8

Sleep, Dreams, and Body Rhythms

LESSON PLANNING CALENDAR

Use this Lesson Planning Calendar to determine how much time to allot for each topic.

Schedule	Day One	Day Two	Day Three
Traditional Period (50 minutes)	Consciousness Body Rhythms	Sleep and Sleep Deficit Why We Sleep	Sleep Stages, REM Sleep, and Dreaming Sleep Disorders and Sleep Problems
Block Schedule (90 minutes)	Consciousness Body Rhythms Sleep and Sleep Deficit	Why We Sleep Sleep Stages, REM Sleep, and Dreaming Sleep Disorders and Sleep Problems	

ACTIVITY PLANNER FROM THE TEACHER'S RESOURCE MATERIALS

Use this Activity Planner to bring active learning to your daily lessons.

Topic	Activities
Consciousness	**Getting Started:** Critical Thinking Activity: The Sleep IQ Test (15 min.) **Building Vocabulary:** Flashcards (10 min.)
Body Rhythms	**Digital Connection:** *The Brain* (2nd ed.), Module 13: "Sleep and Circadian Rhythms" (20 min.) **Application Activity:** Larks or Owls? (20 min.) **Application Activity:** Keeping a Sleep Diary (15 min.) **Digital Connection:** *Discovering Psychology:* "The Mind Awake and Asleep" (30 min.) **Digital Connection:** Film: *An Occurrence at Owl Creek Bridge* (28 min.) **Digital Connection:** DVD: *Sleep* (28 min.)
Sleep and Sleep Deficit	**Evaluation Activity:** Sleep Deficit Scale (20 min.) **Enrichment Lesson:** A Case of Extreme Sleep Deprivation: Randy Gardner (15 min.) **Analysis Activity:** School Start Times: An Informal Debate (20 min.) **Digital Connection:** *Scientific American Frontiers* (2nd ed.), Segment 15: "Can You Beat Jet Lag?" (15 min.)
Why We Sleep	**Digital Connection:** *Scientific American Frontiers* (2nd ed.), Segment 13: "Catching Catnaps" (15 min.)
Sleep Stages, REM Sleep, and Dreaming	**Digital Connection:** *The Brain* (2nd ed.), Module 14: "Sleep: Brain Functions" (10 min.) **Digital Connection:** *Scientific American Frontiers* (2nd ed.), Segment 14: "What's in a Dream?" (10 min.) **Digital Connection:** *The Brain* (2nd ed.), Module 15: "REM Sleep and Dreaming" (10 min.) **Digital Connection:** Technology Application Activity: *PsychSim:* "EEG and Sleep Stages" (20 min.) **Graphic Organizer:** Sleep Stages, Waves, and REM (10 min.) **Critical Thinking Activity:** Remembering Night Dreams (20 min.) **Application Activity:** Dream Journal (20 min.) **Digital Connection:** DVD: *Dreams: Theater of the Night* (27 min.) **Digital Connection:** DVD: *Wake Up, America: A Sleep Alert* (24 min.) **Application Activity:** Dreams and Problem Solving (20 min.) **Application Activity:** Remembering Daydreams (20 min.)
Sleep Disorders and Sleep Problems	**Critical Thinking Activity:** Sleep Strategies (15 min.) **Digital Connection:** Technology Application Activity: Visiting SleepNet (15 min.) **Enrichment Lesson:** Sleep Disorders (15 min.) **Portfolio Project:** Sleep Profile

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Consciousness

MODULES

I had been unfairly accused of taking something, although I couldn't really remember what it was. Nobody wanted to hear my side of the story. My friends and family wouldn't listen, and they actually started chasing me in hopes of turning me into the authorities. Presumed guilty instead of innocent, I feared I was going to be arrested, tried, and convicted without any hope of legal assistance. Cornered and frightened, with no place to hide, I thankfully woke up.

The emotions and events of this dream seemed so real that I had a lot of trouble getting back to sleep. There was even a slight moment of pause, after waking, when I had to reassure myself, "That was a dream, right? Yes. Phew!"

Dreaming is merely one of the altered states of consciousness we examine in these three modules. We also look at drug use and addiction, as well as research and beliefs about hypnosis and other states of consciousness.

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MODULE 8

Sleep, Dreams, and Body Rhythms

We spend about one-third of our lives in bed, but how much is known about sleep and dreaming? It turns out we know quite a bit, and some of what we know will likely surprise you.

Consciousness

WHAT'S THE POINT?

8-1 What do psychologists mean by consciousness?

Has this ever happened to you? You're watching a movie with friends or family late at night, and no matter how hard you fight it, you simply cannot keep your eyes open. Or perhaps you've waged a similar struggle while reading a textbook (but certainly not your psychology text). You fight it, but soon you nod off—sleep wins again.

INTRODUCE THE MODULE

Getting Started TRM

You may wish to use **Critical Thinking Activity: The Sleep IQ Test** as a prereading strategy to find out what students already know about sleep. This activity, along with its results, will prime students to note terms and concepts in the text that confirm or dispel their preconceptions about this topic.

Building Vocabulary TRM

Direct students to the list of vocabulary words on page 156 of the textbook. Have them seek out the meanings of key terms and people in the text and create flashcards using **Building Vocabulary: Flashcards.** Students can use the flashcards independently or with partners.

Resource Manager

Activities	TE	Web/Multimedia	TE	Film/Video	TE
Analysis	143	Digital Connection	140, 145, 146, 152, 153	*The Brain* (2nd ed.), Module 13	140
Application	140, 141, 148, 149	Technology Application	145, 152	*Discovering Psychology:* "The Mind Awake and Asleep"	140
Critical Thinking	139, 148, 152, 154			*An Occurrence at Owl Creek Bridge*	140
Enrichment	141, 147, 151			*Sleep*	140
Evaluation	143			*Scientific American Frontiers* (2nd ed.), Segment 15	142
Graphic Organizer	145, 154			*Scientific American Frontiers* (2nd ed.), Segment 13	143
Portfolio Project	154			*Dreams: Theater of the Night*	145
Vocabulary	139, 154			*The Brain* (2nd ed.), Module 14	146
				The Brain (2nd ed.), Module 15	147
				Scientific American Frontiers (2nd ed.), Segment 14	149
				Wake Up, America: A Sleep Alert	150

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TEACH

Beyond the Classroom TRM

Discuss Invite students into a discussion about sleep and their sleeping habits. You might ask questions such as the following:

- How would you characterize your sleeping habits?
- Why do you think today's teenagers don't get enough sleep?
- If you could plan when and how long to sleep, what would you plan and why?
- At what time of the day do you feel most sleepy? Most awake? Do you structure your day around your daily rhythm of sleepiness and energy? Why or why not?

You can supplement your class discussion with ***The Brain*** **(2nd ed.), Module 13: "Sleep and Circadian Rhythms."**

Beyond the Classroom TRM

Apply **Application Activity: Larks or Owls?** is a short assessment that can help students determine their preference for morning or evening activity. Students can use the results of this assessment to plan their daily tasks for optimal performance.

DIGITAL CONNECTION TRM

Have students check out the website of the National Sleep Foundation at www.sleepfoundation.org. The site has a variety of interactive quizzes, including a variation of the critical thinking activity described under **Getting Started.**

At this point, you may want to use the video resources ***Discovering Psychology:* "The Mind Awake and Asleep,"** ***An Occurrence at Owl Creek Bridge,*** and ***Sleep.***

BLEND IMAGES/ALAMY

Bored Senseless or Sleep Deprived?

This student has clearly lost any struggle to stay awake.

You don't stand much of a chance in the tiredness battle; virtually every night, sleep wins. And when you do stay up later than you should, the effects are often obvious. The day a 10-page term paper is due, I can easily spot those students who, having waited until the last minute, spent most of the previous night at a keyboard. Fighting the "nods" (heads bobbing downward), they suddenly jerk upright after a brief trip to never-never land.

To nod off is to temporarily lose waking **consciousness,** or awareness of yourself and your environment. Once in sleep's grasp, consciousness ceases as certain parts of the brain's cortex stop sending messages that would otherwise keep you awake (Massimini et al., 2005). Depriving yourself of sleep alters your body's natural rhythms, making it difficult to maintain normal, waking consciousness. Indeed, your body has several naturally occurring rhythms that affect wakefulness and sleep.

PAUSE NOW OR MOVE ON

Turn to page 154 to review and apply what you've learned.

Body Rhythms

WHAT'S THE POINT?

8-2 What are body rhythms, and how do they affect us?

An e-mail's subject line, "Reliably Predict Your Mood for Free," once caught my eye. Closer investigation showed the predictions were anything but reliable—and certainly not free. This advertisement pitched something called a "biorhythm chart," which was a good example of a **pseudoscientific claim**—an assertion that attempts to appear scientific but is not really based on science. The e-mail guaranteed that after I typed in the time and date of my birth, the chart could accurately predict my good and bad days, my illnesses and accidents, and even the best days for me to gamble. (Gullibility level was not predicted.)

consciousness Awareness of yourself and your environment.

pseudoscientific claim Any assertion that appears scientific but is not based on science.

biological rhythms Periodic physiological fluctuations.

circadian [ser-KAY-dee-un] rhythms Biological rhythms (for example, of temperature and wakefulness) that occur approximately every 24 hours.

Researchers have found that pseudoscientific biorhythm charts are useless (Hines, 1998). Your body does, however, have real **biological rhythms**—periodic physiological fluctuations—that affect body temperature, blood pressure, and the effectiveness of medicines. These biological rhythms fall into three main categories:

1. **Circadian rhythms** are biological rhythms that occur approximately once every 24 hours (*circa* and *dies* in Latin mean "about" and "day," respectively). The sleep-wake cycle is an example of a circadian rhythm.

2. **Ultradian rhythms** are biological rhythms that occur more than once a day. The most studied ultradian rhythm is the way we cycle through various stages of sleep each night. (You'll read more about these sleep stages shortly.)
3. **Infradian rhythms** are biological rhythms that occur once a month or once a season. Examples include a woman's monthly menstrual cycle and a bear's winter hibernation (once a season).

ultradian [ul-TRAY-dee-un] rhythms Biological rhythms that occur more than once each day.

infradian [in-FRAY-dee-un] rhythms Biological rhythms that occur once a month or once a season.

We are aware of some of these biological rhythms as we cycle through them, but most run on autopilot, rarely generating a thought. An understanding of your body's natural rhythms may help you get more out of your day—and night.

PAUSE NOW OR MOVE ON

Turn to page 155 to review and apply what you've learned.

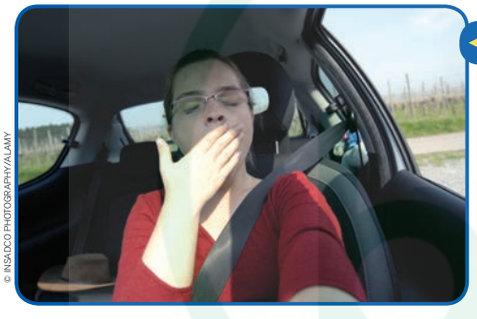
Sleep and Sleep Deficit

WHAT'S THE POINT?

8-3 What happens to your body when you don't get enough sleep?

Live to be 90, and you will have spent roughly 30 years of your life with your eyes closed, mostly oblivious to your surroundings. Ironically, few of us know much about the gentle tyrant that drives us to bed each night (Webb, 1992). While adults in the United States average around 8 hours of sleep, most students get below-average sleep (National Sleep Foundation, 2008; Robinson & Martin, 2007). The research on sleep deprivation shows that not getting enough sleep is bad for you:

- Lack of sleep decreases the levels of hormones necessary for proper immune system functioning. Sleep deprivation also increases levels of the stress hormone cortisol, which has been linked to the damage of brain cells responsible for learning and memory (Leproult et al., 1997).



A More Likely Cause of Accidents

Lack of sleep is a greater cause of accidental death than drunk driving for truck drivers (National Transportation Safety Board, 1995).

TEACHING TIP TRM

The three types of body rhythms discussed here can be easily distinguished by thinking of them in terms of a clock face:

- **Circadian rhythms** correspond with the hour hand on a clock. The hour hand of a clock completes the cycle around the face just once, corresponding to the once-daily circadian cycle.
- **Ultradian rhythms** correspond to the minute hand on a clock. The minute hand moves around the clock face once an hour—more often than the circadian rhythm.
- **Infradian rhythms** correspond to the date found on many wristwatches. The month or year indicates when an infradian rhythm might occur.

At this point, you may want to use **Application Activity: Keeping a Sleep Diary.**

ACTIVE LEARNING

Investigate

Have students estimate the length of time they have slept in their lives to this point. Ask them to interview their parents to find out how many hours of sleep they averaged when they were infants and toddlers. Also have them recall their daily bedtime and waking time during various school years. Then have them monitor the amount of sleep they get for a week or so to determine their average daily amount of sleep.

ACTIVE LEARNING TRM

Sleep Deprivation on the Job

Have students explore laws and policies regarding how long people in certain jobs can work without breaks and sleep. Consider the following jobs, for example. Contact local companies to ask about their policies and how they compare to national requirements.

- Truck drivers
- Air traffic controllers and pilots
- Doctors and nurses
- Factory workers

At this point, you may want to use **Enrichment Lesson: A Case of Extreme Sleep Deprivation: Randy Gardner.**

Active Learning TRM

Apply

The importance of sleep cannot be ignored, especially in today's fast-paced society. Use the following activity to help students evaluate how sleep can positively affect their lives.

1. On the left half of a piece of paper, have students list three ways in which they would like to improve in school or extracurricular activities.
2. After you discuss the importance of getting enough sleep, have students speculate how the three items they listed might improve if they changed or modified some of their sleep habits.
3. Encourage students to write these possible improvements on the right side of the piece of paper and then compare their lists. These comparisons may help students determine ways in which they can correct unhealthy sleep habits.

In addition to this activity, you may want to have students view ***Scientific American Frontiers*** **(2nd ed.), Segment 15: "Can You Beat Jet Lag?"**

Beyond the Classroom

Discuss The text discusses **premenstrual syndrome (PMS)** and some common myths associated with this phenomenon. **Ask:** Why do you think our society continues to believe that a woman's menstrual cycle adversely affects her life (and the lives of people around her), despite evidence to the contrary?

- Adults with less sleep than normal are typically fatter than those who get the sleep they need (Schoenborn & Adams, 2008). In fact, sleep deprivation increases appetite and eating (Nixon et al., 2008).
- Citing the number of road deaths related to truck drivers and others who fall asleep while driving, the National Transportation Safety Board (1995) considers driver fatigue a bigger safety problem than alcohol use. **Figure 8.1,** which dramatically illustrates the effect of 1 hour of lost sleep, supports this position.
- Sleep debt contributes to hypertension, impaired concentration, irritability, suppression of cancer-fighting immune cells, and premature aging (Dement, 1999; Motivala & Irwin, 2007; Spiegel et al., 1999).

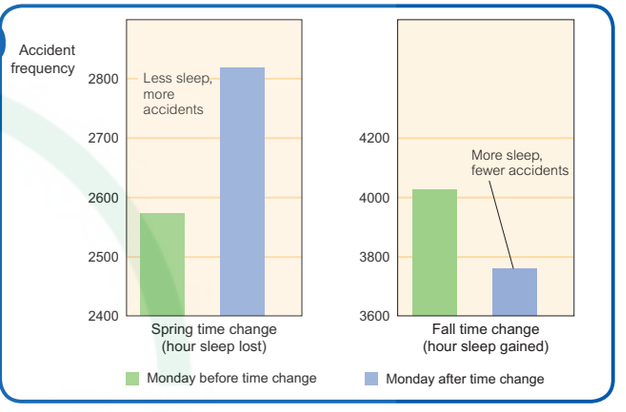
With the evidence mounting against late nights, you'd think that a movement toward turning lights out earlier would gain momentum. Wrong. Teenagers are getting almost 2 hours less sleep now than they did 70 years ago, before the days of all-night drive-throughs, the Internet, and late-night TV channels (Maas, 1998). Four out of five students are "dangerously sleep deprived," according to sleep researcher **William Dement** (1999). Dement states, "The brain keeps an accurate count of sleep debt" (p. 64), which helps explain why many high school students sleep effortlessly until noon on weekends if allowed. He matter-of-factly adds that, given the damage a lack of rest inflicts on your brain, a large sleep debt "makes you stupid." Are you getting the sleep you need? To find out, answer the questions in Psychology in the Real World: Are You Sleep Deprived? Most teens need 9 hours of sleep each night, and 80 percent of all teens in the United States wish they slept more on school nights (Mason, 2005). If you need an alarm to interrupt the sleep your body still wants, you're not getting enough.

PETER MENZEL/PHOTO RESEARCHERS, INC.

WILLIAM DEMENT (1928–) Sleep researcher who coined the term *rapid eye movement (REM).*

Figure 8.1
Spring Forward, Fall Back?

Compare the frequency of accidents on the Mondays before and after we lose an hour to daylight saving time in the spring. In the fall, the opposite trend appears. (From National Transportation Safety Board, 1995.)



PAUSE NOW OR MOVE ON

Turn to page 155 to review and apply what you've learned.

Cross-Curricular Connection

Economics, Health, Civics, and Debate

When to start the school day is a major concern, as studies have shown how little sleep students receive. Some schools now start later in the morning to help improve attendance and academic performance. The following projects can help students explore the effects of start times at your school.

- Team with an economics teacher to help students calculate the financial and economic impacts of different school start and end times on the school and the community. Students can interview parents, community and business leaders, and school administrators.
- Ask a health teacher to help assess the impact of later start times on student health. Have students survey and compare student energy levels during the school week with those on weekends or holidays.
- With your school's civics teacher, help students investigate the legal procedures required to change the start time at your school.
- Invite the school debate teacher to help students conduct a debate about starting school at a later time in order to accommodate the sleep needs of students.

Students' findings may lead them to interesting proposals about their school start times. Encourage these students to write a letter proposing amended start times based on the students' findings. Students can then distribute the letters to the student government, school administration officials, and/or parent-teacher association for review.

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Psychology in THE REAL WORLD

Are You Sleep Deprived?

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

True	False	
_____	_____	1. I often need an alarm clock in order to wake up at the appropriate time.
_____	_____	2. It's often a struggle for me to get out of bed in the morning.
_____	_____	3. Weekday mornings I often hit the snooze bar several times.
_____	_____	4. I often feel tired and stressed out during the week.
_____	_____	5. I often feel moody and irritable; little things upset me.
_____	_____	6. I often have trouble concentrating and remembering.
_____	_____	7. I often feel slow with critical thinking, problem solving, and being creative.
_____	_____	8. I need caffeine to get going in the morning or make it through the afternoon.
_____	_____	9. I often wake up craving junk food, sugars, and carbohydrates.
_____	_____	10. I often fall asleep watching TV.
_____	_____	11. I often fall asleep in boring meetings or lectures or in warm rooms.
_____	_____	12. I often fall asleep after heavy meals.
_____	_____	13. I often fall asleep while relaxing after dinner.
_____	_____	14. I often fall asleep within five minutes of getting into bed.
_____	_____	15. I often feel drowsy while driving.
_____	_____	16. I often sleep extra hours on the weekends.
_____	_____	17. I often need a nap to get through the day.
_____	_____	18. I have dark circles around my eyes.
_____	_____	19. I fall asleep easily when watching a movie.
_____	_____	20. I rely on energy drinks or over-the-counter medications to keep me awake.

If you answered *True* to four or more items, consider yourself seriously sleep deprived. To determine your sleep needs, Maas recommends that you "go to bed 15 minutes earlier than usual every night for the next week—and continue this practice by adding 15 more minutes each week—until you awaken without an alarm clock and feel alert all day." (Maas Robbins Alertness Questionnaire [MRAQ] adapted with permission from Maas & Robbins, 2010.)

Why We Sleep

WHAT'S THE POINT?

8-4 How do we benefit from sleeping?

What causes us to sleep? Over one hundred years ago, Russian physiologist Ivan Pavlov believed sleep resulted from what he called "massive inhibition." Others suggested that neurons disconnected from one another, causing us to "drift off." Although we have come a long way technologically since the days of Pavlov, we still have no complete answer to the question of why we sleep.

Beyond the Classroom TRM

In many Hispanic or Latino cultures, an afternoon rest time, or siesta, has been a traditional standard practice. In recent years, as the world becomes more connected and the economy becomes more global, siestas are becoming a practice of the past.

- Explore how the practice of siesta originated and how it is practiced today.
- Research which nations still honor the practice of siesta and whether debates about the practice are occurring in those countries.
- Discuss whether a siesta is beneficial for a nation's economic strength.

At this point, you may want to use ***Scientific American Frontiers*** **(2nd ed.), Segment 13: "Catching Catnaps."**

Beyond the Classroom

Discuss Have students consider how school administrators might change the school schedule in response to current research on sleep and sleep deficit. **Ask:** Would you take a nap every afternoon if you could? Why or why not?

Beyond the Classroom

Bellringers Use the following prompts as discussion starters:

- Describe any experiences you've had falling asleep in class. Were they embarrassing? Funny?
- Imagine your local school board asks your opinion on when school should begin and end each day. Given that you must attend school for at least 8 hours a day, what would be your ideal start and end times for school? Justify your choices.

Beyond the Classroom TRM

Debate This activity will allow students to examine both sides of the movement to start school at a later time and formulate ideas for how they can maximize the schedule they currently follow. Details on how to organize the debate, along with handouts, can be found in **Analysis Activity: School Start Times: An Informal Debate.**

Beyond the Classroom TRM

Evaluate Have students take the sleep deprivation quiz on page 143. Have them evaluate whether the quiz indicates sleep deprivation. Then have them reflect on why they may be sleep deprived. Challenge them to consider ways in which lack of sleep has adversely affected their lives and what they can realistically do to add more sleep to their daily schedules.

At this point, you may want to use **Evaluation Activity: Sleep Deficit Scale.**

Active Learning

Sleep Survey

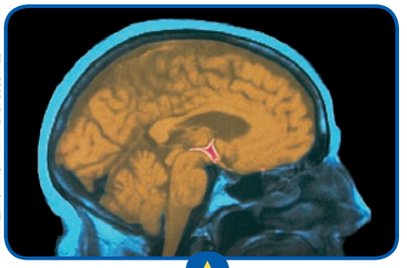
Have students conduct a sleep survey with a representative sample of students at your school. Students should find out

- how much sleep students get each night.
- whether students nap in class or feel extremely tired during the day.
- why students may or may not get enough sleep each night.

Tip: Be sure to get approval from an institutional review board (IRB) and obtain informed consent from subjects before embarking on any research project.

TEACHING TIP

- Point out to students that hormones are chemically identical to neurotransmitters, which were discussed in Module 4. Melatonin works in the nervous system to regulate sleep.
- Remind students that the hypothalamus is responsible for many basic life functions that are regulated by hormones, including eating, fear responses, and sexual behavior. The hypothalamus works directly with the pituitary gland, the body's master gland that regulates hormones in the body.



PIXELATION FROM FRAN HEYL ASSOCIATES

Figure 8.2
Sleep Command Center

The hypothalamus, colored red in this MRI brain scan photograph, sends messages to other parts of the brain saying, "Time to sleep."

But scientists have gathered some partial answers by looking at the brain and nervous system.

The control center for the 24-hour rhythm of sleep appears to be the brain's hypothalamus (see **Figure 8.2**). You have a sort of sensor in your hypothalamus that monitors changes in light and dark. Perceiving key changes in light level, your hypothalamus sends neurological messages to parts of your brain and body, initiating the changes that will cause consciousness to fade and put you to sleep (Massimini et al., 2005). These physiological changes often involve the increase or decrease of hormones (chemical messengers) in your bloodstream.

One such hormone, **melatonin,** helps regulate the sleep-wake cycle (Haimov & Lavie, 1996). Wake up in the morning and turn on the light or open the curtains, and the melatonin levels that built up while you slept will start to drop. Your melatonin levels will continue to drop until the next time you turn out the lights, close your eyes, and go to sleep. Some people with insomnia respond favorably to medically controlled amounts of melatonin supplements.

So, we know something about *how* we go to sleep, but *why* do we need to sleep? Why can't we simply stay up, day after day, doing the things we want to do? Two possible answers to these questions revolve around the concepts of preservation and restoration.

If you've ever walked through your home in the dark without turning on lights and crashed into something, you can understand how sleep might help keep us safe. Such nighttime crashes must have been even more common for our ancestors, who lived in caves and on cliffs. Traveling or hunting at night (well before the invention of the flashlight!) was treacherous, and perhaps those who attempted it did not survive long enough to reproduce and pass along their genes. Sleep provides *protection* from nighttime's dangers, at least for daytime mammals like us. The sleep cycles of other animals have adapted in different ways, depending on such factors as ability to hide and the need for nourishment (Webb, 1992). Bats, for example, sleep 20 hours a day. Cats sleep 14 hours, but elephants drift off for only 3 to 4 hours. The adaptation theory suggests that we sleep at times of the night or day that maximize our safety and survival.

Another prominent theory suggests that sleep is restorative, allowing us to recuperate from the everyday wear and tear we put ourselves through. Though your brain remains active, brain tissue gets repaired and restored while you sleep (Vyazovskiy et al., 2008). We undergo a rebuilding process as tissues are renewed, memories are consolidated, and things learned on the previous day are reorganized.

Getting your sleep also helps you be creative. After struggling with a problem, insightful solutions are more likely found by those who have slept on it than those who stayed awake (Wagner et al., 2004). Sleep helps you "connect the dots" between different pieces of unusual information (Ellenbogen et al., 2007). In essence, sleep helps you be smart.

melatonin Hormone that helps regulate daily biological rhythms.

PAUSE NOW OR MOVE ON

Turn to page 155 to review and apply what you've learned.

FYI

Sleep induced by the hormone **melatonin** seems remarkably normal compared to drug-induced sleep. With melatonin,

- NREM and REM stages occur at the usual hours and last the usual amount of time.
- most users do not seem to feel drowsy or experience side effects.
- the quality of sleep is not affected by the time of day.
- repeated doses at certain times of day or night can alter circadian rhythms.

Data suggest that melatonin may be helpful for people

- who need to sleep during the day, such as night-shift workers or those who fly across time zones.
- who take medications that inhibit normal melatonin synthesis.
- who suffer from conditions that have insomnia as a side effect.

Source: Haimov, I., & Lavie, P. (1996). Melatonin—A soporific hormone. *Current Directions in Psychological Science, 5,* 106–111.

8

Sleep Stages, REM Sleep, and Dreaming

Many people think of sleep and dreaming as virtually identical processes. In fact, your brain, your voluntary muscles, and your eyes are doing very different things while dreaming compared to their actions during the basic stages of sleep.

electroencephalograph (EEG) Machine that amplifies and records waves of electrical activity that sweep across the brain's surface; electrodes placed on the scalp measure these waves.

Stages of Sleep

WHAT'S THE POINT?

8-5 What stages do we go through when we sleep?

The sleep-wake cycle itself is circadian, but we also have a 90-minute *ultradian* rhythm cycling throughout our night's sleep. During the 90-minute ultradian cycle, two types of sleep occur in a series of regular, repeating stages. How do we know this? Because sleep researchers have measured the brain waves, eye movements, and muscle tension of sleeping people. The challenges in gathering sleep data are twofold:

1. The person whom you're studying must be asleep.
2. The person must also agree to have a minimum of five electrodes attached to his or her head (see **Figure 8.3**). The electrodes, which are connected to an **electroencephalograph (EEG),** are collecting brain-wave measurements (not delivering shocks!), so the procedure is painless.

Fortunately, thousands of volunteers have agreed to sleep under observation with electrodes on. Would you volunteer to be a participant in a sleep study? For a few minutes, let's suppose you would. Here's what would happen.

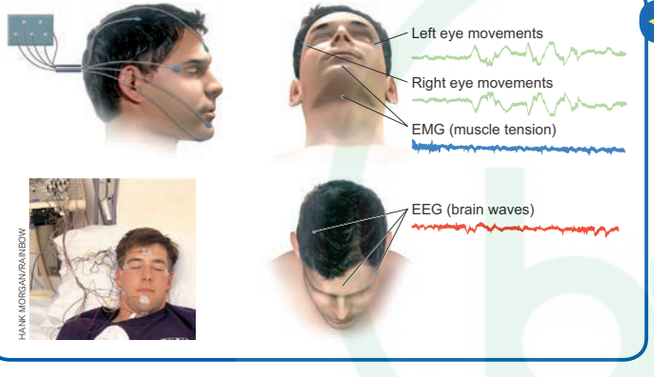


Figure 8.3
Measuring Sleep

Sleep researchers use electrodes to measure brain waves (using an electroencephalograph, or EEG), eye movements, and muscle tension (using an electromyograph, or EMG) while we sleep. They can use the changes in these measurements to label the different stages of sleep and dreaming.

FYI

- According to legend, Leonardo da Vinci slept a mere 90 minutes a day, in catnaps of 15 minutes every 4 hours.
- Salvador Dali liked to doze off sitting up with a spoon in his hand. As he fell asleep, the spoon would fall and clatter to the ground, and he would wake rejuvenated.
- Thomas Edison and Winston Churchill also seemed to thrive on catnaps.
- President Lyndon B. Johnson put on his pajamas in the middle of the day and slept for 30 minutes.
- President Bill Clinton napped in cars, buses, trains, and planes. He joked that Arkansans might come naturally to sleeping anywhere because "most of us don't have to go very far back to find a family without a bed."

DIGITAL CONNECTION TRM

The ***PsychSim:* "EEG and Sleep Stages"** program describes the characteristic wave patterns of sleep stages 1 through 4 and REM sleep. It also includes a simulation of sleep research in which the student awakens a subject at different stages of sleep to check for dreams. To complete the activity, students will need access to the *PsychSim* CD-ROM and workbook and a computer.

ACTIVE LEARNING TRM

Research

Have students research **melatonin** to see what it is and how it is regulated by the government. The students can research in the following ways:

- Check the FDA regulations regarding melatonin.
- Ask local doctors whether they prescribe or recommend melatonin for patients with sleep issues.
- Check local drugstores to see if melatonin supplements are offered over the counter.

At this point, you may want to watch ***Dreams: Theater of the Night.***

Differentiation TRM

Graphic Organizer These options allow learners at all levels to complete the module's graphic organizer.

- **Independent learners** can fill out the organizer on their own or follow along in class during discussion and lecture.
- **Cooperative learners** can use the textbook as a resource and work in groups to find the answers that fit in the blanks.
- **Exceptional learners** can fill in the blanks independently, with a tutor, or during class discussion and lecture.

TEACHING TIP

- The brain waves exhibited when people are awake and active are called **beta waves.** These are high-frequency, low-amplitude waves.
- **Theta waves** characterize the transition from stage 1 to stage 2. Theta waves are slower than beta waves, so they have higher amplitude and lower frequency than **alpha waves,** the type of waves that are present as we move from relaxation to deeper sleep.
- Another type of wave found in sleep stage 2 is the **K-complex.** As you can see in **Figure 8.4: Brain Waves and Sleep Stages,** in stage 2 there is a sharp upturn followed by a rapid downturn of the wave, looking similar to a heartbeat pattern on an EKG. This wave is the precursor to the large **delta waves** that characterize stages 3 and 4 sleep.

DIGITAL CONNECTION TRM

For more insight into brain activity and sleep patterns, have students view ***The Brain*** **(2nd ed.), Module 14: "Sleep: Brain Functions."**

Reteach

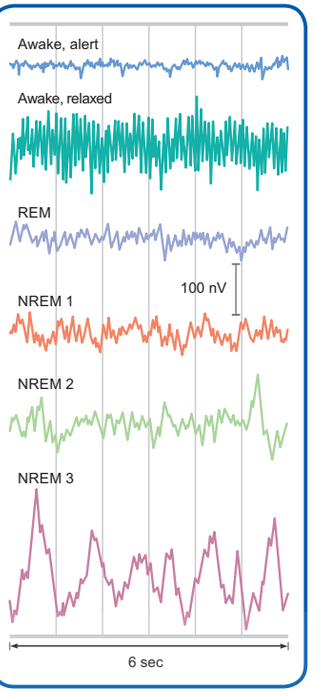
Brain Waves Project **Figure 8.4: Brain Waves and Sleep Stages** for students to view. Have students identify the brain wave pattern characteristic of each sleep stage.

Help them remember the following important concepts:

- Alpha waves characterize wakefulness.
- Sleep spindles are found in stage 2.
- Delta waves characterize stages 3 and 4.
- REM is different from the other stages of sleep.

Figure 8.4
Brain Waves and Sleep Stages

Brain waves slow as we cycle into the deeper stages of sleep.



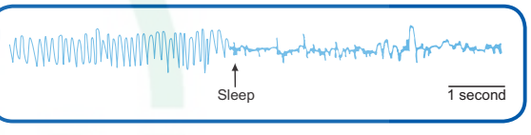
As you try to relax, drifting from wakefulness to sleep, your brain waves cycle more and more slowly. You might yawn, which speeds up heart rate in an attempt to move you toward alertness, but it's a losing battle (Moorcroft, 2003). As you nod off for the benefit of science, you will cycle through three stages of relatively quiet sleep, all referred to as stages of *non–rapid eye movement sleep*, before you go into a more active dreaming state (see **Figure 8.4**). You will not be able to tell the exact moment you enter *NREM 1* (or non–rapid eye movement stage 1), but a sleep researcher, noticing your slowed breathing and irregular brain waves, could accurately point to these first moments of sleep, which rarely last longer than 5 minutes (see **Figure 8.5**). It would be easy to awaken you from this stage, and if the sleep researcher did, you'd probably insist you had not been sleeping.

But let's imagine that the researcher did not awaken you. As you exit NREM 1, your brain waves cycle more slowly and you slide into the deeper sleep of *NREM 2.* The first time you enter NREM 2, your stay lasts 20 minutes. Over the course of the night, you will spend up to half of your entire time asleep in this stage.

About 30 minutes after you fall asleep, your brain waves begin to slow way down as you drop into *NREM 3.* This is a stage called *slow-wave sleep.* Your brain waves slow to less than 1 cycle per second in NREM 3, compared with the 15 or so cycles per second you experienced just after you closed your eyes. The first time you travel through this ultradian cycle, the rejuvenating sleep of NREM 3 will last about 30 minutes.

Figure 8.5
Entering the Land of Nod

You wouldn't be able to say precisely when you fell asleep last night, but a sleep researcher charting your brain waves could pinpoint the time accurately. (From Dement, 1999.)



PAUSE NOW OR MOVE ON

Turn to page 155 to review and apply what you've learned.

GARFIELD

REM Sleep

rapid eye movement (REM) sleep Recurring sleep stage during which vivid dreams commonly occur.

WHAT'S THE POINT?

8-6 Why is REM sleep described as paradoxical?

Up to this point, you've been cycling down through the three stages of *non–rapid eye movement sleep,* or NREM sleep. After you reach NREM 3, your brain waves will begin to pick up a little speed and strength. You will move back up through NREM 2 and 1, and then you will enter your first period of rapid eye movement sleep, or **REM sleep,** a recurring sleep stage during which your eyes move rapidly under your closed lids and you dream vividly. Your initial REM period will not last long, and after it ends, the cycle will start again from NREM 1. This 90-minute ultradian rhythm continues all night, although NREM 3 drops out of the cycle after the second or third time through. The last 4 hours of sleep, assuming you get the 8 to 9 hours you're supposed to, are pretty much spent alternating between NREM 2 and REM (see **Figure 8.6**).

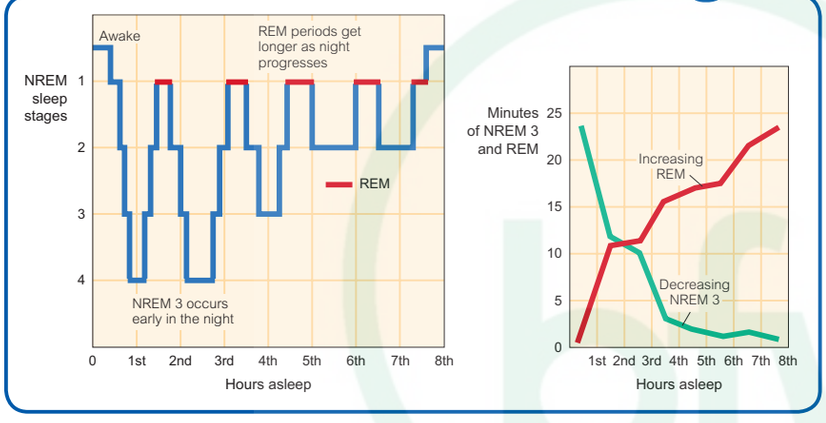


Figure 8.6
A Good Night's Sleep

We cycle through sleep stages all night. The graph on the left shows that as we sleep we cycle down into deeper stages of sleep and back up, where we enter REM sleep. The graph on the right shows how REM sleep increases as the night wears on. (From Cartwright, 1978; Webb, 1992.)

FYI

REM is also known as "emergent stage 1" sleep. As we go through the sleep cycle each night, the body will start with the twilight sleep of stage 1 and move into deeper, slow-wave sleep patterns. When the body cycles back up to stage 1, it experiences brain waves like those of stage 1 again, only this time it is in REM, the most restful sleep. So, while it appears that the body is coming out of sleep every 90 minutes, it is actually cycling into emergent stage 1, or REM, sleep.

Beyond the Classroom

Bellringers Use the following prompts as discussion starters:

- Why are people fascinated by dreams?
- What might be some evolutionary reasons for dreaming?
- Why is REM sleep called "paradoxical" sleep? Why is REM sleep so important to our lives?

TEACHING TIP TRM

What happens when we don't get **REM sleep?** Students may have seen movies or TV shows that depict people going insane if they are deprived of dreaming. Some studies have shown that REM deprivation can lead to confusion, irritability, and lack of concentration. Others have shown that very few ill effects occur when one is deprived of REM. Studies in animals seem to indicate that they will behave as though they are acting out dreams when they are REM deprived. Regardless, when people or animals are deprived of REM, they experience REM rebound, in which they will fall more easily into REM and stay in REM longer than normal.

At this point, you may want to use **Enrichment Lesson: A Case of Extreme Sleep Deprivation: Randy Gardner.**

Differentation TRM

Vocabulary Students who have difficulty with vocabulary may need help understanding why REM is called **paradoxical sleep.** Explain that a paradox is something that seems to contradict itself. It seems illogical for your brain to be so active while it is asleep, but this is true during REM. When we are at our most relaxed physically, we are experiencing one of our most active times mentally.

Students may find it helpful to view ***The Brain* (2nd ed.), Module 15: "REM Sleep and Dreaming."**

During REM sleep, your brain patterns most closely resemble those of NREM 1 sleep. Looks can be deceiving, however, because REM sleep is actually quite different from the other sleep stages. During REM, your eyes dart about under closed eyelids, your pulse quickens, and your breathing becomes faster and irregular. Blood flows into the genitals at a rate faster than it can be removed (which can result in morning erections in males that are unrelated to actual dream content). But despite all this internal activity, the electrode measuring muscle tension in your chin would show a flat line on the EEG because you are, in essence, temporarily paralyzed during REM sleep. Your brainstem blocks messages from your motor cortex, the brain structure that controls your movements.

REM sleep is sometimes called *paradoxical* sleep because of its contrasting nature. During REM, you have active brain waves, you are processing input from your environment (for example, you might incorporate external noises into your dreaming), and you can be awakened more easily than at any other sleep stage. Yet you are still definitely asleep.

What's going on in our brains to produce all that internal activity? We're dreaming. More than 80 percent of people awakened during REM sleep report that the wake-up call interrupted a dream. REM sleep consumes about 25 percent of your nightly sleep, which means that you spend 100 minutes each night dreaming, whether you remember a second of it or not. This holds true for everyone. We *all* dream every night of our lives.

PAUSE NOW OR MOVE ON

Turn to page 156 to review and apply what you've learned.

Why Do We Dream?

WHAT'S THE POINT?

8-7 What are the four modern explanations for why we dream?

There are several theories of why we dream. Sigmund Freud contributed psychology's earliest dream theory. In his book *The Interpretation of Dreams,* published more than a century ago, Freud wrote that dreams were the key to understanding our inner conflicts. He believed that dreams were expressions of wish fulfillment and that analysis could trace most dreams back to erotic wishes (Freud, 1900). Modern theories of dreaming offer at least four more plausible explanations—information processing, physiological function, activation synthesis, and cognitive development:

1. *Information processing*—Dreams serve an important memory-related function by sifting through the day's experiences and tying up loose ends. In other words, think of your brain as a computer that loses its Internet connection when it first goes to sleep but then comes back online during REM sleep to sort through some of the previous day's activities. Research shows that REM sleep facilitates memory storage,

FYI

Stanley Krippner and his colleagues compared the **dreams** of more than 400 Argentinean, Brazilian, and American adults. Among their findings were the following:

- Americans tended to dream about animals and food, whereas Brazilians had more sexual and emotional dreams.
- Americans and Argentineans reported more dreams about architecture than Brazilians.
- Argentineans reported more dreams about aggression and good fortune than Brazilians or Americans.

Americans displayed strong regional differences in dream content:

- Northeasterners had dreams with images of time, activity, streets, and architecture.
- Southerners dreamed of nature, good fortune, emotion, and family members.
- Westerners dreamed about architecture, objects, negative emotions, and indoor settings.

Krippner also found differences between the genders:

- Males were more likely to dream about aggression and tools. Females tended to dream about children.
- American women dreamed about clothes, food, and friendly interactions.
- There were relatively few gender differences in dreams within the Latin American sample. However, other studies have found that in Mexico, women's dreams are significantly more emotional than men's.

Sources: Hall, C. S., & Van de Castle, R. L. (1966). *The content analysis of dreams.* New York, NY: Appleton-Century-Crofts.

Hall, C. S., Domhoff, W., Blick, K. A., & Weisner, K. K. (1982). The dreams of college men and women in 1950 and 1980: A comparison of dream contents and sex differences. *Sleep, 5,* 188–194.

Murray, B. (1995, October). Americans dream about food, Brazilians dream about sex. *APA Monitor,* p. 30.

Stark, E. (1984, October). To sleep, perchance to dream. *Psychology Today,* p. 16.

ACTIVE LEARNING TRM

Dream Theory Survey

Have students conduct a telephone interview of local psychologists and doctors to see what theory of dreaming they believe has more credence. Students can come up with a script to control for confounding variables during their interviews, or they can simply collect the data for class discussion.

Tip: Be sure to get approval from an institutional review board (IRB) and obtain informed consent from subjects before embarking on any research project.

At this point, you may want to use **Critical Thinking Activity: Remembering Night Dreams, Application Activity: Dreams and Problem Solving,** and **Application Activity: Remembering Daydreams.**

and the amount of REM sleep increases following stressful times (McGrath & Cohen, 1978; Palumbo, 1978).

2. *Physiological function*—Neural activity during REM sleep provides periodic stimulation for our brains. Infants, whose brains are developing at a fantastic rate, spend significantly more time than their adult counterparts do in REM sleep (see **Figure 8.7**). The discovery that the pituitary gland secretes a growth hormone *during* NREM 3 supports this theory. Weren't we always told as young children, "If you don't get your sleep, it will stunt your growth"? The growth hormone secreted while we sleep suggests we should have listened to this advice.
3. *Activation synthesis*—Rather than ascribing any physiological or memory-related status to dreams, this activation-synthesis theory suggests that dreams are simply the mind's attempt to make sense out of random neural firing in the various regions of the "sleeping" brain. That is, the brain's attempt to interpret random neural activity during sleep is what creates a dream.
4. *Cognitive development*—Some evidence suggests that dreams are simply a part of the maturation process related to brain development (Domhoff, 2002). That is, the dreams of a third grader are far less dynamic and active and tell less of a story when compared to those of a 20-year-old. Dreams also reflect what we've learned and what we know. If we've never heard of a Native American sweat lodge or the ceremonies that take place inside such a lodge, we're not going to dream about them. Furthermore, some dreams take place outside REM sleep. The dreams outside REM show how parts of the brain that are active during dreaming need not be active for dreams to occur. So, perhaps dreaming is little more than a reflection of normal cognitive development, the same way

MARC CHAGALL "I AND THE VILLAGE" 1911. OIL ON CANVAS, 6' 3⅝" × 5' 9¼" (192.1 × 151.4 CM). THE MUSEUM OF MODERN ART, NEW YORK. MRS. SIMON GUGGENHEIM FUND. PHOTOGRAPH © 1997 THE MUSEUM OF MODERN ART, NEW YORK

The Meaning of Dreams?

Marc Chagall's painting *I and the Village* captures what a dream can look like to the dreamer: colorful, confusing, and possibly filled with meaning.

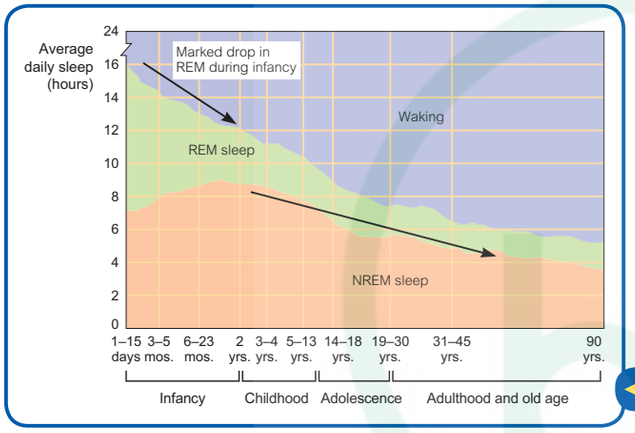


Figure 8.7
Sleep and Age

Sleep patterns change as we grow older. (From Snyder & Snyder, 1972.)

FYI

Dreams do not typically occur in **NREM sleep,** but they can and do occur occasionally. For example, if you have ever nodded off in class and started "dreaming" about something mundane—like walking down the sidewalk or talking with a friend—only to jerk awake when you dream you trip or fall, you experienced an NREM dream. Normally in REM sleep, the body is completely relaxed, so people do not react physically to their dreams. But if we dream during NREM, then our bodies may interpret our dreams as reality and react to them, causing us to jump or startle at our apparent fall.

TEACHING TIP TRM

Students are fascinated by **dream analysis,** a practice that was popularized by Sigmund Freud as being the key to understanding our unconscious thoughts. Dream analysis is still used by some psychoanalysts to help clients determine the causes of their current life problems. Typically, however, these professionals leave most of the interpretation up to the client, forgoing the practice of imposing symbolic interpretation on the patient. Most dream interpretation books on the market today are not based on scientific testing and shouldn't be used as evaluation tools.

Students can learn more about dream interpretation by viewing ***Scientific American Frontiers*** **(2nd ed.), Segment 14: "What's in a Dream?"**

FYI

Freud's theory of dreams is interesting for discussion. Freud believed that there were two levels of meaning in dreams:

- **Manifest content** contains the actual plotline of the dream.
- **Latent content** contains the symbolic, unconscious meaning of the dream.

Cross-Curricular Connection TRM

Art

Have students explore the relationship between **modern art** and **dreaming** in one of two ways:

- Research how modern artists use dream imagery or their own dreams to create their works.
- Create your own modern piece of art (drawing, painting, sculpture, or photo) that reflects your most memorable dreams.

Students may find it helpful to incorporate **Application Activity: Dream Journal** into this activity.

Beyond the Classroom TRM

Guest Speakers Here are two suggestions for having outside professionals enhance the text material on **sleep disorders.**

- Invite a guest speaker from a sleep clinic to talk to the class about the treatment of various sleep disorders.
- Schedule a field trip to a sleep clinic so that students can see firsthand how sleep disorders are studied and treated.

At this point, you may want to watch ***Wake Up, America: A Sleep Alert.***

FYI

Gregg Jacobs and his colleagues report much better success in treating insomnia when a combination of behavioral techniques is used. Subjects who had serious difficulty falling asleep were told to try the following strategies:

- **Sleep restriction** Do not spend more than seven hours in bed. Avoid naps and arise at the same time every morning, including weekends.
- **Stimulus control** Go to bed only when sleepy and use the bed only for sleep or relaxing activities. If you cannot fall asleep within 20 minutes, stop trying and do something relaxing.
- **Relaxation response training** Use soothing visual imagery, rhythmic breathing, and muscle relaxation to calm yourself.

Source: Jacobs, G., Benson, H., & Friedman, R. (1993). Home-based central nervous system assessment of a multifactor behavioral intervention for chronic sleep-onset insomnia. *Behavior Therapy, 24,* 159–174.

Table 8.1

Dream Theories

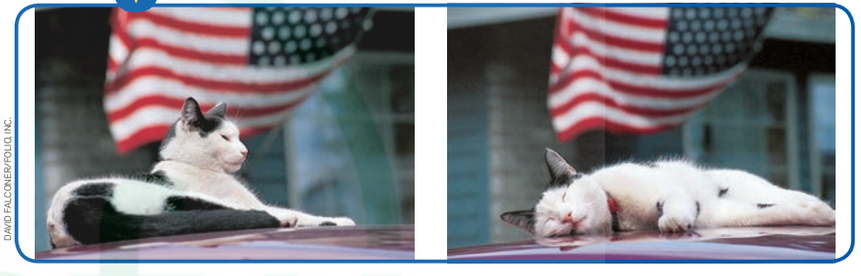
Theory	Explanation	Critical Considerations
Information processing	Dreams help us sort out the day's events.	But why do we sometimes dream about things we have not experienced?
Physiological function	Regular brain stimulation from REM sleep may help develop and preserve neural pathways.	This may be true, but it does not explain why we experience *meaningful* dreams.
Activation synthesis	REM sleep triggers neural activity that evokes random visual memories, which our sleeping brain weaves into stories.	The individual's brain is weaving the stories, which still tells us something about the dreamer.
Cognitive development	Dream content reflects dreamers' cognitive development—their knowledge and understanding.	This theory does not address the neuroscience of dreams.

daydreams become more complex between the ages of 2 and 20. Dream researchers adopting this theory are likely to sharply disagree with both Freudian and activation-synthesis supporters (see Table 8.1).

We are not the only animals who experience REM sleep. We don't know whether other animals are having dreams, but nearly all animals, from sheep to walruses, show measurable REM periods while hooked up to an EEG during sleep. (Just how do they keep electrodes on walruses?) Such evidence suggests a biological *need* for REM sleep. We do know that people don't feel rested unless their sleep has contained REM periods. Also, when finally allowed to sleep after a period of sleep deprivation, we tend to dive straight into REM sleep rather than following the normal cycle. Furthermore, REM does not occur in fish, whose behavior (unlike mammals) is governed more by instinct and less by learning, supporting the information-processing model of why we dream. The truth behind dreams, once discovered, will surely encompass both psychological and biological explanations.

Cat Nap

The cat in NREM sleep (left) is sleeping comfortably. On entering REM sleep, the cat's brain stops sending the signals to the muscles that let the cat hold its head off the floor.



DAVID FALCONER/FOLIO, INC.

PAUSE NOW OR MOVE ON

Turn to page 156 to review and apply what you've learned.

8

Sleep Disorders and Sleep Problems

insomnia Recurring problems in falling asleep or staying asleep.

sleep apnea Sleep disorder characterized by temporary cessations of breathing during sleep and consequent momentary reawakenings.

WHAT'S THE POINT?

8-8 What are sleep disorders, and how do they interfere with our sleep cycles?

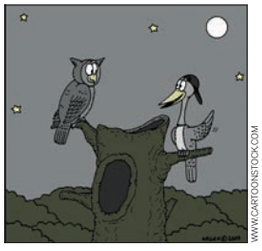
Not everyone follows the normal sleep patterns we've been discussing. Some people experience serious sleep disruptions or problems related to sleep, such as insomnia, sleep apnea, and narcolepsy.

Insomnia

Who among us has never spent a restless night, tossing and turning, unable to get the sleep we so desperately desire? Thoughts of taking an important exam, anticipation of a special trip, or distress brought on by concern for a loved one all carry the potential to block the sleep we'd like to have. Happily, difficulty in getting to sleep is a rare event for most of us. Those less fortunate suffer from **insomnia,** recurring problems in falling asleep or staying asleep. For those with insomnia, getting to sleep or remaining asleep can be a real nightmare.

Oral medications for insomnia may actually worsen the problem. Sleeping pills, with sales increasing over 60 percent since the start of the twenty-first century, can be addictive, and they inhibit or suppress REM sleep, leaving the sleep-hungry person feeling even worse than before (Saul, 2007). Alcohol also suppresses REM sleep: Those who have a drink at bedtime to help get to sleep will find the cure to be worse than the disease.

Stanley Coren's (1996) research sheds some interesting light on insomnia. After collecting EEG data from those who complained about insomnia and those who did not, he asked both groups to estimate how long it took to get to sleep. Insomnia complainers estimated that it took them twice as long to get to sleep as it actually did. Furthermore, they dramatically miscalculated the amount of time they slept, estimating they'd slept half the time they actually had. Perhaps we should keep this research in mind the next time we think we haven't slept much the night before. It's a lot easier to remember, and exaggerate, the times during the night when we were awake than the times we were asleep. (In addition, see Thinking About Positive Psychology: Increasing the Quality of Your Sleep for sleep tips.)



Actually, my species is not nocturnal: I'm just a teenager . . .

Sleep Apnea

Losing one night's sleep may not cause significant damage, but **sleep apnea**—a disorder characterized by repeated awakenings throughout the night as a result of not being able to breathe—can leave you exhausted. A person with sleep apnea is a loud snorer who stops breathing at the peak of a heavy, inhaled snore, and whose breathing may cease for as long as a minute. The only way the person can breathe again is to briefly awaken, which may happen more

ACTIVE LEARNING

Research

Some people have theorized that sleep apnea is related to sudden infant death syndrome (SIDS). This disturbing and controversial problem occurs when infants seem to die without cause in their sleep. Over the years, parents have received conflicting advice about how to prevent this tragedy. Have students explore what researchers know about SIDS and its link to sleep disorders. **Ask:**

- What are some possible causes of SIDS? How might one explanation be related to sleep apnea?
- What is the current advice to parents about avoiding SIDS? How has this advice differed over the years?
- What are some recent research projects into the causes and preventions of SIDS?

Source: Friedlander, A. H., Walker, L. A., Friedlander, I. K., & Felsenfeld, A. L. (2000). Diagnosing and comanaging patients with obstructive sleep apnea syndrome. *Journal of the American Dental Association, 131,* 1178–1184.

FYI

Some studies have shown a link between **type 2 diabetes** and **sleep apnea.** In 2001, Dr. Arthur Friedlander published a study showing that diabetic patients were three times more likely to have sleep apnea. The link is correlational, which may mean that high body weight is the factor linking these two disorders.

ACTIVE LEARNING TRM

Sleep Disorders

Divide students into groups and assign each to research a different **sleep disorder.** Groups should find out the causes, symptoms, and treatments of their assigned disorder. Challenge them to go beyond the information in the text by interviewing someone who has the disorder about its effects on daily life. Groups can present their findings in one of the following ways:

- Create a poster to educate other students about the disorder.
- Write an item for the school or local newspaper.
- Give a PowerPoint presentation on the disorder at a seminar for the school psychology club.

Students can review **Enrichment Lesson: Sleep Disorders** before starting their research.

DIGITAL CONNECTIONS TRM

Students can learn about a wide range of sleep disorders at SleepNet (www.sleepnet.com/disorder.htm). The website includes sections on sleep apnea, restless legs syndrome, and narcolepsy, as well as other disorders.

At this point, you may want to use **Technology Application Activity: Visiting SleepNet.**

Beyond the Classroom

Critical Thinking Have students discuss which of the tips discussed in the Thinking About Positive Psychology box they are guilty of breaking. Ask students whether they feel that students in their school implicitly reinforce bad sleeping habits. Do kids "brag" about staying up all night? Is it decidedly uncool to go to bed early? Do students often compare how late they stayed up the night before? Is sleeping in class a cool thing to do? Students may not realize how a culture of sleeplessness is reinforced by teen social norms that frown on good sleep habits.

At this point, you may want to use **Critical Thinking Activity: Sleep Strategies.**

Thinking About POSITIVE PSYCHOLOGY

Increasing the Quality of Your Sleep

Do you have trouble falling asleep? Do you often wake up during the night? If so, don't sweat it. There are several steps you can take to improve the quality of your sleep while reducing the anxiety you might experience when sleep does not come easily. Consider the following:

- Do not consume caffeinated beverages or foods after 3:00 P.M. Skip that soda with dinner, and turn away from late-night chocolate snacks.
- Exercise daily, but avoid late-night runs.
- Drink milk, which aids in the production of a chemical (serotonin) in your body that promotes sleep.
- Dim the lights at night, and relax before bedtime.
- Accept that as a human being, you experience stress. Conflict during the day might naturally lead to a crummy night's sleep.
- Get up at the same time every morning. Sleeping late on weekends can make it difficult to get to sleep on Sunday night, leaving you extra tired on Monday morning. Naps can have the same effect: You may not be able to fall asleep at your normal bedtime.
- Avoid nighttime activities that rile you up. Angry text messages, action-packed video games, or emotional arguments right before attempting to sleep are not good ideas.
- Try not to worry when you can't get to sleep. Remember that it's normal to take 15 minutes or more to fall asleep at night. Besides, sleeping poorly for one night won't cause any great harm, and often you'll be able to sleep better the following night.

than 400 times a night. Apnea (meaning "with no breath") sufferers (usually overweight males) experience dreadful sleepiness even after a full night's sleep, but they may be unaware they are having such poor-quality sleep.

Some of you are probably thinking, "My dad is heavy and snores like a freight train. Does he have sleep apnea?" I'm not going to advise you to play sleep diagnostician, but if you have a relative or friend who fits this profile, you might want to find out a little more about sleep apnea and perhaps even suggest that the person be checked for this disorder. Roughly 5 percent of Americans (millions of people) suffer from sleep apnea. The most common treatment involves use of a continuous positive airway pressure (CPAP) machine, which helps the person breathe during the night.

M. FISHER/CUSTOM MEDICAL STOCK PHOTO

Sleeping Aid

Those with sleep apnea can turn to this continuous positive airway pressure, or CPAP, machine (and others like it) to help them get the sleep they need.

8

Narcolepsy

Can you imagine what it would be like to suddenly fall asleep because something made you laugh, cry, or feel infuriated? Such is the life of a person with **narcolepsy** (*narco* meaning "numbness," *lepsy* meaning "seizure"), a sleep disorder characterized by uncontrollable sleep attacks. Narcolepsy is a rare disease (striking 1 in 2000 people) that runs in families. Those with narcolepsy experience sleep attacks when their nervous systems become aroused, often from a strong emotion (Dement, 1978). When an attack occurs, they fall immediately into REM sleep, often at the most inopportune or dangerous times. Imagine the horror of being cut off in traffic, becoming angry at the other driver, and then instantly lapsing into sleep.

In recent years, researchers have isolated a narcolepsy-causing gene in dogs and have linked narcolepsy to the absence of the neurotransmitter hypocretin (Taheri, 2004; Taheri et al., 2002). Both of these developments raise hope for the development of a lasting treatment that would, in essence, cure narcolepsy. Until then, physicians will continue to treat narcolepsy with a form of REM-inhibiting stimulant. If you don't have narcolepsy now, chances are you never will; the onset of this disorder accompanies puberty.

narcolepsy Sleep disorder characterized by uncontrollable sleep attacks; the sufferer may lapse directly into REM sleep, often at inopportune times.

somnambulism Sleepwalking, which usually starts in the deeper stages of NREM sleep; the sleepwalker can walk and talk and is able to see but rarely has any memory of the event.

night terrors Sleep-related problem characterized by high arousal and an appearance of being terrified; unlike nightmares, they occur during NREM 3 sleep, occur within two or three hours of falling asleep, and are seldom remembered.

Other Sleep Problems

Other sleep-related problems don't qualify as sleep disorders, but they can be disruptive nonetheless. The first four on this list typically occur during sleep in NREM 3:

- **Somnambulism** is sleepwalking. Is it dangerous to awaken a sleepwalker? *No,* but it is indeed difficult to awaken someone who is walking around with brain waves revving at 1 cycle per second. Is the sleepwalker acting out a dream? Again, *no.* Remember, most dreams occur during REM sleep, and during that type of sleep, we lose our ability to move around.
- **Night terrors** are characterized by high arousal and every indication of being terrified. Night terrors most often afflict children, who look

"Wait! Don't! It can be dangerous to wake them!"

Danger?

Although it may be difficult, awakening this sleepwalker would definitely be the right decision.

DIGITAL CONNECTIONS

Students may have seen any one of the numerous videos available online that show narcolepsy in action (search www.youtube.com). One of the most famous cases involves Rusty, the Narcoleptic Dog. Other videos of the so-called fainting goats and even people with narcolepsy are also widely viewed. Help students appreciate the difficulty people with narcolepsy have with even simple daily activities. Narcoleptics are usually not allowed to drive or operate machinery due to their condition. As soon as a stressful situation occurs, their narcolepsy kicks in, rendering them asleep for a brief period.

FYI

Remind students that REM sleep usually accompanies a period of relaxed muscle tone, making sleepwalking during REM difficult, if not impossible.

ASSESS

Check for Understanding TRM

Critical Thinking Activity: The Sleep IQ Test can help students review concepts about sleep. Ask them not to refer to a version of the Sleep IQ Test they may have completed earlier. In groups, have students discuss the correct response to each item and support their answers with passages from the text.

Graphic Organizer: Sleep Stages, Waves, and REM can help students review module concepts and their relationship to one another and the experience of sleep. Students may either review a previously completed organizer or apply what they have learned in the module by completing a new organizer. You can review students' organizers by using the handout as a transparency and projecting it for the entire class.

If students have not yet prepared question flashcards, as described in **Building Vocabulary: Flashcards,** have them do so now and then use the flashcards individually or with partners to review vocabulary.

CLOSE

Check for Understanding

Discuss **Ask:** How would society need to change for people in this country to place a greater value on getting enough sleep? As you discuss this question, encourage students to use the information they learned from the text to support their arguments, as well as the videos, activities, and lessons in the Teacher's Resource Materials.

Answers Consciousness: Apply What You Know

1. (d)
2. (b)

like they are awake and terrified even though they are sound asleep. The child rarely has any memory of the event when told about it in the morning. Night terrors are different from nightmares, which are dreams (so they occur during REM sleep). Night terrors occur within a few hours of falling asleep, during NREM 3 sleep.

- *Bruxism* is teeth grinding that sounds as though two bricks are being rubbed together. Adults with this problem often wear some kind of tooth guard to keep from wearing away enamel.
- *Enuresis* is bed wetting.
- *Myoclonus* is a sudden jerking of a body part that occurs in NREM 1 or 2. Everyone experiences myoclonus now and then, but acute cases can result in daytime symptoms similar to those accompanying sleep apnea.

Some people appear to get by on as few as 4 hours of sleep per night. However, most of these brief sleepers experience negative effects on their bodies, such as memory loss and premature aging, that we cannot immediately see. So, when you're tired and it's time to sleep, pay attention to your body. Ignore that last text message, resist the urge to keep updating your Facebook profile after it gets late at night, and give in to the gentle tyrant that is your need for sleep.

PAUSE NOW OR MOVE ON
Turn to page 156 to review and apply what you've learned.

SUMMARY AND FORMATIVE ASSESSMENT

MODULE 8

Thinking About Sleep, Dreams, and Body Rhythms

Consciousness

WHAT'S THE POINT?

8-1 What do psychologists mean by consciousness?

- Consciousness is the degree to which we are aware of our environment and ourselves.

Apply What You Know

1. The psychological definition of consciousness involves
   a. any state that does not involve unconsciousness.
   b. ultradian and infradian rhythms.
   c. a waking state in which we are aware of most sensations.
   d. awareness of our inner and outer experiences.
2. When you fall asleep,
   a. you immediately begin to dream.
   b. your brain stops sending messages that keep you awake.
   c. your brain stops sending messages that keep you asleep.
   d. your body enters a paralyzed state.

PORTFOLIO PROJECT TRM

Sleep Profile

Having students document their sleep patterns, analyze their sleep deficits, and develop sleep strategies will help them realize sleep's importance. Have them compile a **Sleep Profile Portfolio** using completed projects from any or all of the following activities in the Teacher's Resource Materials:

- **Keeping a Sleep Diary**
- **Larks or Owls?**
- **Dream Journal**
- **Remembering Daydreams**

A discussion of how to compile and assess the portfolios appears in **Alternative Assessment/Portfolio Project: Sleep Profile.** Adapt the rubric to suit your needs for evaluating the portfolios.

Body Rhythms

WHAT'S THE POINT?

8-2 What are body rhythms, and how do they affect us?

- We go through three types of body rhythms that occur in regular cycles—circadian, ultradian, and infradian—and that affect our consciousness and physiological processes.

Apply What You Know

3. The migration of monarch butterflies from the United States to Mexico that occurs every year is an example of
   a. an ultradian rhythm.
   b. a circadian rhythm.
   c. an infradian rhythm.
   d. a pseudoscientific rhythm.
4. Biological rhythms (for example, of temperature and wakefulness) that occur approximately every 24 hours are called _____ rhythms.

Sleep and Sleep Deficit

WHAT'S THE POINT?

8-3 What happens to your body when you don't get enough sleep?

- Sleep deprivation causes physiological changes that can dramatically affect our moods, health, and ability to perform physically and mentally.

Apply What You Know

5. Lack of sleep interferes with our health and ability to concentrate mainly because
   a. levels of necessary hormones decrease, affecting our immune system and brain operations.
   b. we are conditioned to sleep in infancy.
   c. dreaming is necessary to emotionally process significant events of the day.
   d. a lack of sleep causes us to cycle through various stages of sleep, causing tiredness.
6. True or False: Sleep deprivation can lead to increased appetite and obesity.

Why We Sleep

WHAT'S THE POINT?

8-4 How do we benefit from sleeping?

- Sleep helps restore our bodies physically and protect us from nighttime hazards.

Apply What You Know

7. True or False: "Sleeping on it" might actually help you solve a problem you'd been working on the night before.
8. Psychologists think we sleep for
   a. protective and restorative reasons.
   b. ultradian and infradian reasons.
   c. rapid eye movement (REM) and non–rapid eye movement (NREM) reasons.
   d. conscious and unconscious reasons.

Sleep Stages, REM Sleep, and Dreaming

Stages of Sleep

WHAT'S THE POINT?

8-5 What stages do we go through when we sleep?

- We cycle through three stages of non–rapid eye movement (NREM) sleep every night.
- The stages of sleep describe different levels of brain activity, measured by brain waves.

Apply What You Know

9. A sleep researcher looking at a computer printout of brain waves sees a pattern of long, slow waves (one per second). Which stage is the sleeper in?
   a. NREM 2
   b. REM sleep
   c. NREM 1
   d. NREM 3
10. Which of the following best describes our sleep cycles?
   a. Deep sleep is interrupted by bursts of activity called NREM sleep.
   b. We cycle through three stages of increasing and decreasing levels of brain activity.

Using the Test Bank

The **Test Bank** that accompanies this textbook offers a wide variety of questions in different formats and levels of complexity. Use the software to construct whole tests or to integrate standardized questions into teacher-made tests.

Answers Body Rhythms: Apply What You Know

3. (c)
4. circadian

Answers Sleep and Sleep Deficit: Apply What You Know

5. (a)
6. True

Answers Why We Sleep: Apply What You Know

7. True
8. (a)

Answers Stages of Sleep: Apply What You Know

9. (d)
10. (b)

8

Answers REM Sleep: Apply What You Know

11. False
12. speed up, dream

Answers Why Do We Dream?: Apply What You Know

13. (c)
14. False

Answers Sleep Disorders and Sleep Problems: Apply What You Know

15. (a)
16. insomnia

c. Light sleepers spend all night with high levels of brain activity, and deep sleepers spend all night with low levels.
d. After we fall asleep, our brain slows down to save energy, and it speeds up as we begin to awaken in the morning.

REM Sleep

WHAT'S THE POINT?

8-6 Why is REM sleep described as paradoxical?

- The REM stage of sleep is sometimes called paradoxical because of its contrasting nature. During REM, we have active brain waves, we can process input from our environment, and we can be awakened more easily than at any other sleep stage. Yet we are still definitely asleep.

Apply What You Know

11. True or False: REM brain waves cannot be measured on an electroencephalograph (EEG) like those of the other stages.
12. In REM sleep, your brain waves _____ and you _____ vividly.

Why Do We Dream?

WHAT'S THE POINT?

8-7 What are the four modern explanations for why we dream?

- The four modern explanations of dreams focus on how dreams may be related to information processing, physiological function, activation synthesis, and cognitive development.

Apply What You Know

13. Which of the following dream theories is considered a modern explanation of dreams?
    a. symbolic interpretations of repressed memories
    b. Freudian dream analysis
    c. random neural firing
    d. precognition and clairvoyance
14. True or False: Walruses do not experience REM sleep.

Sleep Disorders and Sleep Problems

WHAT'S THE POINT?

8-8 What are sleep disorders, and how do they interfere with our sleep cycles?

- Sleep disorders interfere with our sleep cycles and can affect us mentally and physically during our waking life.
- Insomnia is the most common sleep disorder, but it is treatable.
- Apnea and narcolepsy (less common) are two serious sleep disorders.

Apply What You Know

15. A friend tells you her father is obese and snores loudly at night. Which of the following sleep disorders might you discuss with your friend?
    a. sleep apnea
    b. enuresis
    c. narcolepsy
    d. bruxism
16. Recurring problems in falling asleep or staying asleep are characteristic of _____.

KEY TERMS AND KEY PEOPLE

consciousness, p. 140
pseudoscientific claim, p. 140
biological rhythms, p. 140
circadian [ser-KAY-dee-un] rhythms, p. 140
ultradian [ul-TRAY-dee-un] rhythms, p. 141
infradian [in-FRAY-dee-un] rhythms, p. 141
melatonin, p. 144
electroencephalograph (EEG), p. 145
rapid eye movement (REM) sleep, p. 147
insomnia, p. 151
sleep apnea, p. 151
narcolepsy, p. 153
somnambulism, p. 153
night terrors, p. 153
William Dement (1928–), p. 142