrocannabinol). People experience a "high" feeling within a few minutes, which peaks within a half hour. Hashish, manufactured from the buds and flowers of female plants, contains much greater concentrations of THC than marijuana and is more potent.

Whether marijuana is smoked or, less frequently, eaten or consumed in tea, users report short-term effects, including a sense of time slowing down, enhanced sensations of touch, increased appreciation for sounds, hunger ("the munchies"), feelings of well-being, and a tendency to giggle. Later, they may become quiet, introspective, and sleepy. At higher doses, users may experience disturbances in short-term memory, exaggerated emotions, and an altered sense of self. Some reactions are more unpleasant, including difficulty concentrating, slowed thought, depersonalization (a sense of being "out of touch" or disconnected from the self; see Chapter 15), and, more rarely, extreme anxiety, panic, and psychotic episodes (Earleywine, 2005). Driving while intoxicated with marijuana is hazardous, especially at high doses (Ramaekers et al, 2006).

The intoxicating effects of marijuana can last for two or three hours, but begin when THC courses through the bloodstream and travels to the brain, where it stimulates cannabinoid receptors. These specialized receptors are concentrated in areas of the brain that control pleasure, perception, memory, and coordinated body movements (see Chapter 3). The most prominent physiological changes are increases in heart rate, reddening of the eyes, and dryness of the mouth.

Scientists are striving to better understand the long-term physical and psychological effects of marijuana use. Although marijuana produces more damage to cells than tobacco smoke (Maertens et al., 2009), aside from an increased risk of lung and respiratory disease (Tetrault et al., 2007), scientists haven't found consistent evidence for serious physical health or fertility consequences of marijuana use. Still, chronic, heavy use of marijuana can impair attention and memory. Fortunately, normal cognitive functioning is typically restored after a month of abstinence (Pope, Gruber, & Yurgelun-Todd, 2001). Questions about cause-and-effect relationships come into play when interpreting research regarding the dangers of marijuana use. High school students who use marijuana earn lower grades and are more likely to get in trouble with the law than other students (Kleinman et al., 1988; Substance Abuse and Mental Health Services Administration, 2001, 2012). But high school students who use marijuana might do so because they have troubled home lives or psychological problems and do poorly in school *before* using marijuana (Shedler & Block, 1990). Indeed, there may be some truth to both scenarios.

Some researchers have argued that marijuana is a "gateway" drug that predisposes users to try more serious drugs, like heroin and cocaine (Kandel, Yamaguchi, & Chen, 1992). In a study of identical twin pairs in which one twin tried marijuana in adolescence but the other didn't, the twin who tried marijuana was later at heightened risk for abusing alcohol and other drugs (Lynskey et al., 2003). Nevertheless, evaluating whether marijuana is a gateway drug isn't easy. Merely because one event precedes another doesn't mean it

hallucinogenic
causing dramatic alterations of perception, mood, and thought

causes it (see Chapter 10). For example, eating baby foods in infancy doesn't cause us to eat "grown-up" foods in adulthood. Teens may tend to use marijuana before other drugs because it's less threatening, more readily available, or both. The scientific debate continues.

LSD AND OTHER HALLUCINOGENS. On Friday, April 16, 1943, an odd thing happened to Swiss chemist Albert Hofmann. In 1938, Hofmann synthesized a chemical compound, d-lysergic acid diethylamide-25 (LSD), from chemicals found in a fungus that grows on rye. Five years later, when Hofmann again decided to work on the compound, he absorbed some of it unknowingly through his skin. When he went home, he felt restless, dizzy, and "perceived an uninterrupted stream of fantastic pictures, extraordinary shapes with intense, kaleidoscopic play of colors. After some two hours this condition faded away" (Hofmann, 1980, p. 5). Hoffman was the first of millions of people to experience the mind-altering effects of LSD.

By the age of 40, about 20 percent of Americans have tried the hallucinogen d-lysergic acid diethylamide-25, better known as LSD (Johnston, O'Malley, & Bachman, 2002). The psychedelic effects of LSD may stem from its interference with the action of the neurotransmitter serotonin at the synapse (see Chapter 3). The effects of LSD are also associated with areas of the brain rich in receptors for the neurotransmitter dopamine. Even tiny amounts of LSD can produce dramatic shifts in our perceptions and consciousness. Pills about the size of two aspirins can provide more than 6,000 "highs." Some users report astonishingly clear thoughts and fascinating changes in sensations and perceptions, including synesthesia (the blending of senses—for example, the "smelling of noises;" see Chapter 4). Some users also report mystical experiences (Pahnke et al., 1970).

But LSD and other hallucinogens can also produce panic, paranoid delusions, confusion, depression, and bodily discomfort. Occasionally, psychotic reactions persist long after a psychedelic experience, most often in people with a history of psychological problems (Abraham & Aldridge, 1993). People who are suspicious and insecure before ingesting LSD are most anxious during an LSD session (Linton & Langs, 1964). *Flashbacks*—recurrences of a psychedelic experience—occur occasionally (Baggot et al., 2011). Curiously, there's no known pharmacological basis for their occurrence. One explanation is that they're triggered by something in the environment or an emotional state associated with a past psychedelic experience.

Unlike LSD, Ecstasy, also known as MDMA (methylenedioxymethamphetamine), has both stimulant and hallucinogenic properties. It produces cascades of the neurotransmitter serotonin in the brain, which increases self-confidence and well-being, and produces powerful feelings of empathy for others. But its use has a serious downside: Its side effects can include high blood pressure, depression, nausea, blurred vision, liver problems, sleep disturbance, and possibly memory loss and damage to neurons that rely on serotonin (Kish, 2002; Soar, Parrott, & Fox, 2004).

Drugs, like other means of altering consciousness, remind us that the "brain" and the "mind" are merely different ways of looking at the same phenomenon (see Chapters 1 and 3). They also illustrate the fluid way we experience the world and ourselves. Although a precise grasp of consciousness eludes us, appreciating the nuances of consciousness and their neurological correlates bring us closer to understanding the biological and psychological underpinnings of our waking and sleeping lives.

Factoid

LSD's subjective effects proved so fascinating to the Central Intelligence Agency (CIA) that in 1953 it launched a research program called MKULTRA to explore LSD's potential as a mind-control drug. This secret program involved administering LSD to unsuspecting individuals, including army scientists. After one of the scientists experienced a psychotic reaction and jumped to his death from a hotel window, the CIA turned to testing the effects of LSD on drug-dependent persons and prostitutes. The full scope of this operation came to light only after the program was discontinued in 1972. The researchers didn't find LSD to be a promising mind-control agent because its subjective effects were so unpredictable.

All-night dance parties termed "raves," in which Ecstasy and other psychedelic drugs are widely available, became popular in the mid-1990s in the United States.

Assess Your Knowledge FACT or FICTION?

1. The effects of many drugs depend on the expectations of the user. **True / False**
2. Alcohol is a central nervous system depressant. **True / False**
3. Tobacco is the most potent natural stimulant drug. **True / False**
4. A causal link between marijuana and poor school performance has been well established. **True / False**
5. Drug flashbacks are common among people who use LSD. **True / False**

Answers: 1. T (p. 192); 2. T (p. 194); 3. F (p. 196); 4. F (p. 198); 5. F (p. 199)

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