

States of Consciousness

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“Car crash kills baby: Man, 44, faces drunk-driving charges causing death,” *Toronto Sun*, July 31, 2000 (Bill, 2000).

“Police officer drank, drove, killed three,” *Canadian Press*, July 25, 2000 (Canadian Press, 2000).

“Dad pleads guilty in crash that killed daughter,” *Ottawa Sun*, June 22, 2000 (Roik, 2000).

We are all aware of the problems associated with alcohol and driving. Every day we are told of yet another unfortunate event that affects people’s lives—the lives of our friends, our family, our community. All regions of our country have laws that specify how much alcohol can be consumed before driving skills are affected. The impact of drunk driving is serious both for the driver and, even more so, for the potential victims. This is why many advocacy groups are active in making the public aware that drinking is a personal choice and that drunk driving is not an uncontrollable event.

Obviously, all of us should be concerned about drunk driving. However, alcohol is not the only factor that affects our state of consciousness—and

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therefore our driving skills. For example, one Canadian researcher, Stanley Coren, at the University of British Columbia, says, “Canadians are so sleep deprived that even little things—like the switch to daylight savings time . . . generate a marked increase in traffic accidents” (Munro, 1996). Coren (1997) suggests that most of us need $9\frac{1}{2}$ to 10 hours of sleep per day. How many of you are getting enough sleep? If you are getting less than this, you may be sleep-deprived. According to Coren, sleep deprivation may “make us clumsy, stupid, unhappy, and dead” (Munro 1996). In fact, Coren’s work on U.S. data suggests that many accidental causes of death, such as falling off a ladder, occur when people do not have enough sleep. So maybe there’s something to that old adage, “Early to bed, early to rise, makes a person healthy, wealthy, and wise.”

What Is Consciousness?

What are some different states of consciousness?

As the research outlined above suggests, much of our lives and many of our life experiences are determined by our state of **consciousness**. And our state of consciousness, in turn, is greatly influenced by things such as the amount of sleep we get and the drugs we may take (including caffeine, cough medicine, alcohol, and illicit drugs). Given the importance of our state of consciousness, it is surprising that our ability to define and explain consciousness is still imprecise. Some liken consciousness to a flowing stream; others argue that it is an underlying “mechanism” that combines attention and short-term memory.

When we are at the highest level of consciousness, we are fully absorbed, and our thoughts are fixed on the details of what we are concentrating on, whether it be our studies, a new skill, or a basketball game on TV. A lower level of awareness involves such states as daydreaming; still lower levels involve sleep. We will now explore the various states of consciousness and examine the many ways in which consciousness may be altered. Ordinary waking consciousness can be altered by substances—alcohol or drugs, for example—and by focused concentration such as in meditation and hypnosis. This chapter will explore these **altered states of consciousness**.

The most fundamental altered state is one in which we spend about one-third of our lives, the one we visit for several hours nearly every night—sleep.

Circadian Rhythms: Our 24-Hour Highs and Lows

What is a circadian rhythm, and which rhythms are most relevant to the study of sleep?

Do you notice changes in the way you feel throughout the day—fluctuations in your energy level, mood, or efficiency? More than 100 of our bodily functions and behaviours fluctuate in 24-hour cycles (Dement, 1974). These daily fluctuations, called **circadian rhythms**, are controlled largely by the brain (Ginty et al., 1993; Ralph, 1989). Blood pressure, heart rate, appetite, secretion of hormones and digestive enzymes, sensory acuity, elimination, and even our body’s responses to medication all follow circadian rhythms (Hrushesky, 1994). Our learning efficiency ebbs and flows by daily rhythms, which also affect our mood (Boivin et al., 1997) and our ability to perform a wide variety of tasks (Johnson et al., 1992).

Two cycles of particular importance to the study of sleep relate to alertness and body temperature. Normal human body temperature can range from a low of about 36.1 degrees Celsius between 4:00 and 5:00 a.m., to a high of about 37 degrees Celsius between 5:00 and 8:00 p.m. People sleep best when their body temperature is lowest, and they are most alert when their body temperature is at its daily high point (Monk & Carrier, 1998). Alertness also follows a circadian rhythm, one that is quite separate from the sleep/wakefulness rhythm (Monk, 1989). For most of us, alertness decreases between 2:00 and 5:00 p.m. and between

2:00 and 7:00 a.m. (Mitler et al., 1988; Webb 1995). During the afternoon decrease in alertness, body temperature also dips (Barrett et al., 1993).

LINK IT!

www.mrs.umn.edu/~goochv/Circadian/circadian.html
Circadian Rhythms

www.websciences.org/sltbr/
Society for Light Treatment and Biological Rhythms Home Page

The Suprachiasmatic Nucleus: The Body's Timekeeper

What is the suprachiasmatic nucleus?

So, what part of our brain acts as a biological clock? Studies suggest that it is a tiny piece of brain tissue smaller

than the head of a pin located in the hypothalamus called the **suprachiasmatic nucleus** (SCN) (Ginty et al., 1993; Moore-Ede, 1993).

Are circadian rhythms strictly biological, or do environmental cues play a part? Canadian researchers Mistlberger and Rusak (1989) attempted to answer this question by placing people in an environment with no cues indicating the time of day. Most people naturally fell into a 25-hour schedule. But external stimuli—day and night, alarm clocks, job or school demands—cause us to modify our biological clock's preference for a 25-hour rhythm to conform to a 24-hour schedule. Circadian rhythms are slightly disrupted each year when daylight saving time begins and ends. An even greater disruption occurs when people fly across a number of time zones or when they work rotating shifts.

Jet Lag: Where Am I and What Time Is It?

Suppose you fly from Toronto to Paris, and the plane lands at 12:00 midnight Toronto time, about the time you usually go to sleep. When it is midnight in Toronto, it is 6:00 a.m. in Paris, almost time to get up. Everything in Paris, including the clocks and the sun, tells you it is early morning, but you still feel like it is 12:00 midnight. You are experiencing jet lag.

The problem is not simply the result of losing a night's sleep. You are fighting your own biological clock, which is synchronized with your usual time

zone and not the time zone you are visiting (Graeber, 1989). It is difficult to sleep when your biological clock is telling you to wake up and feel alert. It is even harder to remain awake and alert when your internal clock is telling you to sleep. Some research suggests that jet lag is less troublesome for women, younger people, extroverts, and night owls (Kiester, 1997).

Shift workers experience a similar problem without the benefit of a trip to Europe or Asia.

Shift Work: Working Day and Night

What are some problems experienced by employees who work rotating shifts?

Many Canadians work the night shift or engage in various other patterns of shift work. The health care, data processing, and transportation industries are the largest employers of shift workers, along with police and fire departments. When people must work at night, they experience a disruption in the rhythms of many bodily functions that are normally synchronized for daytime. These rhythm disruptions can cause a variety of physical and psychological problems.

In a report by the Canadian Centre for Occupational Health and Safety (1988), health risks of shift workers were assessed. Not surprisingly, shift workers complain of sleepiness and sleeping difficulties. Shift workers average two to four hours less sleep than non-shift workers of the same age (Campbell, 1995). Forced to remain awake when their body temperature is low, they use more caffeine. Trying to sleep when their body temperature is high, they use more alcohol and sleeping pills (Gordon et al., 1986). Moreover, digestive problems such as appetite

consciousness: The continuous stream of perceptions, thoughts, feelings, or sensations of which we are aware from moment to moment.

altered state of consciousness: A mental state other than ordinary waking consciousness, such as sleep, meditation, hypnosis, or a drug-induced state.

circadian rhythm (sur-KAY-dee-un): Within each 24-hour period, the regular fluctuation from high to low points of certain bodily functions.

suprachiasmatic nucleus (SCN): A tiny structure in the brain's hypothalamus that controls the timing of circadian rhythms; the biological clock.



What are the physical and psychological effects of disturbing the normal sleep/wakefulness cycle when a person works the night shift, as this printing press operator does?

loss, diarrhea, and irregularity are common, because shift workers eat at times not in synchrony with the circadian rhythms (Regestein & Monk, 1991; Vener et al., 1989).

What about performance on the job? Alertness and performance deteriorate if people work during **subjective night**, when their biological clock is telling them to go to sleep (Åkerstedt, 1990; Folkard, 1990). During subjective night, energy and efficiency reach their lowest point, reaction time is slowest, and productivity is diminished.

Many air, rail, marine, and highway accidents have occurred when the shift workers in charge suffered sleep loss and fatigue because of the disruption of their circadian rhythms (Lauber & Kayten, 1988). More errors in judgment and most accidents occur during the night shift (Webb, 1975). The nuclear disasters at Three Mile Island and Chernobyl, and the Challenger disaster, are thought to have occurred in

part because those responsible were dangerously fatigued (Moore-Ede, 1993).

Can anything be done to make shift rotation less disruptive? Rotating work schedules forward—from days to evenings to nights—and changing work shifts every three weeks rather than every week have resulted in increased job satisfaction, health, and productivity (Czeisler et al., 1982).

In several experiments of real significance to shift workers, researchers found that exposure to appropriately timed bright- or medium-intensity light reset workers' biological clocks and improved their performance (Martin & Eastman, 1998). Even a four-hour exposure to bright light between midnight and 4:00 a.m. on one night can improve performance and reduced sleepiness during the same period the following night (Thessing et al., 1994). Factories, police departments, and hospitals should seriously consider the research in this field to help workers adjust to shift changes.

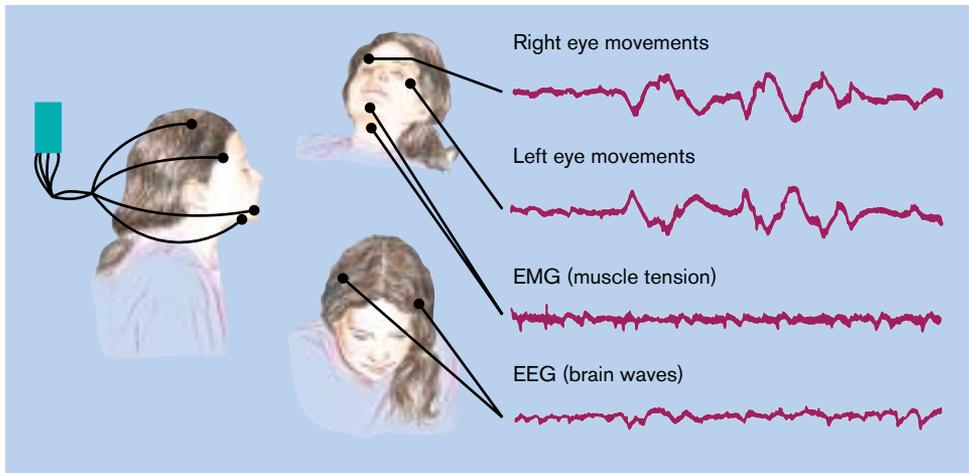
Sleep: That Mysterious One-Third of Our Lives

Over a lifetime, a person spends about 25 years sleeping. For decades, sleep researchers argued about the function of sleep. Some believed sleep simply served a restorative function; others argued that sleep evolved

Remember It! Consciousness and Circadian Rhythms

- Which of the following best defines consciousness?
 - awareness
 - wakefulness
 - receptiveness
 - rationality
- The two circadian rhythms most relevant to the study of sleep are the sleep/wakefulness cycle and
 - blood pressure.
 - secretion of hormones.
 - body temperature.
 - heart rate.
- We sleep best when our body temperature is at the low point in our 24-hour cycle. (true/false)
- Which is not characteristic of people who work rotating shifts?
 - disturbed sleep
 - digestive problems
 - increased efficiency and alertness during subjective night
 - greater use of caffeine, alcohol, and sleeping pills
- For swing-shift workers, work schedules should be rotated from nights to evenings to days. (true/false)

Answers: 1. a 2. c 3. true 4. c 5. false

**FIGURE 4.1****How Researchers Study Sleeping Participants**

Researchers study participants in a sleep laboratory or sleep clinic by taping electrodes to the participant's head to monitor brain-wave activity, eye movements, and muscle tension. (After Dement, 1974.)

to keep animals out of harm's way. But neither of these theories alone accounts for many of the research findings about sleep. For example, if you miss a night's sleep, why are you very sleepy during the middle of the night, but less so the next day? Today most sleep researchers believe that sleep should be viewed as a circadian rhythm that, in part, serves a restorative function (Webb, 1994). This view accommodates the variety of findings about sleep that we will explore in the following pages.

LINK IT!

www.sleepfoundation.org

National Sleep Foundation Home Page: Non-profit organization that promotes public understanding of sleep and sleep disorders

bisleep.medsch.ucla.edu/SRS/srs_main.htm
Sleep Research Society Home Page

NREM and REM Sleep: Watching the Eyes

Before the 1950s there was no understanding of what goes on during the state of consciousness we call sleep. Then, in the 1950s, several universities set up sleep laboratories where people's brain waves, eye movements, chin-muscle tension, heart rate, and respiration rate were monitored through a night of sleep. From the data they gathered, researchers discovered that there are two major categories of sleep: NREM (non-rapid eye movement) sleep and REM (rapid

eye movement) sleep. Figure 4.1 shows a sleep research participant whose brain activity, eye movement, and chin-muscle activity are being recorded.

NREM Sleep: From Light to Deep Sleep in Stages

How does a sleeper act physically during NREM sleep?

NREM (pronounced NON-rem) **sleep** is the sleep in which there are no rapid eye movements. It is often called "quiet sleep," because heart rate and respiration are slow and regular, there is little body movement, and blood pressure and brain activity are at their lowest points of the 24-hour period.

There are four stages of NREM sleep, with Stage 1 being the lightest sleep and Stage 4 being the deepest. We pass gradually rather than abruptly from one stage to the next. Each stage can be identified by its brain-wave pattern, as shown in Figure 4.2. Growth hormone is secreted mainly during Stage 3 and Stage 4 sleep (Grønfier et al., 1996).

subjective night: The time during a 24-hour period when your body temperature is lowest and your biological clock is telling you to go to sleep.

NREM sleep: Non-rapid eye movement sleep,

consisting of the four sleep stages and characterized by slow, regular respiration and heart rates, an absence of rapid eye movements, and blood pressure and brain activity that are at a 24-hour low point.

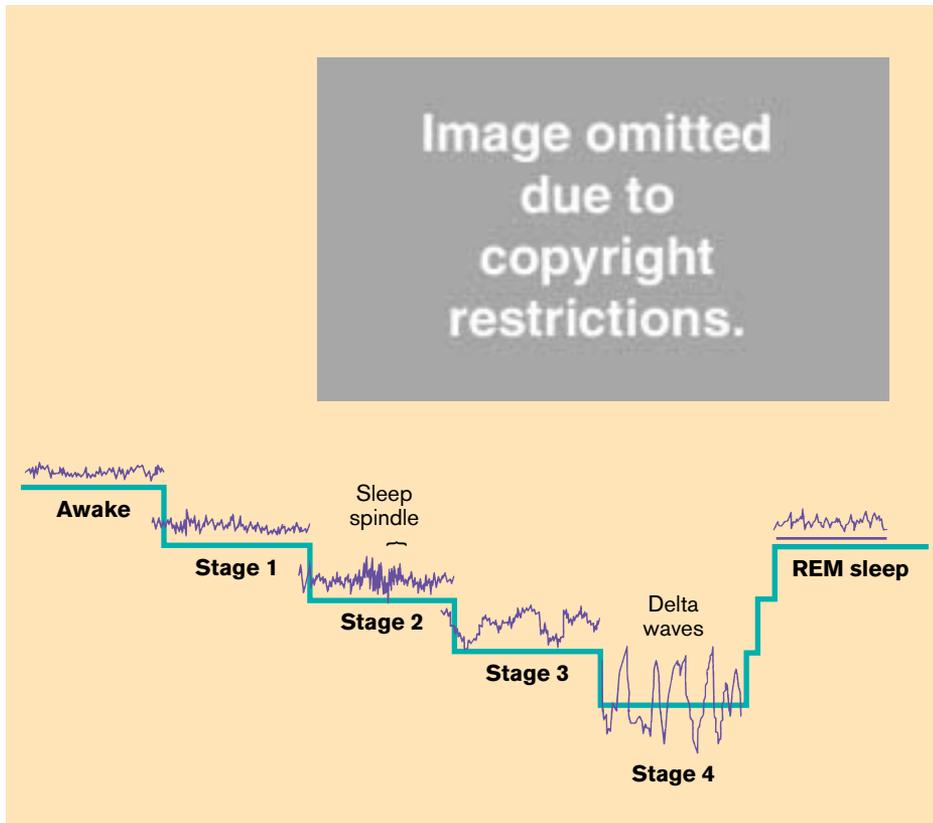


FIGURE 4.2
Brain-Wave Patterns Associated with Different Stages of Sleep By monitoring brain-wave activity with the EEG throughout a night's sleep, researchers have identified the brain-wave patterns associated with different stages of sleep. As sleepers progress through the four NREM stages, the brain-wave pattern changes from faster, low-voltage waves in Stages 1 and 2 to the slower, larger delta waves in Stages 3 and 4. Notice that the brain-wave activity during REM sleep is similar to that of the subject when awake. (After Hobson, 1989.)

REM Sleep: Rapid Eye Movements and Dreams

How does the body respond physically during REM sleep?

Most of us envision sleep as a time of deep relaxation and calm. But **REM sleep**, sometimes called

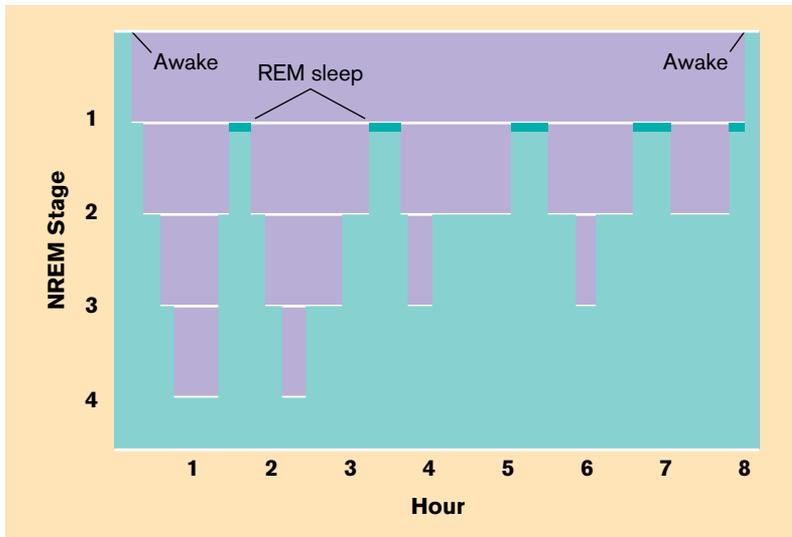
“active sleep,” is anything but calm, and it constitutes 20 to 25 percent of a normal night's sleep in adults. During the REM state, there is intense brain activity, and our body reacts as if to a daytime emergency. Epinephrine (adrenaline) shoots into the system, blood pressure rises, and heart rate and respiration become faster and irregular and brain temperature increases (Krueger & Takabashi, 1997). In contrast to this storm of internal activity, there is an external calm during REM sleep. The large muscles of the body—arms, legs, trunk—become paralyzed (Chase & Morales, 1990). Some researchers suggest that the reason for this paralysis is to prevent us from acting out our dreams.

If you observe a sleeper during the REM state, you can see the eyes darting around under the eyelids. Eugene Azerinsky discovered these bursts of rapid eye movements in 1952. Five years later, William

Dement and Nathaniel Kleitman made the connection between rapid eye movements and dreaming. It is during REM periods that most of our vivid dreams occur. When awakened from REM sleep, 80 percent of people report dreaming (Carskadon & Dement, 1989).

Almost from birth, regardless of the content of their dreams, males have a full or partial erection during REM sleep, and women experience vaginal swelling and lubrication. Because sleepers are more likely to awaken naturally at the end of a REM period than during the NREM stages of sleep, men usually wake up with an erection (Campbell, 1985). In males suffering from impotence, the presence of an erection during REM sleep indicates that the impotence is psychological; its absence indicates that the impotence has physical causes.

If you are awakened during REM sleep and remain awake for several minutes, you will not go back into REM sleep for at least 30 minutes. This explains why most of us have experienced the disappointment of waking in the middle of a wonderful dream and not being able to get quickly back to sleep and into the dream.

**FIGURE 4.3**

The Typical Composition of Sleep Cycles for Young Adults A typical night's sleep for young adults consists of about five sleep cycles of about 90 minutes each. Stage 4 sleep occurs during the first two sleep cycles. People spend progressively more time in REM sleep with each succeeding 90-minute cycle. (After Hartmann, 1967.)

Sleep Cycles: The Nightly Pattern of Sleep

What is the progression of NREM stages and REM sleep that a person goes through in a typical night of sleep?

Many people are surprised to learn that sleep follows a fairly predictable pattern each night. We sleep in cycles. During each **sleep cycle**, which lasts about 90 minutes, we have one or more stages of NREM sleep followed by a period of REM sleep. Let us go through a typical night of sleep for a young adult (see Figure 4.3).

The first sleep cycle begins with a few minutes in Stage 1 sleep, sometimes called “light sleep.” Stage 1 is actually a transition stage between waking and sleeping. Then sleepers descend into Stage 2 sleep, in which they are somewhat more deeply asleep and harder to awaken. About 50 percent of the total night's sleep is spent in Stage 2 sleep. Next, sleepers enter Stage 3 sleep, the beginning of **slow-wave sleep** (or deep sleep). As sleep gradually becomes deeper, brain activity slows and more **delta waves** (slow waves) appear in the EEG. When there are more than 50 percent delta waves on the EEG, people are said to be in **Stage 4 sleep**, the deepest sleep, when people are hardest to awaken (Carskadon & Rechtschaffen, 1989; Cooper, 1994). Perhaps you have taken an afternoon nap and awakened confused, not knowing whether it was morning or night, a weekday or a weekend. If so, you probably awakened during Stage 4 sleep.

After about 40 minutes in Stage 4 sleep, brain activity increases and the delta waves begin to disappear from the EEG. Sleepers make an ascent back through Stage 3 and Stage 2 sleep, then enter the first REM period of the night, which lasts 10 or 15 minutes. At the end of this REM period, the first sleep cycle is complete, and the second sleep cycle begins. Unless people awaken after the first sleep cycle, they go directly from REM sleep into Stage 2 sleep. They then follow the same progression as in the first sleep cycle, through Stages 3 and 4 and back again into REM sleep.

After the first two sleep cycles of about 90 minutes each (three hours in total), the sleep pattern changes and sleepers usually get no more Stage 4 sleep. From this point on, during each 90-minute sleep cycle, people alternate mainly between Stage 2

REM sleep: Sleep characterized by rapid eye movements, paralysis of large muscles, fast and irregular heart rate and respiration rate, increased brain-wave activity, and vivid dreams.

sleep cycle: A cycle of sleep lasting about 90 minutes and including one or more stages of NREM sleep followed by a period of REM sleep.

slow-wave sleep: Stages 3 and 4 sleep; deep sleep.

delta wave: The slowest brain-wave pattern, associated with Stage 3 sleep and Stage 4 sleep.

Stage 4 sleep: The deepest NREM stage of sleep, characterized by an EEG pattern of more than 50 percent delta waves.

and REM sleep for the remainder of the night. With each sleep cycle, the REM periods (the “dreaming times”) get progressively longer. By the end of the night, REM periods may be 30 to 40 minutes long. In a night, most people sleep about five sleep cycles (7.5 to 8 hours) and get about 1.5 hours of slow-wave sleep and 1.5 hours of REM sleep.

Variations in Sleep: How We Differ

There are great individual variations in sleep patterns. The major factor contributing to these variations is age.

The Older We Get, the Less We Sleep

How do sleep patterns change over the lifespan?

Infants and young children have the longest sleep times and the highest percentages of REM and deep sleep.

However, people get even more REM sleep *before* birth. The fetus spends up to 80 percent of its time in REM sleep (Hobson, 1989).

Children between age six and puberty are the champion sleepers and wakers. They fall asleep easily, sleep soundly for 8.5 to 9 hours at night, and feel awake and alert during the day. Between puberty and the end of adolescence, teenagers average about 7.2 hours of sleep but would need about two hours more to be as alert as they should for school (Wolfson & Carskadon, 1998).

As people age, they usually experience a decrease in quality and quantity of sleep (Reyner & Horne, 1995). Older people have more difficulty falling asleep, and they typically have lighter sleep and more and longer awakenings than younger people (Foley et al., 1995). They spend more time awake in bed but less time asleep, averaging about 6.5 hours of sleep (Prinz et al., 1990). Slow-wave sleep decreases substantially from age 30 to 50 (Mourtazaev et al., 1995). The percentage of REM sleep stays about the same (Moran & Stoudemire, 1992).

Larks and Owls: Early to Rise and Late to Bed

Some people awaken early every morning and leap out of bed with enthusiasm, eager to start the day. Others of us fumble for the alarm clock and push in the snooze button to get a few more precious minutes of sleep. Sleep researchers have names for these two types—larks and owls—and there is a physical explanation for the differences in how they feel. About

25 percent of people are larks—people whose body temperature rises rapidly after they awaken and stays high until about 7:30 p.m. Larks turn in early and have the fewest sleep problems. Then there are the 25 percent who are owls and the 50 percent who are somewhere in between. The body temperature of an owl rises gradually throughout the day, peaking in the afternoon and not dropping until later in the evening. It is not surprising that larks have more difficulty than owls in adapting to night shifts. They are sleepier during their subjective night and are more likely to complain of difficulty sleeping (Hilliker et al., 1992). Differences in one of the genes that run the biological clock are responsible, in part, for the differences between larks and owls (Katzenberg et al., 1998).

“Larks see owls as lazy; owls see larks as party poopers” (Coleman, 1986, p. 15). Can an owl turn into a lark with a little self-discipline? The authors have been trying unsuccessfully to accomplish this for years. However, preliminary work with animals being conducted by Ralph Mistlberger (1991) at Simon Fraser University suggests that it may be possible to alter these roles. Researchers note that even when owls change their sleep schedule to match the early risers, they still *feel* like owls in the morning.

How Much Sleep Do We Need? More Than We Probably Get

What factors influence our sleep needs?

Perhaps you have wondered how much sleep you need in order to feel good, and perhaps you are hoping to find the answer in this chapter. When it comes to sleep, the expression “one size fits all” does *not* apply. Although adults average about 7.5 hours of sleep daily, with an extra hour on weekends, this is too much for some people and too little for others. Short sleepers are the 20 percent who require less than 6 hours; long sleepers are the 10 percent who require more than 9. There seems to be a limit below which most of us cannot go. In one study, not a single participant could get by with less than 4.5 hours of sleep. It seems that 6.5 hours is the minimum for most people.

What accounts for the large variation in the need for sleep? Genetics appears to play a part. Identical twins, for example, have strikingly similar sleep patterns compared with fraternal twins (Webb & Campbell, 1983). Laboratory animals have been bred to be short or long sleepers. But genetics aside, people

Types, Cycles, and Patterns of Sleep

- State the type of sleep—NREM or REM—that corresponds to each characteristic.
 - Paralysis of large muscles
 - REM
 - NREM
 - Slow, regular respiration and heart rate
 - Rapid eye movements
 - Penile erection and vaginal swelling
 - Vivid dreams
- The average length of a sleep cycle in adults is
 - 30 minutes.
 - 60 minutes.
 - 90 minutes.
 - 120 minutes.
- After the first two sleep cycles, most people get equal amounts of deep sleep and REM sleep. (true/false)
- Match the age group with the appropriate description of sleep.

___ 1) Have most difficulty sleeping, most awakenings	a. infancy
___ 2) Sleep best at night; feel best during day	b. middle childhood
___ 3) Have highest percentage of REM and deep sleep	c. adolescence
___ 4) Are usually sleepy during the day regardless of the amount of sleep at night	d. old age

Answers: 1. 1) a 2) b 3) a 4) a 5) a 2. c 3. false 4. 1) d 2) a 3) c 4) b

need more sleep when they are depressed, under stress, or experiencing significant life changes such as changing jobs or schools. Increases in mental, physical, or emotional effort also increase our need for sleep (Hartmann, 1973). Contrary to popular opinion, the amount of activity required in an occupation does not affect the amount of sleep a person needs.

Do most people sleep enough? The answer is no, according to data from a number of North American studies. In fact, more than 36 percent of the population are chronically sleep-deprived (Bonnet & Arand, 1995).

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How much sleep does the average person need? Probably more than he or she gets. And a temporary increase in mental activity can increase the need for sleep.

Sleep Deprivation: How Does It Affect Us?

What happens when people are deprived of REM sleep? What function does REM sleep appear to serve?

What is the longest you have ever stayed awake—one day, two days, three days, or four days? According to the *Guinness Book of World*

Records, Californian Robert McDonald stayed awake 453 hours and 40 minutes (almost 19 days) in a 1986 rocking-chair marathon. Unlike McDonald, most of us have missed no more than a few consecutive nights of sleep, perhaps while studying for final exams. If you have ever missed two or three nights of sleep, you may remember having had difficulty concentrating, lapses in attention, and general irritability. After 60 hours without sleep, some people even have minor hallucinations. Most people who try to stay awake for long periods of time will have **microsleeps**, two- to three-second lapses from wakefulness into sleep. You may have experienced a microsleep if you have ever caught yourself nodding off for a few seconds in class or on a long automobile trip.

microsleep: A momentary lapse from wakefulness into sleep, usually occurring when one has been sleep-deprived.

Recent studies, with over 2000 participants, indicated that sleep deprivation seriously impairs functioning (Pilcher & Huffcutt, 1996). It has a negative impact on mood, alertness, and performance (Bonnet & Arand, 1995). Even partial sleep deprivation impairs one's ability to attend and process relevant stimuli from the environment (McCarthy & Waters, 1997). But do not despair if you are one of these people who tends to wake up often during the night, as this will not reduce your alertness the next day.

When people are deprived of REM sleep as a result of general sleep loss, illness, or too much alcohol (or other drugs), their bodies will make up for the loss by getting an increased amount of REM sleep after the deprivation (Vogel, 1975). This increase in the percentage of REM sleep to make up for REM deprivation is called a **REM rebound**. Because the intensity of REM sleep is increased during a REM rebound, nightmares often occur. But why do we need REM sleep?

The Function of REM Sleep: Necessary, but Why?

The fact that newborns have such a high percentage of REM sleep has led to the conclusion that REM sleep is necessary for maturation of the brain in infants.

Recent research has shown that REM sleep is involved in the consolidation of memories after learning. Karni and colleagues (1994) found that research participants learning a new perceptual skill showed an improvement in performance, with no additional practice, 8 to 10 hours later if they had a normal night's sleep or if their NREM sleep was disturbed.

Performance did not improve, however, in those who were deprived of REM sleep (Marks et al., 1995).

An opposite view is proposed by Francis Crick and Graeme Mitchison (1983, 1995). They suggest that REM sleep is a type of “mental housecleaning” that erases trivial and unnecessary memories and clears overloaded neural circuits that might interfere with memory and rational thinking. In other words, they say, people dream in order to forget.

Dreaming: Mysterious Mental Activity While We Sleep

How do REM and NREM dreams differ?

People have always been fascinated by dreams. The vivid dreams we remember and talk about are **REM dreams**—the type that occur almost continuously during each REM period. But there are also **NREM dreams**, which occur during NREM sleep (Foulkes, 1996). REM dreams have a story-like or dream-like quality and are more visual, vivid, emotional, and bizarre than NREM dreams, which typically have a thought-like quality (Hobson, 1989; Webb & Cartwright, 1978). As the night wears on, our REM dreams become longer and more complex (Cipolli & Poli, 1992).

Have you ever heard that an entire dream takes place in an instant? Did you find that hard to believe? In fact, it is not true. Sleep researchers have discovered that it takes about as long to dream a dream as it would to experience the same thing in real life (Kleitman, 1960). Let's take a closer look at the dream state.

Image omitted due to copyright restrictions.

What do we dream about? REM dreams have a story-like quality and are more visual, vivid, and emotional than NREM dreams.

LINK IT!www.ASDreams.org

The Association for the Study of Dreams

Dream Memories: We Remember Only a Few

Very few dreams are memorable enough to be retained very long. Sleep researchers have learned that sleepers have the best recall of a dream if they are awakened during the dream; the more time that passes after the dream ends, the poorer the recall (Kleitman, 1960). Perhaps the reason for the quick loss of memory is that human brain chemistry during sleep appears to differ from that in the waking state and does not facilitate the storing of memories (Hobson, 1996; Hobson & Stickgold, 1995).

The Content of Dreams: Bizarre or Commonplace?

In general, what have researchers found regarding the content of dreams?

What do we dream about? You may be surprised to learn that dreams are less bizarre and less filled with emotion than is generally

believed (Cipolli et al., 1993; Hall & Van de Castle, 1966; Snyder, 1971). Because dreams are notoriously hard to remember, the features that stand out tend to be those that are bizarre or emotional.

Sleep researchers generally agree that dreams reflect our preoccupations in waking life—our fears, wishes, plans, hopes, and worries. Most dreams have rather commonplace settings with real people, half of whom are known to the dreamer. In general, dreams are more unpleasant than pleasant, and they contain more aggression than friendly interactions and more misfortune than good fortune. Fear and anxiety, often quite intense, are common in REM dreams (Hobson, 1996). Some dreams are in “living colour,” whereas others are in black and white.

Table 4.1 (on the next page) lists the 20 most common dream themes among 250 university students. Although the study was conducted in 1958, a study today would probably yield similar results. Compare the results of your dream themes in *Try It!* with the results of the study shown in Table 4.1.

Try It!**What's in Your Dreams?**

Read this list of 20 common dream themes. Check each one you have dreamed about.

- Falling
- Finding money
- Being attacked or pursued
- Swimming
- Trying repeatedly to do something
- Being dressed inappropriately
- Snakes
- School, teachers, studying
- Being smothered
- Sexual experiences
- Being nude in public
- Arriving too late
- Fire
- Eating
- Failing an examination
- Being frozen with fright
- Flying
- Death of a loved person
- Seeing self as dead
- Being locked up

Image omitted due to copyright restrictions.

REM rebound: The increased amount of REM sleep that occurs after REM deprivation; often associated with unpleasant dreams or nightmares.

REM dreams: Having a dream-like and story-like quality; the type of dream that occurs almost

continuously during each REM period; more vivid, visual, emotional, and bizarre than NREM dreams.

NREM dreams: Mental activity occurring during NREM sleep that is more thought-like in quality than REM dreams are.

TABLE 4.1
Common Dream Themes

These are the 20 most common dream themes reported by 250 university students and the percentage of students having each type of dream.

Type of Dream	Percentage of Students
Falling	83
Being attacked or pursued	77
Trying repeatedly to do something	71
School, teachers, studying	71
Sexual experiences	66
Arriving too late	64
Eating	62
Being frozen with fright	58
Death of a loved person	57
Being locked up	56
Finding money	56
Swimming	52
Snakes	49
Being dressed inappropriately	46
Being smothered	44
Being nude in public	43
Fire	41
Failing an examination	39
Flying	34
Seeing self as dead	33

Source: Griffith, Miyago, & Tago, 1958.

Some people are troubled by unpleasant recurring dreams. The two most common themes involve being chased or falling (Stark, 1984). People who have recurring dreams seem to have more minor physical complaints, greater stress, and more anxiety and depression than other people (Brown & Donderi, 1986). Is there anything that can be done to stop recurring dreams? Some people have been taught to use *lucid dreaming* to bring about satisfactory resolutions to their unpleasant recurring dreams.

Have you ever experienced a **lucid dream**—one during which you were aware that you were dream-

ing? If so, you are among the 10 percent who possess this ability. Many lucid dreamers are able to change a dream while it is in progress, and a few virtuosos claim to be able to dream about any subject at will (Gackenbach & Bosveld, 1989; La Berge, 1981).

LINK IT!

www.cris.com/~Mbreck/lucid.shtml
The Lucid Dreamer's Reference Guide

www.lucidity.com
Lucidity Institute: Lucid Dreaming

Interpreting Dreams: Are There Hidden Meanings in Our Dreams?

Freud believed that dreams function to satisfy unconscious sexual and aggressive wishes. Because such wishes are unacceptable to the dreamer, they have to be disguised and therefore appear in dreams in symbolic form. Freud (1900/1953a) asserted that objects like sticks, umbrellas, tree trunks, and guns symbolize the male sex organ; objects like chests, cupboards, and boxes represent the female sex organ. Freud differentiated between the “manifest” content of the dream—the dream as recalled by the dreamer—and the underlying meaning of the dream, called the “latent” content, which he considered more significant.

In recent years there has been a major shift away from the Freudian interpretation of dreams. The greater focus now is on the manifest content—the actual dream itself—rather than on the search for symbols that can be decoded to reveal some inner conflict. The symbols in dreams, when analyzed, are now perceived as being specific to the individual rather than as having standard or universal meanings for all dreamers.

J. Allan Hobson (1988) rejects the notion that nature would equip us with a capability and a need to dream dreams that only a specialist could interpret. Hobson and McCarley (1977) advanced the activation-synthesis hypothesis of dreaming. This hypothesis suggests that dreams are simply the brain's attempt to make sense of the random firing of brain cells during REM sleep.

But Hobson (1989) now believes that our dreams do have psychological significance because they are woven from our personal experiences, remote memories, and “associations, drives, and fears” (p. 5).



Sleep and Dreams

- Which factor *least* affects the amount of sleep people need?
 - their heredity
 - their emotional state
 - the amount of stress in their lives
 - the amount of physical activity required in their occupation
- Following REM deprivation, there is usually
 - an absence of REM sleep.
 - an increase in REM sleep.
 - a decrease in REM sleep.
 - no change in the amount of REM sleep.
- Which type of sleep seems to aid in learning and memory in humans and other animals?
 - Stage 1
 - Stage 2
 - Stages 3 and 4
 - REM sleep
- Dream memories usually do not persist for more than 10 minutes after a dream has ended. (true/false)
- Compared with REM dreams, NREM dreams are
 - more emotional.
 - more visual.
 - more thought-like.
 - more confusing.
- According to researchers, each of the following statements about the content of dreams is correct *except*
 - dreams are generally bizarre and filled with emotion.
 - dreams generally reflect our waking preoccupations.
 - dreams are generally more unpleasant than pleasant.
 - dreams contain more aggression than friendly interactions.

Answers: 1. d 2. b 3. d 4. true 5. c 6. a

LINK IT!

[psychclassics.yorku.ca/Freud/Dreams/Classics in the History of Psychology: Freud](http://psychclassics.yorku.ca/Freud/Dreams/Classics%20in%20the%20History%20of%20Psychology%3A%20Freud)

Sleep Disorders

So far our discussion has centred on a typical night for a typical sleeper. But one-third of North American adults report sleep problems (Rosekind, 1992), and many children also experience sleep disturbances. Sleep problems range from mild to severe and from problems that affect only sleep to those that affect a person's entire life. Yet even today, most medical schools provide less than two hours' instruction on sleep and sleep disorders (Rosen et al., 1993).

LINK IT!

www.asda.org
American Sleep Disorders Association

Parasomnias: Unusual Behaviours During Sleep

Parasomnias are sleep disturbances in which behaviours and physiological states that normally occur

only in the waking state take place during sleep or the transition from sleep to wakefulness. Sleepwalking and sleep terrors are two parasomnias that occur during Stage 4 sleep.

Sleepwalking and Sleep Terrors: Their Shared Characteristics

What are the characteristics common to sleepwalking and night terrors?

Sleepwalking (**somnambulism**) and **sleep terrors** are parasomnias that often run in families (Dement, 1974). They occur during a partial arousal from Stage 4 sleep in which the sleeper does not come to full consciousness.

lucid dream: A dream during which the dreamer is aware of dreaming; the dreamer is often able to influence the content of the dream while it is in progress.

parasomnias: Sleep disturbances in which behaviours and physiological states that normally occur only in the waking state take place during sleep or the transition from sleep to

wakefulness (e.g., sleepwalking, sleep terrors).

somnambulism (somnambulism): Sleepwalking that occurs during a partial arousal from Stage 4 sleep.

sleep terror: A sleep disturbance in which a person partially awakens from Stage 4 sleep with a scream, in a dazed, groggy, and panicky state, and with a racing heart.

Typically, there is no memory of the episode the following day (Moldofsky et al., 1995). Most cases begin in childhood and are attributed primarily to a delayed development of the nervous system (Masand et al., 1995). The disturbances are usually outgrown by adolescence, and treatment is generally not advised. If the problems persist, however, or develop later in adulthood, the origin is thought to be psychological, and treatment is recommended.

Sleepwalking (Somnambulism): Walking Around but Sound Asleep

Cartoonists often depict sleepwalkers groping about with their eyes closed and their arms extended forward as if to feel their way about. Actually, sleepwalkers have their eyes open with a blank stare, and rather than walking normally, they shuffle about. Their coordination is poor, and if they talk, their speech is usually unintelligible.

If an EEG recording were made during a sleepwalking episode, it would show a combination of delta waves, indicating deep sleep, and alpha and beta waves, signalling the waking state. Sleepwalkers are awake enough to carry out activities that do not require their full attention, but asleep enough not to remember having done so the following day. Sleepwalkers may get up and roam through the house or simply stand for a short time and then go back to bed (Ferber, 1989; Karacan, 1988). Occasionally they get dressed, eat a snack, or go to the bathroom. The most important concern in sleepwalking is safety. Because of their reduced alertness and coordination, sleepwalkers are at risk of hurting themselves. They have been known to walk out of windows, fall down stairs, and more.

Finally, let us dispel a myth about sleepwalking. You may have heard that it is dangerous to awaken a sleepwalker. This piece of conventional wisdom is not true.

Sleep Terrors: Screams in the Night

What is a sleep terror? Sleep terrors usually begin with a piercing scream. The sleeper springs up in a state of panic—eyes open, perspiring, breathing rapidly, with the heart pounding at two to four times the normal rate (Karacan, 1988). Episodes usually last from 5 to 15 minutes, and then the person falls back to sleep. If not awakened during

a night terror, children usually have no memory of the episode the next morning. If awakened, however, they may recall a single frightening image (Hartmann, 1981).

Parents should not be unduly alarmed by sleep terrors in young children, since up to 5 percent of them have sleep terrors (Keefauver & Guilleminault, 1994). However, episodes that continue through adolescence into adulthood are more serious. Fewer than 1 percent of adults experience sleep terrors (Hublin et al., 1999), and they often indicate extreme anxiety or other psychological problems.

Nightmares: The Worst of Dreams

How do nightmares differ from sleep terrors?

Nightmares are very frightening dreams that occur during REM sleep and are likely to be remembered in vivid detail.

The most common themes are being chased, threatened, or attacked. Nightmares can be a reaction to traumatic life experiences (Hefez et al., 1987), and are more frequent at times of high fever, anxiety, and emotional upheaval. REM rebound during drug withdrawal or after long periods without sleep can also produce nightmares. Sleep terrors occur early in the night during Stage 4 sleep, whereas anxiety nightmares occur toward morning, when the REM periods are longest.

Sleeptalking (Somniloquy): Might We Reveal Secrets?

Do you sometimes talk in your sleep? Are you afraid that you might confess to something embarrassing, or reveal some deep, dark secret? Relax. Sleeptalkers rarely reply to questions, and they usually mumble words or phrases that make no sense to the listener. Sleepers can talk during any sleep stage, but most often sleeptalking occurs in Stage 1 or Stage 2 sleep (Aldrich, 1989). There is no evidence at all that sleeptalking is related to a physical or psychological disturbance—not even to a guilty conscience (Arkin, 1981).

Major Sleep Disorders

Some sleep disorders can be so debilitating that they affect a person's entire life. These disorders are narcolepsy, sleep apnea, and insomnia.

Narcolepsy: Sudden Attacks of REM Sleep

What are the major symptoms of narcolepsy?

Narcolepsy is an incurable sleep disorder characterized by excessive daytime sleepiness and uncontrollable attacks of REM sleep, usually lasting 10 to 20 minutes (American Psychiatric Association, 1994). People with narcolepsy are often unfairly stigmatized as lazy, depressed, and uninterested in their work.

Anything that causes an ordinary person to be tired can trigger a sleep attack in a narcoleptic—a heavy meal, sunbathing at the beach, or a boring lecture. A sleep attack can also be brought on by any situation that is exciting (narcoleptic attacks often occur during lovemaking) or that causes a strong emotion, such as anger or laughter.

Narcolepsy is a physiological disorder caused by an abnormality in the part of the brain that regulates sleep, and it appears to have a strong genetic component (Billiard et al., 1994; Partinen et al., 1994). Although there is no cure for narcolepsy, stimulant medications improve daytime alertness in most patients (Guilleminault, 1993; Mitler et al., 1994). Many experts also recommend scheduled naps to relieve sleepiness (Hawkins et al., 1992; Mullington & Broughton, 1993).

LINK IT!

www.websciences.org/narnet/Narcolepsy_Network

Sleep Apnea: Can't Sleep and Breathe at the Same Time

What is sleep apnea?

Sleep apnea consists of periods during sleep when breathing stops and the individual must awaken briefly to breathe (White, 1989). The major symptoms of sleep apnea are excessive daytime sleepiness and extremely loud snoring (as loud as a jackhammer), often accompanied by snorts, gasps, and choking noises.

In very severe cases, apnea may last throughout the night, with as many as 800 partial awakenings to gasp for air. Alcohol and sedative drugs aggravate the condition (Langevin et al., 1992). Severe sleep apnea can lead to chronic high blood pressure, heart problems, and even death (Lavie et al., 1995).

Image omitted due to copyright restrictions.

Sleep researcher **William Dement** holds a dog that is experiencing a narcoleptic sleep attack. Much has been learned about narcolepsy through research with dogs.

LINK IT!

www.newtechpub.com/phantom/faq/osa_faq.htm
Sleep Apnea FAQ

Insomnia: When You Can't Fall Asleep

What is insomnia?

People with **insomnia** suffer distress and impairment in daytime functioning owing to difficulty falling or staying asleep or to experiencing sleep that is light, restless, or of poor quality. Temporary insomnia, lasting three weeks or less, can result from jet lag, emotional highs or lows, or a brief illness or injury that interferes with sleep. Much more serious is chronic insomnia, which lasts for months or even years (Costa E Silva et al., 1996).

Chronic insomnia may begin as a reaction to a psychological or medical problem but persist long after the problem has been resolved.

In *Apply It!* at the end of this chapter, we examine some ways to overcome insomnia.

nightmare: A very frightening dream occurring during REM sleep.

narcolepsy (NAR-co-lep-see): A serious sleep disorder characterized by excessive daytime sleepiness and sudden, uncontrollable attacks of REM sleep.

sleep apnea: A sleep disorder characterized by periods when breathing

stops during sleep and the person must awaken briefly to breathe; major symptoms are excessive daytime sleepiness and loud snoring.

insomnia: A sleep disorder characterized by difficulty falling or staying asleep or by light, restless, or poor sleep; causing distress and impaired daytime functioning.



Sleep Disorders

- Which is *not* a characteristic common to sleepwalking and sleep terrors in children?
 - They occur during partial arousals from Stage 4 sleep.
 - Episodes are usually forgotten the next morning.
 - The disturbances occur most often in children.
 - The disturbances indicate a psychological problem that should be treated by a mental health professional.
- Match the disorder with the description or associated symptom.

___ 1) sleep attacks during the day	a. narcolepsy
___ 2) cessation of breathing during sleep; loud snoring	b. sleep apnea
___ 3) difficulty falling or staying asleep	c. sleep terror
___ 4) a very frightening REM dream	d. insomnia
___ 5) partial awakening from Stage 4 sleep in a panic state related to a frightening dream image	e. nightmare

Answers: 1. d 2. (1) a (2) b (3) d (4) e (5) c

Altering Consciousness through Concentration and Suggestion

Sleep is an altered state of consciousness and a necessary one. We must sleep. But there are other, voluntary forms of altered consciousness. Meditation and hypnosis are two of these.

Meditation: Expanded Consciousness or Relaxation?

For what purposes is meditation used?

Meditation is a group of techniques that involve focusing attention on an object, a word, one's breathing, or body movement to block out all distractions and achieve an altered state of consciousness. Some forms of meditation—yoga, Zen, and transcendental meditation (TM)—have their roots in Eastern religions and are practised by followers of those religions to attain a higher state of spirituality. Others use these approaches to increase relaxation, reduce arousal, or expand consciousness.

Some meditators sit in a comfortable chair with eyes closed, both feet flat on the floor, and hands in the lap or simply resting on the arms of the chair. They might begin meditation by relaxing their muscles from the feet up, to achieve a deep state of relaxation. Other people concentrate on their breathing—slowly, rhythmically, in and out. In transcendental meditation, the meditator is given a

mantra, a word (such as *om*) assigned by the teacher. The meditator repeats the mantra over and over during meditation to block out unwanted thoughts and facilitate the meditative state. Dr. Herbert Benson (1975) suggests that any word or sound will do. Moreover, he asserts that the benefits of meditation can be achieved through simple relaxation techniques. Do *Try It!* to experience Benson's relaxation response.



Try It!

Relaxing through Meditation

Find a quiet place and sit in a comfortable position.

- Close your eyes.
- Relax all your muscles deeply. Begin with your feet and move slowly upward, relaxing the muscles in your legs, buttocks, abdomen, chest, shoulders, neck, and finally your face. Allow your whole body to remain in this deeply relaxed state.
- Now concentrate on your breathing, and breathe in and out through your nose. Each time you breathe out, silently say the word *om* to yourself.
- Repeat this process for 20 minutes. (You can open your eyes to look at your watch periodically, but don't use an alarm.) When you are finished, remain seated for a few minutes—first with your eyes closed, and then with them open.

Benson recommends that you maintain a passive attitude. Don't try to force yourself to relax. Just let it happen. If a distracting thought comes to mind, ignore it and just repeat *one* each time you exhale. It is best to practise this exercise once or twice each day, but not within two hours of your last meal. Digestion interferes with the relaxation response.

Hypnosis: Look into My Eyes

What is hypnosis, and when is it most useful?

Have you ever been hypnotized? Many people are fascinated by this unusual, somewhat mysterious phenomenon. Other people doubt that it even exists.

Hypnosis is a trance-like state of concentrated and focused attention, heightened suggestibility, and diminished response to external stimuli. In the hypnotic state, people suspend their usual rational and logical ways of thinking and perceiving, and allow themselves to experience distortions in perceptions, memories, and thinking. Under hypnosis, people may experience positive hallucinations, in which they see, hear, touch, smell, or taste things that are not present in the environment; or they may have negative hallucinations and fail to perceive those things that are present.

About 80 to 95 percent of people are hypnotizable to some degree, but only 5 percent can reach the deepest levels of trance (Nash & Baker, 1984). The ability to become completely absorbed in imaginative activities is characteristic of highly hypnotizable people

Image omitted due to copyright restrictions.

Hypnosis is a trance-like state of concentrated attention and heightened suggestibility. This hypnotherapist suggested to the youth that a balloon was tied to his right hand—and the youth began to raise his arm accordingly.

(Nadon et al., 1991). Silva and Kirsch (1992) found that individuals' fantasy-proneness and their expectations of responding to hypnotic suggestions were predictors of hypnotizability.

LINK IT!

www.hypnosis.com/faq

Hypnosis FAQ

serendip.brynmawr.edu/Mind/Trance.html

Trance and Trauma: Functional Nervous Disorders and the Subconscious Mind

Hypnosis: Separating Fact from Fiction

Hypnosis has been studied extensively in Canada—for example, by Nick Spanos and colleagues at Carleton University and by Kenneth Bowers and colleagues at the University of Waterloo. There are many misconceptions about hypnosis. Here are the facts.

- Hypnotized subjects *are* aware of what is going on during hypnosis.
- Individuals will *not* violate their moral values under hypnosis.
- Individuals *cannot* demonstrate superhuman strength or perform amazing feats because they are hypnotized.
- Memory is *not* more accurate under hypnosis.
- Hypnotized individuals will *not* reveal embarrassing secrets.
- Hypnotized individuals will *not* relive events as they believe the events should have occurred (i.e., rather than as they actually took place in childhood).
- Hypnotized individuals are *not* under the complete control of the hypnotist.
- The hypnotized person's responses are often automatic and involuntary (Bowers & Woody, 1996).

meditation: A group of techniques that involve focusing attention on an object, a word, one's breathing, or body movement in order to block out all distractions and achieve an altered state of consciousness.

hypnosis: A trance-like state of concentrated, focused attention, heightened suggestibility, and diminished response to external stimuli.

Medical Uses of Hypnosis: It's Not Just Entertainment

Hypnosis is now recognized as a viable technique for use in medicine, dentistry, and psychotherapy. It has been particularly helpful in the control of pain (Spanos et al., 1990). It has also been used successfully to treat a wide range of disorders, including high blood pressure, bleeding, psoriasis, severe morning sickness, side effects of chemotherapy, and burns (Kelly & Kelly, 1985). Other problems that have responded well to hypnosis are asthma, severe insomnia, some phobias (Orne, 1983), and multiple personality disorder (Kluft, 1992). Furthermore, recent studies suggest that hypnosis can be useful in treating warts (Ewin, 1992), repetitive nightmares (Kingsbury, 1993), and sexual dysfunctions such as inhibited sexual desire (Hammond, 1992) and impotence (Crasilneck, 1992).

Suppose you are overweight, or you smoke or drink heavily. Would a quick trip to a hypnotist rid you of overeating or other bad habits? Hypnosis has been only moderately effective in weight control and virtually useless in overcoming drug and alcohol abuse (Orne, 1983).

Critics' Explanations of Hypnosis: Is It Really What It Seems?

Because there is no reliable way to determine whether a person is truly hypnotized, some critics offer other

explanations for behaviour occurring during this state. One explanation is that people are simply acting out the role suggested by the hypnotist (Spanos, 1991). Although some people who declare that they are hypnotized may be role-playing, this theory does not adequately explain how people can undergo surgery with hypnosis rather than a general anesthetic (Kroger & Fezler, 1976).

Another idea is that behaviour under hypnosis is no different from behaviour of other highly motivated individuals. Barber (1970) found that "both hypnotic and waking control subjects are responsive to suggestions for analgesia [pain relief], age regression, hallucinations and amnesia if they have positive attitudes toward the situation and are motivated to respond" (p. 27).

Next we will explore how psychoactive substances produce altered states of consciousness.

Altered States of Consciousness and Psychoactive Drugs

The altered states of consciousness we have examined thus far are natural ones. We will now explore effect of psychoactive drugs. A **psychoactive drug** is any substance that alters mood, perception, or thought. Some of these drugs are legal, but most are

Meditation and Hypnosis

- Which is *not* a proposed use of meditation?
 - to promote relaxation
 - to substitute for anesthesia during surgery
 - to bring a person to a higher level of spirituality
 - to alter consciousness
- A special mantra is used in transcendental meditation. (true/false)
- According to Dr. Herbert Benson, the beneficial effects of meditation cannot be duplicated with simple relaxation techniques. (true/false)
- Which of the following statements is true of people under hypnosis?
 - They will often violate their moral code.
 - They are much stronger than in the normal waking state.
 - They can be made to experience distortions in their perceptions.
 - Their memory is more accurate than during the normal waking state.
- For a moderately hypnotizable person, which use of hypnosis would probably be most successful?
 - for relief from pain
 - for surgery instead of a general anesthetic
 - for treating drug addiction
 - for improving memory

Answers: 1. b 2. true 3. false 4. c 5. a

TABLE 4.2**Risk Factors and Protective Factors for Adolescent Drug Use and Abuse**

	Risk Factors	Protective Factors
Peer Influences	Peers use and encourage use Peers provide substances	Peers are not users
Educational variables	Poor school performance Low educational aspirations	Good grades High educational aspirations
Social/family variables	Family conflict Family alcohol and/or drug abuse Lack of religious commitment	Positive family relationships Perceived sanctions against drug use Involvement in religious community
Environmental variables	Extreme poverty Neighbourhood disorganization Availability of drugs	
Psychological/ behavioural variables	Low self-esteem Antisocial behaviour Need for excitement Poor impulse control Stressful life events Depression Anxiety Apathy and pessimism Alienation and rebelliousness	Self-acceptance Law abidance Perceived future opportunities

Source: Adapted from Hawkins et al., 1992; Newcomb, 1997; Newcomb & Felix-Ortiz, 1992.

not. When these drugs are approved for medical use only, they are called *controlled substances*.

In Canada, there is considerable concern about the sale and use of illicit drugs. But in terms of “damage to users, harm to society, and numbers of addicts,” alcohol and tobacco are “the most serious problem drugs by far” (Goldstein & Kalant, 1990, p. 151b).

Why do so many Canadians use psychoactive drugs? There are many reasons for taking drugs, and users often do not recognize their real motives. Some people take drugs to cope with or relieve anxiety, depression, or boredom (Baker, 1988). Others use drugs just to feel good, experience a thrill, or conform to social pressures. Others use psychoactive drugs for their medical benefits.

Peer influence is the factor most highly correlated with adolescents’ use of illicit drugs, cigarettes, and alcohol. According to Dinges and Oetting (1993), there is a “90 percent correspondence between an adolescent’s use of particular drugs and the use of those exact drugs by friends” (p. 264). Table 4.2 summarizes the risk factors and protective factors associated with adolescent drug use and abuse.

Drug Dependence: Slave to a Substance

What is the difference between physical and psychological drug dependence?

The effects of drugs are not always predictable. Some drugs create a physical or chemical dependence; others create a psychological dependence. **Physical drug dependence** comes about as a result of the body’s natural ability to protect itself against harmful substances by developing a **drug tolerance**. This means that the user becomes progressively less affected by the drug

psychoactive drug: A drug that alters normal mental functioning—mood, perception, or thought; if used medically, called a controlled substance.

drug dependence (physical): A compulsive pattern of drug use in which the user develops a drug tolerance coupled with

unpleasant withdrawal symptoms when the drug is discontinued.

drug tolerance: A condition in which the user becomes progressively less affected by the drug so that larger and larger doses are necessary to maintain the same effect.

and must take larger doses to get the same effect or high (Ramsey & Woods, 1997). Tolerance grows because the brain adapts to the presence of the drug by responding less intensely to it. The various bodily processes adjust in order to continue to function with the drug in the system.

Once drug tolerance is established, a person cannot function normally without the drug. If the drug is taken away, the user begins to suffer withdrawal symptoms. The **withdrawal symptoms**, both physical and psychological, are usually the exact opposite of the effects produced by the drug. For example, withdrawal from stimulants leaves a person exhausted and depressed; withdrawal from tranquilizers leaves a person nervous and agitated.

If physical dependence alone explained drug addiction, there would be no problem with drugs long thought to be physically non-addictive. Once the period of physical withdrawal was over, the desire for the drug would end along with the withdrawal symptoms. But this is not the case—there is more to drug addiction than physical dependence. **Psychological drug dependence** is a craving or irresistible urge for the drug's pleasurable effects, and it is more difficult to combat than physical dependence (O'Brien, 1996).

Four factors influence the addictive potential of a drug: (1) how quickly the effects of the drug are felt; (2) how pleasurable the drug's effects are; (3) how long the pleasurable effects last; and (4) how much discomfort is experienced when the drug is discontinued (Medznerian, 1991). With the most addictive drugs, the pleasurable effects are felt almost immediately but are short-lived. For example, the intensely pleasurable effects of crack cocaine are felt in seven seconds but last only about five minutes. Because the discomfort is intense after the pleasurable effects wear off, the user is highly motivated to continue taking the drug. With any drug, the abuse potential is higher if the drug is injected rather than taken orally, and higher still if it is smoked rather than injected.

Psychoactive drugs alter consciousness in a variety of ways. Let's consider the various alterations produced by the major categories of drugs: stimulants, hallucinogens (or psychedelics), and depressants.

LINK IT!

itsa.ucsf.edu/~ddrc

Drug Dependence Research Center Home Page

www.arf.org

Addiction Research Foundation

www.health.org/index.htm

U.S. National Clearinghouse for Alcohol and Drug Information

Stimulants: Speeding Up the Nervous System

How do stimulants affect the user?

Stimulants, often called **uppers**, speed up the central nervous system, suppress appetite, and can make a person feel more awake, alert, and energetic. Stimulants increase pulse, blood pressure, and respiration rate; they also reduce cerebral blood flow (Mathew & Wilson, 1991). In higher doses, they make people feel nervous, jittery, and restless, and they can cause shaking or trembling and can interfere with sleep.

No stimulant actually delivers energy to the body. Instead, a stimulant forces the body to use some of its stored-up energy sooner and in greater amounts than it would naturally. When the stimulant's effect wears off, the body's natural energy is depleted. This leaves the person feeling exhausted and depressed.

There are *legal* stimulants such as caffeine and nicotine, *controlled* stimulants such as amphetamines, and *illegal* stimulants such as cocaine.

There are *legal* stimulants such as caffeine and nicotine, *controlled* stimulants such as amphetamines, and *illegal* stimulants such as cocaine.

Caffeine: The Most Widely Used Drug

Caffeine is the world's most widely used drug. If you cannot start your day without a cup of coffee (or two, or more), you may be addicted to it. Coffee, tea, cola drinks, chocolate, and more than 100 prescription and over-the-counter drugs contain caffeine. They provide a mild jolt to the nervous system, at least temporarily. Caffeine makes us more mentally alert and can help us stay awake. Many people use caffeine to lift their mood, but laboratory studies reveal that one hour after consuming medium or high doses of caffeine, subjects show significantly higher levels of anxiety, depression, and hostility (Veleber & Templer, 1984).

Nicotine: A Deadly Poison

Nicotine is a poison so strong that the body must develop a tolerance for it almost immediately—in only hours, in contrast to days or weeks for heroin, and usually months for alcohol. It is estimated that 20 to 30 percent of Canadians smoke, and that 40 000 Canadians die each year from cigarette smoking. “Cigarette smoking results in the premature death of approximately 50 percent of smokers” (Henningfield et al., 1996, p. 1857). The many health problems associated with smoking are discussed in Chapter 11.

Amphetamines: Energy to Burn—at a Price

What effects do amphetamines have on the user?

Amphetamines form a class of stimulants that increase arousal, relieve fatigue, suppress the appetite, and give a rush of energy. In low to moderate doses, these stimulants may temporarily improve athletic and intellectual performance. A person who takes amphetamines becomes more alert and energetic, experiences mild euphoria, and usually becomes more talkative, animated, and restless.

In high doses—100 milligrams or more—amphetamines can cause confused and disorganized behaviour, extreme fear and suspiciousness, delusions and hallucinations, aggressiveness and antisocial behaviour, and even manic behaviour and paranoia. One powerful amphetamine, known as *methamphetamine* (“crank” or “speed”), now comes in a smokable form—“ice,” which is highly addictive and can be fatal.

Withdrawal from amphetamines leaves a person physically exhausted, sleeping for 10 to 15 hours or more. The user awakens in a stupor, extremely depressed and intensely hungry. Victims of fatal overdoses of stimulants usually have multiple hemorrhages in the brain.

Cocaine: Snorting White Powder, Smoking Crack

How does cocaine affect the user?

Cocaine, a stimulant derived from coca leaves, can be sniffed as a white powder, injected intravenously, or smoked in the form of crack. The rush of well-being is dramatically intense and powerful, but it is just as dramatically short-lived. In the case of cocaine, the euphoria lasts no more than 30 to 45 minutes; with crack, however, the effect lasts no more than 5 to 10 minutes (Julien, 1995). In

both cases, the euphoria is followed by an equally intense **crash** that is marked by depression, anxiety, agitation, and a powerful craving for more of the drug (Gawin, 1991).

Cocaine stimulates the reward or “pleasure” pathways in the brain, which use the neurotransmitter dopamine (Landry, 1997). With continued use, the reward systems fail to function normally and the user becomes incapable of feeling any pleasure except from the drug (Gawin, 1991). The main withdrawal symptoms are psychological—the inability to feel pleasure and the craving for more cocaine (Gawin & Ellinwood, 1988).

Cocaine constricts the blood vessels, raises blood pressure, speeds up the heart, quickens respiration, and can even cause epileptic seizures in people who have no history of epilepsy (Pascual-Leone et al., 1990). Over time, or even quickly in high doses, cocaine can cause heart palpitations, an irregular heartbeat, and heart attacks (Lange et al., 1989). Smart and Adlaf (1992), at the Addiction Research Foundation in Toronto, note that cocaine use is relatively rare in Canada. For instance, in Ontario fewer than 2 percent of adolescents have used cocaine.

The cheapest and perhaps the most dangerous form of cocaine, **crack** can produce a powerful dependency in several weeks. Crack may be “the most addicting form of the most addicting drug” (Lundgren, 1986, p. 7).

withdrawal symptoms: The physical and psychological symptoms (usually the opposite of those produced by the drug) that occur when a regularly used drug is discontinued and that terminate when the drug is taken again.

drug dependence (psychological): A craving or irresistible urge for a drug’s pleasurable effects.

stimulants: A category of drugs that speed up activity in the central nervous system, suppress appetite, and cause a person to feel more awake, alert, and energetic.

uppers: A slang term for stimulants.

amphetamines: A class of central nervous system stimulants that increase arousal, relieve fatigue, and suppress the appetite.

cocaine: A stimulant that produces a feeling of euphoria.

crash: The feelings of depression, exhaustion, irritability, and anxiety that occur following an amphetamine, a cocaine, or a crack high.

crack: The most potent, inexpensive, and addictive form of cocaine, and the form that is smoked.

Drug Tolerance, Drug Dependence, and Stimulants

- Which of the following does not necessarily occur with drug tolerance?
 - The body adjusts to functioning with the drug in the system.
 - The person needs larger and larger doses of the drug to get the desired effect.
 - The user becomes progressively less affected by the drug.
 - The user develops a craving for the pleasurable effects of the drug.
- During withdrawal from a drug, the user experiences symptoms that are the opposite of the effects produced by the drug. (true/false)
- Psychological dependence on a drug is more difficult to combat than physical dependence. (true/false)
- Match the stimulant with the appropriate description.

___ 1) responsible for the most deaths	a. caffeine
___ 2) used to increase arousal, relieve fatigue, and suppress appetite	b. cigarettes
___ 3) found in coffee, tea, chocolate, and colas	c. amphetamines
___ 4) snorted or injected	d. crack
___ 5) most dangerous, potent, and addictive form of cocaine	e. cocaine

Answers: 1. d 2. true 3. true 4. (1) b (2) c (3) a (4) e (5) d

Hallucinogens: Seeing, Hearing, and Feeling What Is Not There

What are the main effects of hallucinogens, and what are three psychoactive drugs classified as hallucinogens?

The **hallucinogens**, or psychedelics, are drugs that can alter and distort perceptions of time and space, alter mood, and produce feelings of unre-

ality. Hallucinogens have been used for recreation and in religious rituals and ceremonies in diverse cultures since ancient times (Millman & Beeder, 1994). As the name implies, hallucinogens also cause **hallucinations**, sensations that have no basis in external reality (Andreasen & Black, 1991; Miller & Gold, 1994).

Rather than producing a relatively predictable effect as do most other drugs, hallucinogens usually magnify the mood or the frame of mind of the user at the time the drug is taken. The hallucinogens we will discuss are LSD, Ecstasy, and marijuana.

LSD: Mind Altering, Not Mind Expanding

LSD, sometimes referred to simply as “acid,” is the acronym for lysergic acid diethylamide. The average LSD “trip” lasts 10 to 12 hours and usually produces extreme perceptual changes—visual hallucinations

and distortions. Emotions can become very intense and unstable, ranging from euphoria to anxiety, panic, and depression (Miller & Gold, 1994). LSD sometimes causes bad trips, which can leave the user in a state of terror. Some bad LSD trips have ended in accidents, death, or suicide. Sometimes a person who has taken LSD experiences a **flashback**—a brief, sudden recurrence of a trip. Flashbacks can occur as many as five years after LSD use (APA, 1994). Marijuana and some other drugs may trigger LSD flashbacks (Gold, 1994).

The Newest Trend in Designer Drug: Ecstasy (MDMA)

Ecstasy is a designed drug—a laboratory creation—that is a cross between a hallucinogen and an amphetamine. As many young people already know, it is a popular drug of abuse with teenagers, especially those who attend raves (Schwartz & Miller, 1997). The drug’s main appeal is its psychological effect—a feeling of relatedness and connectedness with others (Taylor, 1996). But animal experiments with MDMA have revealed some disturbing findings—irreversible destruction of serotonin-releasing neurons (Green & Goodwin, 1996). MDMA is also more toxic than most other hallucinogens and should be considered a dangerous drug.

Marijuana: More Harmful Than We Once Believed

In Canada, marijuana is probably the most widely used illicit drug. **Marijuana** tends to produce a feeling of well-being, promotes relaxation, and lowers inhibitions and anxiety. The user may experience an increased sensitivity to sights, sounds, and touch, as well as perceptual distortions and a “slowing” of time.

THC (tetrahydrocannabinol), the ingredient in marijuana that produces the high, remains in the body for days or even weeks (Julien, 1995). A person who smokes only one marijuana cigarette, or joint, every few weeks is never completely free of THC. Marijuana impairs attention and coordination and slows reaction time; these effects make operating complex machinery such as an automobile dangerous, even after the feeling of intoxication has passed.

Marijuana can interfere with concentration, logical thinking, and the ability to form new memories. It can produce fragmentation in thought as well as confusion in remembering recent occurrences (Fletcher et al., 1996; Herkenham, 1992). Many of the receptor sites for marijuana are in the hippocampus, which explains why memory is affected (Matsuda et al., 1990). Chronic use of marijuana has been associated with loss of motivation, general apathy, and decline in school performance—referred to as the amotivational syndrome (Andreasen & Black, 1991).

Marijuana can cause respiratory damage even faster than cigarette smoking (Tzu-Chin et al., 1988). Marijuana abuse affects the reproductive system in males, causing a 20 percent impotence rate, a 44 percent reduction in testosterone levels (Kolodny et al., 1979), a 30 to 70 percent reduction in sperm count, and an abnormal appearance of sperm cells (Hembree et al., 1979). In women, failure to ovulate, other menstrual irregularities, and lower-birth-weight babies have been associated with heavy marijuana smoking (Hingson et al., 1982; Kolodny et al. 1979).

Marijuana has been prescribed by doctors to treat the eye disease glaucoma (Restak, 1993) and in controlling nausea and stimulating appetite in patients receiving chemotherapy for cancer or AIDS (Fackelmann, 1997). But, as discussed in the *It Happened in Canada* box on the next page, there is a continuing controversy about whether marijuana should be legalized for medical purposes.

Depressants: Slowing Down the Nervous System

What are some of the effects of depressants, and what drugs make up this category?

Depressants (sometimes called **downers**) decrease activity in the central nervous system, slow down body functions,

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Marijuana, the most widely used illicit drug in North America, has been associated with loss of motivation, general apathy, and decline in school performance.

hallucinogens (hal-lu-SIN-o-jenz): A category of drugs, sometimes called psychedelics, that alter perception and mood and can cause hallucinations.

hallucination: An imaginary sensation.

LSD (lysergic acid diethylamide): A powerful hallucinogen with unpredictable effects ranging from perceptual changes and vivid hallucinations to states of panic and terror.

flashback: The brief recurrence of effects a person has experienced

while taking LSD or other hallucinogens, occurring suddenly and without warning at a later time.

Ecstasy (MDMA): A designer drug that is a hallucinogen-amphetamine and can produce permanent damage of the serotonin-releasing neurons.

marijuana: A hallucinogen with effects ranging from relaxation and giddiness to perceptual distortions and hallucinations.

THC tetrahydrocannabinol: The principal psychoactive ingredient in marijuana and hashish.

and reduce sensitivity to outside stimulation. Within this category of drugs are the sedative-hypnotics (alcohol, barbiturates, and minor tranquilizers) and the narcotics, or opiates.

IT HAPPENED IN CANADA

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Medicinal Use of Marijuana

Should marijuana be available to people who need it for medicinal purposes? This is a difficult question that has been at the forefront of many court debates and decisions all across Canada. The debate is complicated by the fact that while marijuana possession and use is illegal in Canada, recent research suggests that it may just be a very effective treatment for a variety of side effects associated with many medical conditions. For instance, marijuana appears to be an effective treatment for AIDS-related syndrome, intro-ocular pressure caused by glaucoma, chemotherapy-related nausea, as well as muscle spasticity arising from spinal cord injuries, epilepsy, and multiple sclerosis. It is also estimated that over 200 000 Canadians might benefit from marijuana's medical effects. And perhaps these findings are changing the way the public thinks about the use of marijuana for both medical and non-medical purposes. According to a recent poll conducted by the *National Post*, 65 percent of Canadians would like to see possession of small amounts of marijuana decriminalized, and 92 percent of them believe that marijuana should be legal for medical purposes.

Recent efforts on the part of Federal Government have tended to be consistent with the change in public opinion. Section 56 of the Controlled Drugs and Substances Act now allows Canadians to obtain exemptions to the nation's marijuana laws. The amendment has already had an effect in the courts. For instance, in August 2000, the Ontario Court of Appeal decided that Terrance Parker could be both a legal marijuana grower and user as long as the substance was required for medical purposes. Similar judgments have been made in courts across the country. But the application of this new amendment to the Drug Act has not been without complications. Police authorities in many localities have been inconsistent in recognizing the new law and have either seized or even arrested some people who have been given permission to possess marijuana as a therapeutic drug. (Based on Handelman, 2000; "Marijuana as medicine," 2000; "Just say yes," 2000.)

Alcohol: The Nation's Number One Drug Problem

Even though **alcohol** is a depressant, the first few drinks seem to relax and enliven at the same time. But the more alcohol is put into the bloodstream, the more the central nervous system is depressed. As drinking increases, the symptoms of drunkenness mount—slurred speech, poor coordination, staggering. Men tend to become more aggressive (Pihl et al., 1997) and more sexually aroused (Roehrich & Kinder, 1991) but less able to perform sexually (Crowe & George, 1989). Too much alcohol can cause a person to lose consciousness, and extremely large amounts can kill. The dangers from overdrinking were made obvious when one student at the University of Guelph died in 1988 after a night of partying. Similar incidents have been reported both in Canada and the United States (Cohen, 1997). Table 4.3 shows the effects of various blood alcohol levels.

Barbiturates: Sedatives That Can Kill in Overdose

Barbiturates depress the central nervous system and, depending on the dose, can act as a sedative or a sleeping pill. People who abuse barbiturates become drowsy and confused. Their thinking and judgment suffer, and their coordination and reflexes are affected (Henningfield & Ator, 1986). Barbiturates can kill if taken in overdose, and a lethal dose can be as little as only three times the prescribed dose. The popular **minor tranquilizers**, the benzodiazepines, came on the scene in the early 1960s and are sold under the brand names Valium, Librium, Dalmane, and, more recently, Xanax (also used as an antidepressant). About 90 million prescriptions for minor tranquilizers are filled each year. Benzodiazepines are prescribed for several medical and psychological disorders and are considered to be generally effective and safe (Cole & Chiarello, 1990). They are rarely used recreationally (Woods et al., 1987). Alcohol and benzodiazepines, when taken together, are a potentially fatal combination.

Narcotics: Drugs from the Opium Poppy

What are the general effects of narcotics, and what are several drugs in this category?

The word *narcotic* comes from a Greek word meaning "stupor." **Narcotics** produce both a pain-relieving and a calming effect. All

TABLE 4.3
Behavioural Effects Associated with Different Blood Alcohol Levels

Blood Alcohol Level (in milligrams of alcohol per millilitre of blood)	Behavioural Effects
0.05	Alertness is lowered, judgment is impaired, inhibitions are lowered, and the user relaxes and feels good.
0.10	Reaction is slowed, motor functions are impaired, and the user is less cautious.
0.15	Reaction time is slowed markedly; the user may stagger, slur speech, and act impulsively.
0.20	Perceptual and motor capabilities are markedly depressed; the user shows obvious intoxication.
0.25	Motor functions and sensory perceptions are severely distorted. The user may see double and fall asleep.
0.30	The user is conscious but in a stupor and not able to comprehend events in the environment.
0.35	The user is completely anesthetized.
0.40–0.80	The user is unconscious. Respiration and heartbeat stop. User dies (blood level of 0.40 causes death for 50% of people; death comes by 0.80 for the rest.)

Source: Adapted from Hawkins et al., 1992; Newcomb, 1997; Newcomb & Felix-Ortiz, 1992.

narcotics originate from opium, a dark, gummy substance derived from the opium poppy. Opium affects mainly the brain and the bowel. It paralyzes the intestinal muscles, which is why it is used medically to treat diarrhea. If you have ever taken paregoric, you have had a little tincture of opium. Because opium suppresses the cough centre, it is used in some cough medicines. Both morphine and codeine, two drugs prescribed for pain, are natural constituents of opium.

A highly addictive narcotic derived from morphine is **heroin**. Heroin addicts describe a sudden “rush,” or euphoria, followed by drowsiness, inactivity, and impaired concentration. Withdrawal symptoms begin about 6 to 24 hours after use, and the addict becomes physically sick (APA, 1994). Nausea, diarrhea, depression, stomach cramps, insomnia, and pain grow worse and worse until they become intolerable—unless the person gets another fix. Heroin use has doubled since the mid-1980s (Leland, 1996).

Review & Reflect 4.1 provides a summary of the effects and withdrawal symptoms of the major psychoactive drugs.

How Drugs Affect the Brain

Eating, drinking, and sexual activity—in fact, all the natural reinforcers—have one thing in common with all addictive drugs. They increase the availability of the neurotransmitter dopamine in a part of the brain’s limbic system known as the *nucleus accumbens*. The stimulation of the nucleus accumbens by dopamine

depressants: Drugs that decrease activity in the central nervous system, slow down bodily functions, and reduce sensitivity to outside stimulation.

downers: A slang term for depressants.

alcohol: A central nervous system depressant.

barbiturates: A class of central nervous system depressants used as sedatives, sleeping pills, and anesthetics; addictive,

and in overdose can cause coma or death.

tranquilizer (minor): A central nervous system depressant that calms the user (examples: Valium, Librium, Dalmane, Xanax).

narcotics: Derived from the opium poppy, a class of depressant drugs that have pain-relieving and calming effects.

heroin: A highly addictive, partly synthetic narcotic derived from morphine.

plays an important role in reinforcement and reward (Di Chiara, 1997).

There is now ample evidence that dopamine is involved in the rewarding and motivational effects produced by a long list of drugs, including alcohol, amphetamines, cocaine (Landry, 1997), marijuana, heroin (Tanda et al., 1997), and nicotine (Pich et al., 1997). Amphetamines, alcohol, and nicotine stimulate the release of dopamine, whereas both cocaine and amphetamines slow the reuptake of dopamine at the synapses, and thus increase and prolong its reinforcing effects (Volkow et al., 1997a; 1997b).

Opiates such as morphine and heroin mimic the effects of the brain's own endorphins, which make us feel good, and have analgesic, or pain-relieving, properties.

Alcohol, barbiturates, and benzodiazepines (which include Valium and Librium) act upon GABA receptors (Harris et al., 1992). GABA is primarily an inhibitory neurotransmitter that slows down the central nervous system. Thus, stimulating the release of GABA by ingesting alcohol or tranquilizers has a calming and sedating effect. If enough GABA is released, it can shut down the brain. This is why the combination of alcohol and tranquilizers is potentially so deadly.

Unfortunately, most addicts experience a virtually irresistible compulsion to use drugs and are apparently unable to consider the likely consequences of their acts—the loss of the love and respect of family and friends, of money, of jobs, of health, and even their lives (Leshner, 1999).

REVIEW & REFLECT 4.1

The Effects and Withdrawal Symptoms of Some Psychoactive Drugs

Psychoactive Drug	Effects	Withdrawal Symptoms
Stimulants		
Tobacco (nicotine)	Effects range from alertness to calmness; lowers appetite for carbohydrates; increases pulse rate and other metabolic processes.	Irritability, anxiety, increased appetite.
Caffeine	Produces wakefulness and alertness; increases metabolism but slows reaction time.	Headache, depression.
Amphetamines	Increase metabolism and alertness; elevate mood, cause wakefulness, suppress appetite.	Fatigue, increased appetite, depression, long periods of sleep, irritability.
Cocaine	Brings on euphoric mood, energy boost, feeling of excitement; suppresses appetite.	Depression, fatigue, increased appetite, long periods of sleep, irritability.
Hallucinogens		
Marijuana	Generally produces euphoria, relaxation; affects ability to store new memories.	Anxiety, difficulty sleeping, decreased appetite, hyperactivity.
LSD	Produces excited exhilaration, hallucinations, experiences perceived as insightful and profound.	
Depressants		
Alcohol	First few drinks stimulate and enliven while lowering anxiety and inhibitions; higher doses have a sedative effect, slowing reaction time, impairing motor control and perceptual ability.	Tremors, nausea, sweating, depression, weakness, irritability, and in some cases hallucinations.
Tranquilizers (e.g., Valium, Xanax)	Lower anxiety, have calming and sedative effect, decrease muscular tension.	Restlessness, anxiety, irritability, muscle tension, difficulty sleeping.
Barbiturates (e.g., phenobarbital)	Promote sleep, have calming and sedative effect, decrease muscular tension, impair coordination and reflexes.	Sleeplessness, anxiety; sudden withdrawal can cause seizures, cardiovascular collapse, and death.
Narcotics		
Opium, morphine, heroin	Produces euphoria, relaxes muscles, suppresses pain, causes constipation.	Anxiety, restlessness, diarrhea, nausea, muscle spasms, chills and sweating, runny nose.

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Battling Insomnia

Apply It!

As we saw in this chapter, insomnia is a sleep disorder whereby a person has trouble falling or staying asleep or whereby sleep is light, restless, or of poor quality.

What causes insomnia?

Sleep researchers believe that most causes are psychological in origin. Some of the major causes include the following (Bootzin & Perlis, 1992; Costa E Silva et al., 1996; Mendelson, 1995; Morin & Ware, 1996):

- Psychological disorders, such as depression, anxiety disorders, or alcohol or other drug abuse.
- Medical problems such as chronic pain, breathing problems, or gastrointestinal disorders.
- Circadian rhythm disturbances caused by shift work, jet lag, or a chronic mismatch between a person's body time and clock time.

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- Use of various drugs, such as caffeine, prescription drugs, nicotine, alcohol, tranquilizers, sleeping pills, and so on.
- Poor sleep environment with conditions that may be too noisy, hot, cold, or bright.
- Poor sleep habits, such as spending too much non-sleep time in bed, taking unnecessary naps, or having irregular sleep times; or association of bedtime with the frustration of not being able to get to sleep.

Sleeping Pills: Do They Help?

A person whose sleep is disturbed by insomnia may resort to a variety of sleep “aids,” including tranquilizers, over-the-counter sleep products, and the most widely used drug of all—alcohol. A few drinks at bedtime may get you to sleep faster, but there is a price to be paid: lighter sleep, more awakenings, and less sleep overall (Johnson et al., 1998). Over-the-counter sleep aids are useless in serious cases of insomnia because instead of actually inducing sleep, they simply cause grogginess (Morin & Wooten, 1996). These products can be dangerous if taken in higher-than-recommended doses (Meltzer, 1990). Research also indicates, however, that some medications prescribed by physicians can reduce the effects of temporary insomnia. These drugs are called benzodiazepines (Dement, 1992; Vogel, 1992).

Hints for a Better Night's Sleep

So what can you do to battle insomnia and improve the quality of your sleep? Here are some good, research-based suggestions (Murtagh & Greenwood, 1995).

- Use your bed only for sleep. Don't read, study, write letters, watch television, eat, or talk on the phone on your bed.
- Leave the bedroom whenever you cannot fall asleep after 10 minutes. Go to another room and read, watch television, or listen to music. Don't return to bed for another try until you feel more tired. Repeat the process as many times as necessary until you fall asleep within 10 minutes.
- Establish a consistent, relaxing ritual to follow each night just before bedtime. For example, take a warm bath, eat a small snack, brush your teeth, pick out your clothes for the next day, and so on.
- Set your alarm and wake up at the same time every day, including weekends, regardless of how much you have slept. No naps are allowed during the day.
- Exercise regularly—but not within several hours of bedtime. (Exercise raises body temperature and makes it more difficult to fall asleep.)
- Establish regular mealtimes. Don't eat heavy or spicy meals close to bedtime. If you must eat then, try milk and a few crackers.
- Beware of caffeine and nicotine—they are sleep disturbers. Avoid caffeine within six hours and smoking within one or two hours of bedtime.
- Avoid wrestling with your problems when you go to bed. Try counting backward from 1000 by twos; or try a progressive relaxation exercise.



Hallucinogens and Depressants

- Which category of drugs alters perception and mood and can cause hallucinations?
 - stimulants
 - depressants
 - hallucinogens
 - narcotics
- Which of the following is *not* associated with long-term use of marijuana?
 - respiratory damage
 - loss of motivation
 - reproductive problems
 - increased risk of heart attack and stroke
- Decreased activity in the central nervous system is the chief effect of
 - stimulants.
 - depressants.
 - hallucinogens.
 - narcotics.
- Which of the following is a narcotic?
 - cocaine
 - heroin
 - LSD
 - Valium
- Narcotics have
 - pain-relieving effects.
 - stimulating effects.
 - energizing effects.
 - perception-altering effects.
- Cocaine and amphetamines increase the effect of the neurotransmitter
 - acetylcholine.
 - GABA.
 - dopamine.
 - serotonin.

Answers: 1. c 2. d 3. b 4. b 5. a 6. c

KEY TERMS

- | | | |
|---|--|------------------------------------|
| alcohol, p. 134 | flashback, p. 132 | psychoactive drug, p. 128 |
| altered state of consciousness, p. 112 | hallucinations, p. 132 | REM dreams, p. 120 |
| amphetamines, p. 131 | hallucinogens, p. 132 | REM rebound, p. 120 |
| barbiturates, p. 134 | heroin, p. 135 | REM sleep, p. 116 |
| circadian rhythm, p. 112 | hypnosis, p. 127 | sleep apnea, p. 125 |
| cocaine, p. 131 | insomnia, p. 125 | sleep cycle, p. 117 |
| consciousness, p. 112 | LSD (lysergic acid diethylamide), p. 132 | sleep terror, p. 123 |
| crack, p. 131 | lucid dream, p. 122 | slow-wave sleep, p. 117 |
| crash, p. 131 | marijuana, p. 133 | somnambulism, p. 123 |
| delta wave, p. 117 | meditation, p. 126 | Stage 4 sleep, p. 117 |
| depressants, p. 134 | microsleep, p. 119 | stimulants, p. 130 |
| downers, p. 134 | narcolepsy, p. 125 | subjective night, p. 114 |
| drug dependence (physical), p. 129 | narcotics, p. 134 | suprachiasmatic nucleus, p. 113 |
| drug dependence (psychological), p. 130 | nightmare, p. 124 | THC (tetrahydrocannabinol), p. 133 |
| drug tolerance, p. 129 | NREM dreams, p. 120 | tranquilizer, p. 134 |
| Ecstasy (MDMA), p. 132 | NREM sleep, p. 115 | uppers, p. 130 |
| | parasomnias, p. 123 | withdrawal symptoms, p. 130 |

THINKING CRITICALLY

Evaluation

The famous sleep researcher Wilse Webb wrote a book called *Sleep, the Gentle Tyrant*. From what you have learned about sleep, explain why this is or is not a fitting title.

Point/Counterpoint

You hear much debate about the pros and cons of legalizing drugs. Present the most convincing argument possible to support each of these positions:

- a. Illicit drugs should be legalized.
- b. Illicit drugs should not be legalized.

Psychology in Your life

You have been asked to make a presentation to Grades 7 and 8 students about the dangers of drugs. What are the most persuasive general arguments you can give to convince them not to get involved with drugs? What are some convincing, specific arguments against using each of these drugs: alcohol, marijuana, cigarettes, and cocaine?

SUMMARY & REVIEW

What Is Consciousness?

What are some different states of consciousness?

Various states of consciousness include ordinary waking consciousness, daydreaming, sleep, and altered states brought about through meditation, hypnosis, or the use of psychoactive drugs.

Circadian Rhythms: Our 24-Hour Highs and Lows

What is a circadian rhythm, and which rhythms are most relevant to the study of sleep?

A circadian rhythm is the regular fluctuation in certain body functions from a high point to a low point within a 24-hour period. Two rhythms that are highly relevant to sleep are the sleep/wakefulness cycle and body temperature.

What is the suprachiasmatic nucleus?

The suprachiasmatic nucleus is the body's biological clock, which regulates circadian rhythms and signals the pineal gland to secrete or suppress secretion of melatonin.

What are some problems experienced by employees who work rotating shifts?

People working rotating shifts experience a disruption in their circadian rhythms that causes sleep difficulties, digestive problems, and lowered alertness, efficiency, productivity, and safety during subjective night.

Sleep: That Mysterious One-Third of Our Lives

How does a sleeper act physically during NREM sleep?

During NREM sleep, heart rate and respiration are slow and regular, blood pressure and brain activity are at a 24-hour low point, and there is little body movement and no rapid eye movements.

How does the body respond physically during REM sleep?

During REM sleep, the large muscles of the body are paralyzed, respiration and heart rates are fast and irregular, brain activity increases, and the sleeper has rapid eye movements and vivid dreams.

What is the progression of NREM stages and REM sleep that a person goes through in a typical night of sleep?

During a typical night, a person sleeps in sleep cycles, each lasting about 90 minutes. The first sleep cycle contains Stages 1, 2, 3, and 4, and REM sleep; the second contains Stages 2, 3, and 4, and REM sleep. In the remaining sleep cycles, the sleeper alternates mainly between Stage 2 and REM sleep, with each sleep cycle having progressively longer REM periods.

How do sleep patterns change over the lifespan?

Infants and young children have the longest sleep time and largest percentage of REM and deep sleep. Children from age six to puberty sleep best. The elderly typically have shorter total sleep time, more awakenings, and a virtual lack of deep sleep.

What factors influence our sleep needs?

Factors that influence our sleep needs are heredity, the amount of stress in our lives, and our emotional state.

What happens when people are deprived of REM sleep? What function does REM sleep appear to serve?

Following REM deprivation, people experience REM rebound, an increase in the percentage of REM sleep. REM sleep appears to aid in learning and memory.

How do REM and NREM dreams differ?

Dreams usually reflect the dreamer's preoccupations in waking life. Dreams tend to have commonplace settings, to be more unpleasant than pleasant, and to be less emotional and bizarre than people remember them.

In general, what have researchers found regarding the content of dreams?

REM dreams have a dream-like, story-like quality and are more vivid, visual, emotional, and bizarre than the more thought-like NREM dreams.

Sleep Disorders

What are the characteristics common to sleepwalking and night terrors?

Sleepwalking and sleep terrors occur during a partial arousal from slow-wave sleep, and the person does not come to full consciousness. Episodes are rarely recalled. These disorders are typically found in children and outgrown by adolescence, and they tend to run in families.

What is a sleep terror?

A sleep terror is a parasomnia in which the sleeper awakens from Stage 4 sleep with a scream, in a dazed, groggy, and panicky state, and with a racing heart.

How do nightmares differ from sleep terrors?

Nightmares are frightening dreams occurring during REM sleep and remembered in vivid detail. Sleep terrors occur during Stage 4 sleep, are rarely remembered, and often involve a single, frightening dream image.

What are the major symptoms of narcolepsy?

The symptoms of narcolepsy include excessive daytime sleepiness and sudden attacks of REM sleep.

What is sleep apnea?

Sleep apnea is a serious sleep disorder in which breathing stops during sleep and the person must awaken briefly to breathe. Its major symptoms are excessive daytime sleepiness and loud snoring.

What is insomnia?

Insomnia is a sleep disorder that involves difficulty falling or staying asleep, or sleep that is light, restless, or of poor quality. It can be transient or chronic, and it affects from 10 to 15 percent of the adult population.

Altering Consciousness through Concentration and Suggestion

For what purposes is meditation used?

Meditation is used by some to promote relaxation and reduce arousal, and by others to expand consciousness or attain a higher level of spirituality.

What is hypnosis, and when is it most useful?

Hypnosis, which has been used most successfully for the control of pain, is a trance-like state of consciousness characterized by focused attention, heightened suggestibility, and diminished response to external stimuli.

Altered States of Consciousness and Psychoactive Drugs

What is the difference between physical and psychological drug dependence?

With physical drug dependence, the user develops a drug tolerance so that larger and larger doses are needed to get the same effect. Withdrawal symptoms appear when the drug is discontinued and disappear when the drug is taken again. Psychological drug dependence involves an intense craving for the drug.

How do stimulants affect the user?

Stimulants speed up activity in the central nervous system, suppress appetite, and make a person feel more awake, alert, and energetic.

What effects do amphetamines have on the user?

Amphetamines increase arousal, relieve fatigue, and suppress the appetite; with continued use they result in exhaustion, depression, and agitation.

How does cocaine affect the user?

Cocaine, a stimulant, causes a feeling of euphoria and is highly addictive. Heavy use can cause heart damage, seizures, and even heart attacks.

What are the main effects of hallucinogens, and what are three psychoactive drugs classified as hallucinogens?

Hallucinogens—LSD, Ecstasy, and marijuana—can alter perception and mood, and cause hallucinations.

What are some harmful effects associated with heavy marijuana use?

There is some evidence that heavy marijuana use can cause memory problems, respiratory damage, loss of motivation, impotence, lowered testosterone levels and sperm count, irregular menstrual cycles, and lower-birth-weight babies.

What are some of the effects of depressants, and what drugs make up this category?

Depressants decrease activity in the central nervous system, slow down body functions, and reduce sensitivity to outside stimulation. Depressants include sedative-hypnotics (alcohol, barbiturates, and minor tranquilizers) and narcotics (opiates).

What are the general effects of narcotics, and what are several drugs in this category?

Narcotics, which include opium, codeine, morphine, and heroin, have both pain-relieving and calming effects.