9

CHAPTER NINE

Emotion and Motivation

AT 6:02 P.M. ON OCTOBER 2, 2002, James Martin was walking across the Shoppers Food Warehouse parking lot in Wheaton, Maryland, with a bag of groceries in his arms. As Martin approached his truck, there was a sudden, loud pop, and a bullet from a Bushmaster XM15 semiautomatic rifle severed his spinal cord and perforated his aorta. He crumpled to the pavement and bled to death.

James Martin was the first, but he would not be the last. The next day, in a period of less than 90 minutes, James Buchanan was shot while mowing the lawn, Premkumar Walekar was shot while pumping gas, Sarah Ramos was shot while sitting at a bus stop, Lori Ann Lewis-Rivera was shot while vacuuming her car, and Pascal Charlot was shot while taking a walk. The serial killer whom the media called the "Beltway Sniper" seemed to select his victims at random and shoot them from afar. The authorities received a note demanding $10 million to stop the killings, and that note provided clues that led to the arrest of two men: 42-year-old John Allen Muhammad and 17-year-old Lee Boyd Malvo.

Why did these men ride around in a car for 22 days, slaughtering innocent people at random? Everyone had a different answer. The authorities discovered that Muhammad and Malvo had made the decision to ask for $10 million only *after* they had killed most of their victims. Prosecutors claimed that Muhammad had come to Maryland to kill his ex-wife and that when he was unable to locate her, he went mad and "began shooting people around her" (Ahlers, 2003). Muhammad's attorney argued that his client was a troubled veteran for whom "something went terribly wrong. He came back from Desert Storm a different man" (Sipe, 2006). A psychologist described Muhammad as a "very, very

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AP PHOTO/SUSAN WALSH, FILE

What motivated John Allen Muhammad (left) and Lee Boyd Malvo (right), to spend 22 days killing people at random?

angry individual," but added, "Of course there are a lot of angry people who don't explode. So there must have been something in his social interaction—in his marriage or his military career—that pulled the trigger" (Leonard, 2002). To further complicate matters, the teenage Malvo claimed that he had not wanted to kill anyone and that he'd participated in the slaughter only to please Muhammad, whom he called "Father."

Not everyone believed that the two men were motivated by greed, by rage, or by filial loyalty. "Muhammad might have seen himself as a foot soldier in the jihad against the United States and he took up arms to terrorize Americans," wrote one commentator (Pipes, 2002). "In a society that celebrates celebrity above all, they were seeking to enter the Hall of Fame in the only category where they stood a chance, as criminals and serial killers," wrote another (Buchanan, 2002). ■

"Why? Why? Why? Why? That's the question I think everyone is asking," said Malvo's brother (Pipes, 2002). And indeed it was. Serial killers fascinate us—not only because of our morbid curiosity, but because we are fascinated by people whose motives we can't fathom and whose emotions we can't comprehend. What could have led Muhammad to select another human being at random and put a bullet through his heart? What could have compelled Malvo to take aim at a pregnant woman simply because his surrogate father told him to? How could these men have pulled the triggers of their rifles; watched helpless people fall to the ground, and then driven away calmly? How could they not have felt sadness, remorse, or disgust?

When we ask why people feel and act as they do, we are asking questions about their emotions and motivations. As you will see, emotions and motivations are intimately connected, and understanding their connection allows us to answer the "Why?" question that everyone is asking.

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For most people, these pictures evoke emotional experiences. Having these experiences is easy, but describing them is difficult.

Emotional Experience: The Feeling Machine

Trying to describe love to someone who had never experienced it would be a bit like trying to describe green to someone who was born blind. You could tell them about its sources ("It's that feeling you get when you see your sweetheart across the room"), and you could describe its physiological correlates ("It makes your pupils dilate"), but in the end, your descriptions would largely miss the point because the essential feature of love—like the essential feature of all emotions—is the *experience*. It *feels* like something to love, and what it feels like is love's defining attribute.

What Is Emotion?

What can we do when we want to study something whose defining attribute resists description? Psychologists have developed a clever technique that capitalizes on the fact that while people can't always say what an emotional experience feels like ("Love is . . . um . . . uh . . ."), they can usually say how similar it is to another ("Love is more like happiness than like anger"). By asking people to rate the similarity of dozens of emotional experiences, psychologists have been able to map those experiences using a sophisticated technique known as *multidimensional scaling*. The mathematics behind this technique is complex, but the logic is simple. If you listed the distances between a dozen U.S. cities and then handed the list to a friend and challenged him to draw a map on which every city was the listed distance from every other, your friend would be forced to draw a map of the United

● **What is the logic behind *multidimensional scaling*?**

States because there is no other map that allows every city to appear at precisely the right distance from every other.

The same logic can be used to generate a map of the emotional landscape. If you listed the similarity of a dozen emotional experiences (assigning smaller "distances" to those that were conceptually "close" to each other and larger "distances" to those that are conceptually "far away" from each other) and then challenged a friend to draw a map on which every experience was the listed "distance" from every other, your friend would draw a map like the one shown in **FIGURE 9.1**, below. This is the unique map that allows every emotional experience to be precisely the right "distance" from every other. What good is this map? As it turns out, maps don't just show how close things are to each other: They also reveal the *dimensions* on which those things vary. For example, the emotion map in **FIGURE 9.1** reveals that emotional experiences differ on two dimensions that are called *valence* (how positive or negative the experience is) and *arousal* (how active or passive the experience is), and every emotional experience can be described by its unique coordinates in this two-dimensional space (Russell, 1980; Watson & Tellegen, 1985).

This map of emotional experience suggests that any definition of emotion must include two things: first, the fact that emotional experiences are always good or bad, and second, the fact that these experiences are associated with characteristic levels of bodily arousal. As such, **emotion** can be defined as *a positive or negative experience that is associated with a particular pattern of physiological activity.* As you are about to see, the first step in understanding emotion involves understanding how experience and physiological activity are related.

emotion A positive or negative experience that is associated with a particular pattern of physiological activity.

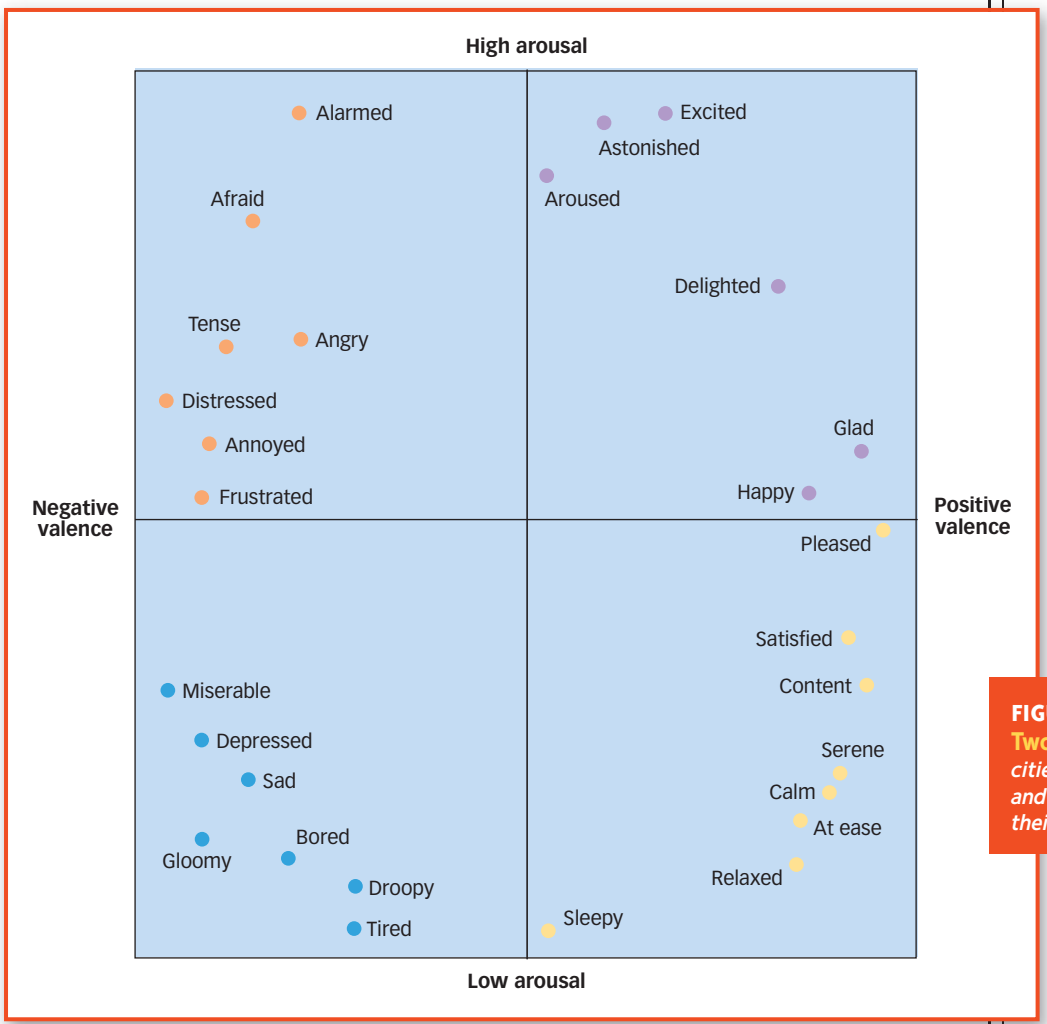


FIGURE 9.1
Two Dimensions of Emotion *Just as cities can be mapped by their longitude and latitude, emotions can be mapped by their arousal and valence.*

"I never realized they had feelings."

The Emotional Body

You probably think that if you walked into your kitchen right now and saw a bear nosing through the cupboards, you would feel fear, your heart would start to pound, and the muscles in your legs would prepare you for running away. But William James and Carl Lange suggested that the events that produce an emotion might actually happen in the opposite order (Lange & James, 1922). The **James-Lange theory** of emotion asserts that *stimuli trigger activity in the autonomic nervous system, which in turn produces an emotional experience in the brain.* In other words, first you see the bear, then your heart starts pounding and your leg muscles contract, and *then* you experience fear, which is simply your experience of your body's activity. James saw emotional experience as the consequence—and not the cause—of our physiological reactions to objects and events in the world.

But James's former student, Walter Cannon, disagreed, and together with *his* student, Philip Bard, Cannon proposed an alternative to James's theory. The **Cannon-Bard theory** of emotion suggested that *a stimulus simultaneously triggers activity in the autonomic nervous system and emotional experience in the brain* (Bard, 1934; Cannon, 1927). Cannon favored his own theory over the James-Lange theory for several reasons. First, the autonomic nervous system reacts too slowly to account for the rapid onset of emotional experience. For example, a blush is an autonomic response to embarrassment that takes 15 to 30 seconds to occur, and yet one can feel embarrassed long before that, so how could the blush be the cause of the feeling? Second, people often have difficulty accurately detecting changes in their own autonomic activity, such as their heart rates. If people cannot detect increases in their heart rates, then how can they experience those increases as an emotion? Third, if nonemotional stimuli—such as temperature—can cause the same pattern of autonomic activity that emotional stimuli do, then why don't people feel afraid when they get a fever? Finally, Cannon argued that there simply weren't enough unique patterns of autonomic activity to account for all the unique emotional experiences people have. If many different emotional experiences are associated with the same pattern of autonomic activity, then how could that pattern of activity be the sole determinant of the emotional experience?

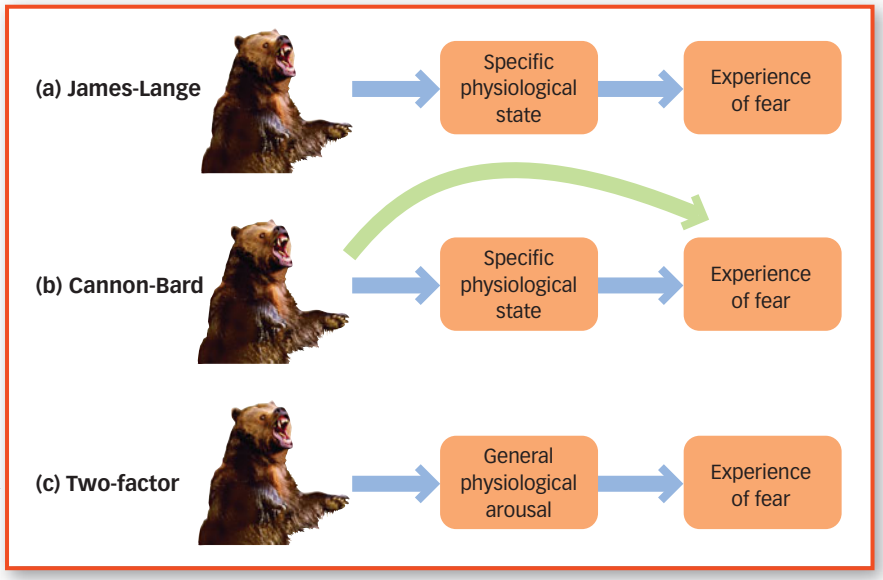
TIM GRAHAM/GETTY IMAGES

England's Prince William blushes with embarrassment as he arrives at his hotel and finds a throng of adoring female fans. Because the experience of embarrassment precedes blushing by up to 30 seconds, it is unlikely that blushing is the cause of the experience.

These are all good questions, and about 30 years after Cannon asked them, psychologists Stanley Schachter and Jerome Singer supplied some answers (Schachter & Singer, 1962). James and Lange were right, they claimed, to equate emotion with the perception of one's bodily reactions. Cannon and Bard were also right, they claimed, to note that there are not nearly enough distinct bodily reactions to account for the wide variety of emotions that human beings can experience. Whereas James and Lange had suggested that different emotions are *different experiences* of *different patterns* of bodily activity, Schachter and Singer claimed that different emotions are merely *different interpretations* of *a single pattern* of bodily activity, which they called "undifferentiated physiological arousal" (see **FIGURE 9.2**).

How did the *two-factor theory* of emotion expand on earlier theories?

Schachter and Singer's **two-factor theory** of emotion claimed that *emotions are inferences about the causes of undifferentiated physiological arousal.* When you see a bear in your kitchen, your heart begins to pound. Your brain quickly scans the environment, looking for a reasonable explanation for all that pounding, and finds a bear. Your brain



JIM ZUCKERMAN/CORBIS

FIGURE 9.2
Classic Theories of Emotion *Classic theories make different claims about the origins of emotion. (a) The James-Lange theory suggests that stimuli trigger specific physiological states, which are then experienced as emotions. (b) The Cannon-Bard theory suggests that stimuli trigger both specific physiological states and emotional experiences independently. (c) The two-factor theory suggests that stimuli trigger general physiological arousal whose cause the brain interprets, and this interpretation leads to emotional experience.*

then does what brains do so well: It puts two and two together, and interprets your arousal as fear. In other words, when people are physiologically aroused in the presence of something that they think should scare them, they label their arousal as *fear*. But if they have precisely the same bodily response in the presence of something that they think should delight them, they may label that arousal as *excitement*. According to Schachter and Singer, people have the same physiological reaction to all emotional stimuli, but they interpret that reaction differently on different occasions.

Schachter and Singer sought to support their theory with an experiment in which they gave participants an injection of epinephrine, a neurotransmitter that mimics the action of the sympathetic nervous system, causing increases in blood pressure, heart rate, blood flow to the brain, blood sugar levels, and respiration. Participants then interacted with another person who (unbeknownst to them) was a confederate of the experimenter. Schachter and Singer predicted that those participants who experienced epinephrine-induced arousal, but who hadn't been informed of the injection's effects, would seek an explanation for their arousal—and that the confederate's behavior would supply it. In fact, that's what happened. When the confederate acted goofy, the participants concluded that they themselves were feeling *happy*; when the confederate acted nasty, they concluded that they themselves were feeling *angry*. These and other studies suggest that people can indeed misattribute their arousal to other stimuli in their environments and that the inferences people draw about the causes of their arousal can influence their emotional experience.

Why is it difficult to identify the origin of an emotional experience?

Research has not been so kind to another part of the two-factor model, however. One of the theory's central claims is that all emotional experiences derive from the same pattern of bodily activity, namely, undifferentiated physiological arousal. Paul Ekman and colleagues (1983) measured participants' physiological reactions during six different emotions and found that anger, fear, and sadness each produced a higher heart rate than disgust; that fear and disgust produced higher galvanic skin response (sweating) than did sadness or anger; and that anger produced a larger increase in finger temperature than did fear (see **FIGURE 9.3**, on page 274).

So it now appears that James and Lange were right when they suggested that patterns of physiological response are not the same for all emotions. But it appears that Cannon and Bard were right when they suggested that people are not perfectly sensitive to these patterns of response, which is why people must sometimes make inferences about what they are feeling. Our bodily activity and our mental activity are both the causes and the

James-Lange theory A theory about the relationship between emotional experience and physiological activity suggesting that stimuli trigger activity in the autonomic nervous system, which in turn produces an emotional experience in the brain.

Cannon-Bard theory A theory about the relationship between emotional experience and physiological activity suggesting that a stimulus simultaneously triggers activity in the autonomic nervous system and emotional experience in the brain.

two-factor theory A theory about the relationship between emotional experience and physiological activity suggesting that emotions are inferences about the causes of undifferentiated physiological arousal.

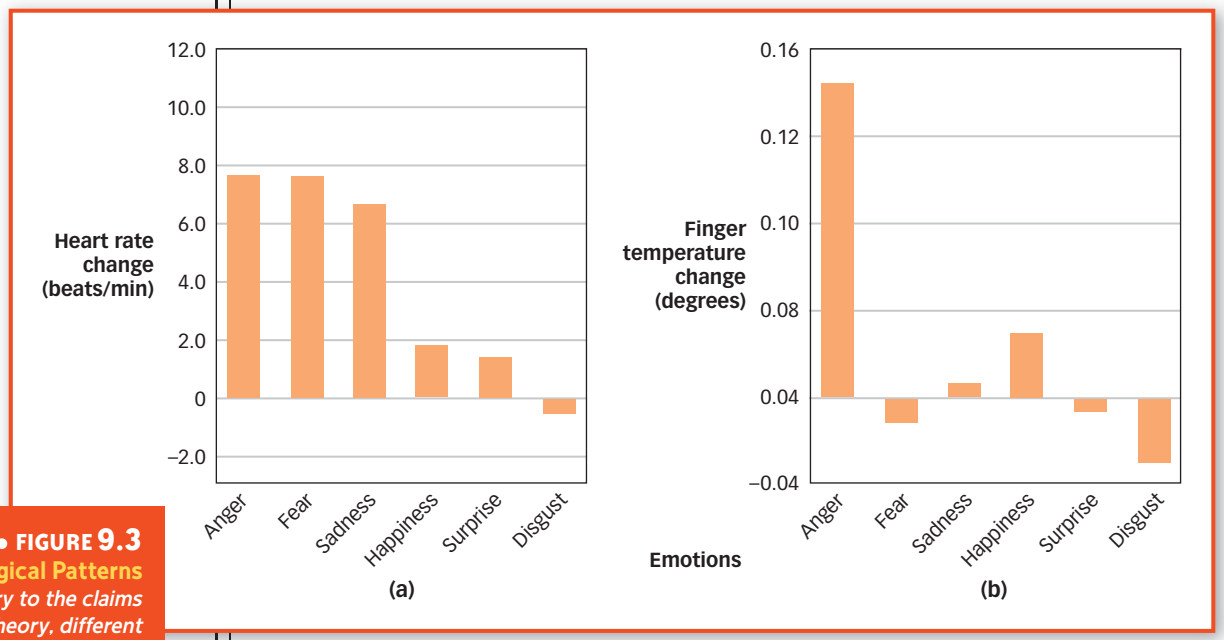
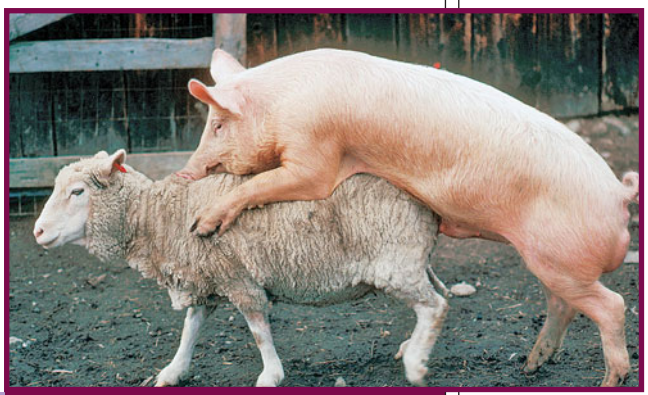


FIGURE 9.3
Different Physiological Patterns of Emotion *Contrary to the claims of the two-factor theory, different emotions do seem to have different underlying patterns of physiological arousal. (a) Anger, fear, and sadness all produce higher heart rates compared to happiness, surprise, and disgust. (b) Anger produces a much larger increase in finger temperature than any other emotion.*

consequences of our emotional experience. The precise nature of their interplay is not yet fully understood, but as you are about to see, much progress has been made over last few decades by following the trail of emotion from the beating heart to the living brain.

The Emotional Brain

Psychologist Heinrich Klüver and the physician Paul Bucy were studying the effects of hallucinogenic drugs in rhesus monkeys when they made an accidental discovery that Klüver would later call "the most striking behavior changes ever produced by a brain operation in animals" (Klüver, 1951, p. 151). After surgically removing a particular monkey's temporal lobe, they noticed that she would eat just about anything and have sex with just about anyone or anything—as though she could no longer distinguish between good and bad food or good and bad mates. But the most striking thing about her was her extraordinary lack of fear. She were eerily calm when being handled by experimenters or being confronted by snakes, both of which rhesus monkeys typically find alarming (Klüver & Bucy, 1937, 1939). This constellation of behaviors became known as "temporal lobe syndrome" or "Klüver-Bucy syndrome."



PETER MILLER/PHOTO RESEARCHERS

Animals with Klüver-Bucy syndrome become hypersexual and will attempt to mate with members of different species and even inanimate objects.

What explained this behavior? As it turned out, Klüver and Bucy's surgery damaged several brain regions including the amygdala, a brain structure that we now know plays a key role in the production of emotion, particularly in **appraisal**, which is *an evaluation of the emotion-relevant aspects of a stimulus* (Arnold, 1960; Lazarus, 1984; Roseman, 1984; Roseman & Smith, 2001; Scherer, 1999, 2001) (**FIGURE 9.4**, page 275). Klüver and Bucy's monkey was calm in the presence of a snake because her amygdala had been damaged, so the sight of a snake was no longer coded as threatening. Research on human beings has reached a similar conclusion. For example, normal people have superior memory for emotionally evocative words such as *death* or *crap*, but people whose amygdalae are damaged (LaBar & Phelps, 1998) or who take drugs that temporarily impair neurotransmission in the amygdala (van Stegeren et al., 1998) do not.

appraisal An evaluation of the emotion-relevant aspects of a stimulus that is performed by the amygdala.

The amygdala's job is to make a very rapid appraisal of a stimulus, and thus it does not require much information (Zajonc, 1980, 1984). When people are shown fearful faces at speeds so fast that they are unaware of having seen them, their amygdalae show

COURTESY ANDY CALDER

FIGURE 9.4
Emotion Recognition and the Amygdala *Facial expressions of emotion were morphed into a continuum that ran from happiness to surprise to fear to sadness to disgust to anger and back to happiness. This sequence was shown to a patient with bilateral amygdala damage and to a group of 10 people without brain damage. Although the patient's recognition of happiness, sadness, and surprise was generally in line with that of the undamaged group, her recognition of anger, disgust, and fear was impaired. (Calder et al., 1996)*

increased activity (Whalen et al., 1998). Psychologist Joseph LeDoux (2000) mapped the route that information about a stimulus takes through the brain and found that it is transmitted simultaneously along two distinct routes: the "fast pathway," which goes from the thalamus directly to the amygdala, and the "slow pathway," which goes from the thalamus to the cortex and *then* to the amygdala (see **FIGURE 9.5**). This means that while the cortex is slowly using the information to conduct a full-scale investigation of the stimulus's identity and importance ("This seems to be an animal . . . probably a mammal . . . perhaps a member of the genus *Ursus* . . ."), the amygdala has already received the information directly from the thalamus and is making one very fast and very simple decision: "Is this potentially bad for me?" If the amygdala's answer to that question is yes, it initiates the neural processes that ultimately produce the bodily reactions and conscious experience that we call fear.

When the cortex finally finishes processing the information, it sends a signal to the amygdala telling it to maintain fear ("We've now analyzed all the data up here, and sure enough, that thing is a bear—and bears bite!") or decrease it ("Relax, it's just some guy in a bear costume"). When people are asked to *experience* emotions such as happiness, sadness, fear, and anger, they show increased activity in the limbic system and decreased activity in the cortex (Damasio et al., 2000); but when people are asked to *inhibit* these emotions, they show increased cortical activity and decreased limbic activity (Ochsner et al., 2002). In a sense, the amygdala presses the emotional gas pedal and the cortex then hits the brakes. That's why adults with cortical damage and children (whose cortices are not well developed) have difficulty inhibiting their emotions (Stuss & Benson, 1986).

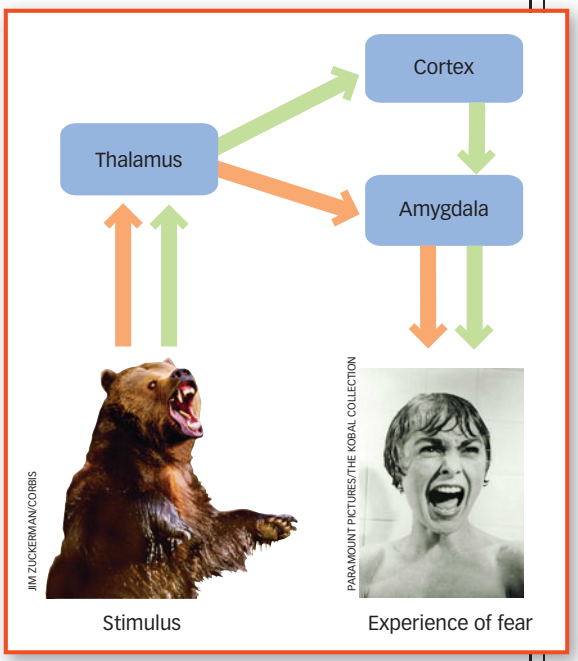


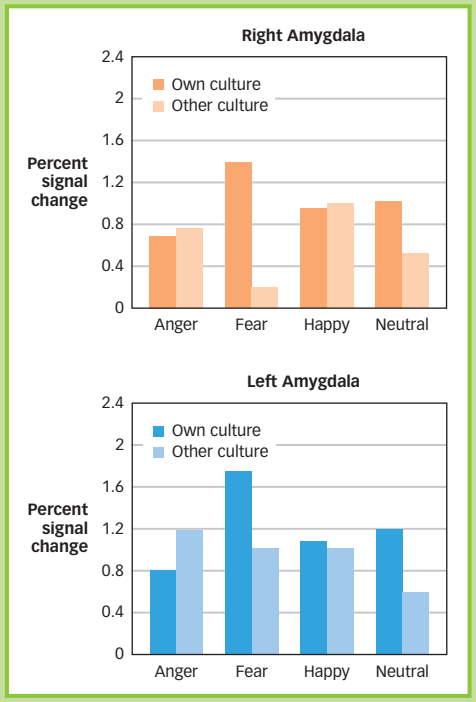
FIGURE 9.5
The Fast and Slow Pathways of Fear *According to Joseph LeDoux, information about a stimulus takes two routes simultaneously: the "fast pathway" (shown in pink), which goes from the thalamus directly to the amygdala, and the "slow pathway" (shown in green), which goes from the thalamus to the cortex and then to the amygdala. Because the amygdala receives information from the thalamus before it receives information from the cortex, people can be afraid of something before they know what it is.*

Culture & Community

Do We Really Fear People from Other Cultures More Than Our Own?

While people are able to recognize the meaning behind facial expressions across cultures, a recent study sheds new light on the relationship between fear response and culture (Chiao et al., 2009).

Using fMRI (a brain imaging technique), psychologists measured the amygdala response of young Americans and young Japanese as they looked at angry, fearful, happy, and neutral faces from both cultures. As the bar graphs here show, amygdala response was greater when participants saw fearful faces of someone from their own culture. Fear perceived in the face of one's own cultural group may more clearly indicate threat and therefore may be more likely to trigger the amygdala response associated with fear.



Studies of the brain confirm what psychologists have long suspected: Emotion is a primitive system that prepares us to react rapidly and on the basis of little information to things that are relevant to our survival and well-being. While our newly acquired cortex identifies a stimulus, considers what it knows about it, and carefully plans a response, our ancient limbic system does what it has done so well for all those millennia before the cortex evolved: It makes a split-second decision about the significance of the objects and events in our environment and, when necessary, prepares our hearts and our legs to get our butts out of the woods.

● Why is emotion considered a primitive system?

The Regulation of Emotion

People are never agnostic about their own emotional experience. We may not care whether we have cereal or eggs for breakfast, whether we play cricket or cards this afternoon, or whether we spend a few minutes thinking about hedgehogs, earwax, or the War of 1812. But we always care whether we are feeling happy or fearful, angry or relaxed, joyful or disgusted. Because we care so much about our emotional experiences, we take an active role in determining which ones we will have. **Emotion regulation** refers to *the cognitive and behavioral strategies people use to influence their own emotional experience*. Although people occasionally feel a bit too chipper for their own good and seek ways to "cheer down" (Erber, Wegner, & Therriault, 1996; Parrott, 1993), emotion

emotion regulation The use of cognitive and behavioral strategies to influence one's emotional experience.

reappraisal A strategy that involves changing one's emotional experience by changing the meaning of the emotion-eliciting stimulus.

regulation is more often an attempt to turn negative emotions into positive ones. A patient who is feeling depressed may whistle a silly song while waiting for his doctor, and a doctor who is feeling silly may think a few depressing thoughts before entering the room to give the patient bad news. Both are regulating their emotional experience.

Nine out of 10 people report that they attempt to regulate their emotional experience at least once a day (Gross, 1998), and they describe more than a thousand different strategies for doing so (Parkinson & Totterdell, 1999). Some of these are behavioral strategies (e.g., avoiding situations that trigger unwanted emotions, doing distracting activities, or taking drugs), and some are cognitive strategies (e.g., trying not to think about the cause of the unwanted emotion or recruiting memories that trigger the desired emotion). Research suggests that one of the most effective strategies for emotion regulation is **reappraisal**, which involves *changing one's emotional experience by changing the meaning of the emotion-eliciting stimulus.* How people think about an event can determine how they feel about it. For example, participants who watched a circumcision that was described as a joyous religious ritual had slower heart rates, had lower skin conductance levels, and reported less distress than did participants who watched the circumcision but did not hear the same description (Lazarus & Alfert, 1964).

JANINE WIEDEL PHOTOLIBRARY/ALAMY

RADIUS IMAGES/ALAMY

Taking heroin and singing in church would seem to have little in common, but both can be forms of emotion regulation.

In another study, participants' brains were scanned as they saw photos that induced negative emotions, such as a photo of a woman crying during a funeral. Some participants were then asked to reappraise the picture, for example, by imagining that the woman in the photo was at a wedding rather than a funeral. The results showed that when participants initially saw the photo, their amygdalae became active. But as they reappraised the picture, several key areas of the cortex became active, and moments later, their amygdalae were deactivated (Ochsner et al., 2002). In other words, participants consciously and willfully turned down the activity of their own amygdalae simply by thinking about the photo in a different way.

How does reappraisal of an event change emotional experience?

Studies such as these demonstrate at the neural level what psychologists have observed for centuries at the behavioral level: Because emotions are reactions to the appraisals of an event and not to the event itself, changes in appraisal bring about changes in emotional experience. As you will learn in Chapter 14, therapists often attempt to alleviate depression and distress by helping people find new ways to think about the events that happen to them. Indeed, reappraisal appears to be important for both mental and physical health (Davidson, Putnam, & Larson, 2000), and the inability to reappraise events lies at the heart of psychiatric disorders, such as depression (Gross & Munoz, 1995).

ONLY HUMAN

WHO ENFORCES THE EMOTION REGULATION? In 1991, the mayor of Sund, Norway, proposed a resolution to the town council that banned crankiness and required people to be happy and think positively. The resolution contained an exemption for those who had a good reason to be unhappy.

summary quiz [9.1]

1. _____ is a positive or negative experience that is associated with a particular pattern of physiological activity.
   a. Motivation b. Emotion c. Valence d. Arousal

2. "Emotions are inferences about the causes of undifferentiated physiological arousal." This is a statement of
   a. the James-Lange theory.
   b. the Cannon-Bard theory.
   c. Schachter and Singer's two-factor theory.
   d. the Klüver-Bucy syndrome.

3. A structure involved in the rapid appraisal of the emotional relevance of stimuli is the
   a. amygdala. b. cortex. c. hypothalamus. d. thalamus.

4. An effective cognitive strategy for regulating one's emotional experiences is
   a. arousal. b. valence. c. appraisal. d. reappraisal.

Emotional Communication: Msgs w/o Wrds

Emotions may be private events, but the "bodily reactions" they produce are not. An **emotional expression** is *an observable sign of an emotional state,* and human beings exhibit many such signs. For example, people's emotional states influence the way they talk—from intonation and inflection to loudness and duration—and research shows that listeners can infer a speaker's emotional state from vocal cues alone with better-than-chance accuracy (Banse & Scherer, 1996; Frick, 1985). The voice is not the only clue to a person's emotional state. In fact, observers can often estimate a person's emotional state from the direction of the person's gaze, gait, posture, and even from a person's touch (Dittrich et al., 1996; Keltner & Shiota, 2003; Wallbott, 1998). In some sense, we are walking, talking advertisements for what's going on inside us.

● How are we "walking, talking advertisements" of our inner states?

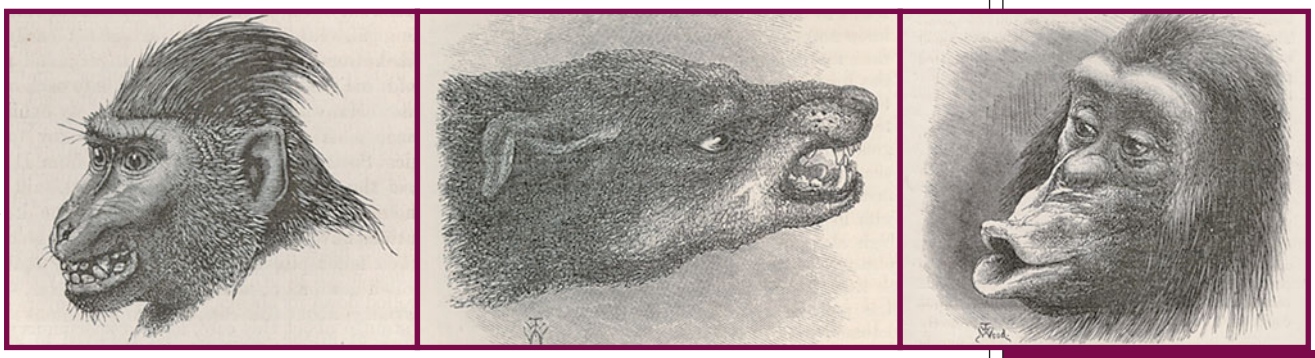
No part of the body is more exquisitely designed for communicating emotion than the face. Underneath every face lie 43 muscles that are capable of creating more than 10,000 unique configurations, which enables a face to convey information about its owner's emotional state with an astonishing degree of subtlety and specificity (Ekman, 1965). Psychologists Paul Ekman and Wallace Friesen (1978) spent years cataloguing the muscle movements of which the human face is capable. They isolated 46 unique movements, which they called *action units,* and they gave each one a number and a memorable name, such as "cheek puffer" and "dimpler" and "nasolabial deepener" (all of which, oddly enough, are also the names of heavy metal bands). Research has shown that combinations of these action units are reliably related to specific emotional states (Davidson et al., 1990). For example, when someone feels happy, the movements of the *zygomatic major* (a muscle that pulls the lip corners up) and the *obicularis oculi* (a muscle that crinkles the outside edges of the eyes) produce a unique facial expression that psychologists describe as "action units 6 and 12" and that the rest of us simply call smiling (Ekman & Friesen, 1982; Frank, Ekman, & Friesen, 1993; Steiner, 1986).

Communicative Expression

Why are our emotions written all over our faces? In 1872, Charles Darwin published a book titled *The Expression of the Emotions in Man and Animals,* in which he speculated about the evolutionary significance of emotional expression (Darwin, 1872/1998). Darwin noticed that people and animals seem to share certain facial and postural expressions, and he suggested that these expressions are a means by which organisms communicate information about their internal states to each other. If a dominant animal can bare its teeth and communicate the message "I am angry at you," and if a subordinate animal can lower its head and communicate the message "I am afraid of you," then the two may be able to establish a pecking order without actually spilling blood. Emotional expressions are a convenient way for one animal to let another animal know how it is feeling and hence how it is prepared to act. In this sense, emotional expressions are a bit like the words or phrases of a nonverbal language.

emotional expression Any observable sign of an emotional state.

universality hypothesis The hypothesis that emotional expressions have the same meaning for everyone.



FROM DARWIN, C. (1872). THE EXPRESSION OF THE EMOTIONS IN MAN AND ANIMALS. LONDON: MURRAY. COURTESY OF UNIVERSITY OF CAMBRIDGE, DARWIN-ONLINE.ORG.UK

Some animals looking soothed, angry, and sulky, according to Charles Darwin.

The Universality of Expression

Of course, a language only works if everybody speaks the same one, and that fact led Darwin to develop the **universality hypothesis**, which suggests that *emotional expressions have the same meaning for everyone.* In other words, every human being expresses happiness with a smile, and every human being understands that a smile signifies happiness. Two lines of evidence suggest that Darwin was largely correct. First, people are quite accurate at judging the emotional expressions of members of other cultures (Boucher & Carlson, 1980; Ekman & Friesen, 1971; Ekman et al., 1987; Elfenbein & Ambady, 2002; Frank & Stennet, 2001; Haidt & Keltner, 1999; Izard, 1971; McAndrew, 1986; Shimoda, Argyle, & Ricci-Bitt, 1978). In the 1950s, researchers showed photographs of people expressing anger, disgust, fear, happiness, sadness, and surprise to members of the South Fore, a people who lived a Stone Age existence in the highlands of Papua New Guinea and who had had little contact with the outside world. The researchers discovered that the Fore could recognize the emotional expressions of Americans about as accurately as Americans could and vice versa. The one striking exception to this rule was that the Fore had trouble distinguishing expressions of surprise from expressions of fear, perhaps because for people who live in the wild, surprises are rarely pleasant.

URIEL SINAI/GETTY IMAGES

An Israeli woman cries at the funeral of a relative who was killed in a suicide attack in 2005. The universality hypothesis suggests that any human being who looks at this picture will know what she is feeling.

The second line of evidence in favor of the universality hypothesis is that people who have never seen a human face make the same facial expressions as those who have.

● **Which facial expressions are considered universal?**

For instance, congenitally blind people make all the facial expressions associated with the basic emotions (Galati, Scherer, & Ricci-Bitt, 1997), and 2-day-old infants (who have had virtually no exposure to human faces) react to sweet tastes with a smile and to bitter tastes with an expression of disgust (Steiner, 1973, 1979). In short, a good deal of evidence suggests that the facial displays of at least six emotions—*anger, disgust, fear, happiness, sadness, and surprise*—are universal. Recent evidence suggests that some other emotions, such as embarrassment, amusement, guilt, or shame, may have a universal pattern of facial expression as well (Keltner, 1995; Keltner & Buswell, 1996; Keltner & Haidt, 1999; Keltner & Harker, 1998).

FRANK MICELOTTA/FOX VIA GETTY IMAGES

Why is Stevie Wonder smiling? Perhaps it's the 22 Grammy Awards he's won since 1974. Research shows that people who are born blind express emotion on their faces in the same ways that sighted people do.

The Cause and Effect of Expression

Why do so many people seem to express so many emotions in the same ways? After all, people in different cultures don't speak the same languages, so why do they smile the same smiles and frown the same frowns? The answer is that words are *symbols* and facial

COURTESY OF SCOTT FAHLMAN

On September 19, 1982, Scott Fahlman posted a message to an Internet user's group that read, "I propose the following character sequence for joke markers: :-) Read it sideways." And so the emoticon was born. Fahlman's smile (above left) is a sign of happiness, whereas his emoticon is a symbol.

expressions are *signs*. Symbols are arbitrary designations that have no causal relationship with the things they symbolize. We English speakers use the word *cat* to indicate a particular animal, but there is nothing about felines that actually causes this particular sound to pop out of our mouths, and we aren't surprised when other human beings make different sounds—such as *popoki* or *gatto*—to indicate the same thing. Facial expressions, in contrast, are not arbitrary symbols of emotion. They are signs of emotion, and signs are *caused* by the things they signify. The feeling of happiness *causes* the contraction of the zygomatic major and thus its contraction is a sign of that feeling in the same way a footprint in the snow is a sign that someone walked there.

Although emotional experiences cause emotional expressions, sometimes the causal path runs in the other direction. The **facial feedback hypothesis** (Adelmann & Zajonc, 1989; Izard, 1971; Tomkins, 1981) suggests that *emotional expressions can cause the emotional experiences they signify.* For instance, people feel happier when they are asked to make the sound of a long *e* or to hold a pencil in their teeth (both of which cause contraction of the zygomatic major) than when they are asked to make the sound of a long *u* or to hold a pencil in their lips (Strack, Martin, & Stepper, 1988; Zajonc, 1989) (see **FIGURE 9.6**). Some researchers believe that this happens because the muscle contractions of a smile change the temperature of the brain, which in turn brings about a pleasant affective state (Zajonc, 1989). Others believe that the smile and the feeling of happiness become so strongly associated through experience that one always brings about the other. Although no one is sure why it happens, smiling does seem to be a cheap cure for the blues.

The fact that emotional expressions can cause the emotional experiences they signify may help explain why people are generally so good at recognizing the emotional expressions of others. Some studies suggest that observers unconsciously mimic the body postures and facial expressions of the people they are watching (Chartrand & Bargh, 1999; Dimberg, 1982). When we see someone lean forward and smile, we lean very slightly and slightly contract our zygomatic major. What purpose does this subtle mimicry serve? If making a facial expression brings about the feeling it signifies, then one can tell what others are feeling simply by imitating their expressions and thereby experiencing their feelings oneself (Lipps, 1907). If this is actually what happens, then we would expect people who have trouble experiencing emotions to have trouble recognizing the emotional expressions of others. In fact, people with amygdala damage are typically quite poor at recognizing facial expressions of fear and anger (Adolphs, Russell, & Tranel, 1999), and this is especially true if their brain damage was sustained early in life (Adolphs et al., 1997). This suggests that our emotional expressions play an important role in both sending and receiving information (see the Real World box on page 281).

THE IMAGE WORKS

FIGURE 9.6
The Facial Feedback Hypothesis
Research shows that people who hold a pen in their teeth feel happier than those who hold a pen in their lips. Holding a pen in the teeth contracts the zygomatic major muscles of the face in the same way a smile does.

Why are people so good at recognizing other's expressions?

Deceptive Expression

Given how important emotional expressions are, it's no wonder that people have learned to use them to their advantage. Because you can control most of the muscles in your face, you don't have to display the emotion you are actually feeling or actually feel the emotion you are displaying. When your roommate makes a sarcastic remark about your haircut, you may make the facial expression for contempt (accompanied, perhaps, by a reinforcing hand gesture), but when your boss makes the same remark, you probably swallow hard and display a pained smile. Your expressions are moderated by your knowledge that it is permissible to show contempt for your peers but not for your superiors. **Display rules** are *norms for the control of emotional expression* (Ekman, 1972; Ekman & Friesen, 1968), and following them requires using several techniques:

facial feedback hypothesis The hypothesis that emotional expressions can cause the emotional experiences they signify.

display rules Norms for the control of emotional expression.

[THE REAL WORLD]

That's Gross!

If you want to feel one of the most powerful, most irrational, and most poorly understood of all emotions, just spit in a glass of water. Then drink it. Despite the fact that the spit is yours and despite the fact that it was in your mouth just a moment ago, you will probably experience disgust.

Psychologist Paul Rozin has spent a lifetime disgusting people in order to understand the nature of this emotion, which is produced by the prospect of incorporating an offensive substance into one's body (Rozin & Fallon, 1987). The disgust reaction is characterized by feelings of nausea, a facial expression marked by distinct actions of the nose and mouth, and an etymology meaning "bad taste" (Rozin, Haidt, & McCauley, 1999). In this sense, disgust is a kind of defensive response that ensures that improper substances do not enter our bodies through our mouths, noses, or other orifices. For Americans, these improper substances include certain animals (e.g., rats and roaches), certain body products (e.g., vomit, feces, or blood), and certain foods (e.g., dog meat). The thought of eating a sumptuous meal of stewed monkey brains or of biting into an apple teeming with maggots makes most Americans feel nauseated, despite the fact that people in many other countries find both dishes quite palatable.

Disgust plays an important role, but it can be quite irrational, and its irrationality seems to follow two rules. The first is the rule of *contagion,* which suggests that any two things that were once in contact will continue to share their properties. So, for example, would you be willing to lick raisins off a flyswatter? Of course not. The flyswatter may have invisible traces of roach legs and fly guts on it, and those things can make you sick. Okay, then, what if the flyswatter were washed in alcohol, heated to within a degree of melting, and cooled to within a degree of breaking, making it the most sterile and hygienic thing in your entire house? Would you lick raisins off it then? Most people still say no (Rozin, Millman, & Nemeroff, 1986b). And the reason is that the swatter once touched a bug and thus it will forever have a disgusting essence of "bugginess" that cannot be cleansed away.

The second irrational rule is the rule of *similarity,* which suggests that things that share appearances also share properties. If someone whipped up a batch of fudge that was shaped to look convincingly like dog poop, chances are you'd turn down the opportunity to sample it. Fudge is fudge, of course, and its shape shouldn't matter, but most people still balk at this proposition (Rozin et al., 1986b)—most people, that is, except children. Children under 2 years of age will readily put any number of disgusting things in their mouths, which suggests that disgust (unlike many emotions) develops late in life (Rozin et al., 1986a). A 4-year-old will avoid eating human hair because it doesn't taste very good, but a 10-year-old child will avoid eating it because . . . well, it's haaaaaaaaair—and that's gross!

If you want to observe the irrationality of disgust for yourself, just offer your friends some guacamole in a disposable diaper or some lemonade in a bedpan. And make sure to stir it with a comb.

COURTESY ALAN SWINKELS

San Francisco's Exploratorium features an exhibit on disgust that invites visitors to drink clean water from a toilet. Casual observation suggests that 5-year-olds are generally willing and 55-year-olds are not.

- *Intensification* involves exaggerating the expression of one's emotion, as when a person pretends to be more surprised by a gift than she really is.
- *Deintensification* involves muting the expression of one's emotion, as when the loser of a contest tries to look less distressed than he really is.
- *Masking* involves expressing one emotion while feeling another, as when a poker player tries to look distressed rather than delighted as she examines a hand with four aces.
- *Neutralizing* involves feeling an emotion but displaying no expression, as when judges try not to betray their leanings while lawyers make their arguments.

Although people in different cultures all use the same techniques, they use them in the service of different display rules. For example, in one study, Japanese and American college students watched an unpleasant film of car accidents and amputations (Ekman, 1972;

DAN DRY/COURTESY U. CHICAGO USB

Can you tell what this woman is feeling? She hopes not. Helen Duann is a champion poker player who knows how to keep a "poker face," which is a neutral expression that provide little information about her emotional state.

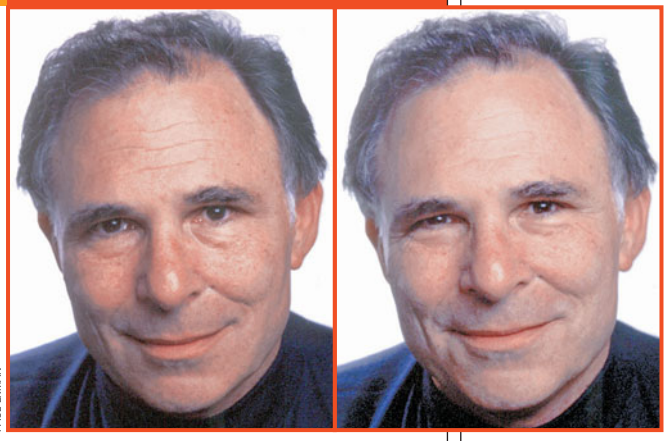
Friesen, 1972). When the students didn't know that the experimenters were observing them, Japanese and American students made similar expressions of disgust, but when they realized that they were being observed, the Japanese students (but not the American students) masked their disgust with pleasant expressions. Many Asian societies have a strong cultural norm against displaying negative emotions in the presence of a respected person, and people in these societies may mask or neutralize their expressions.

Do people attempt to control their emotional expression in the same way across cultures?

Our attempts to obey our culture's display rules don't always work out so well. Darwin (1898/1998) noted that "those muscles of the face which are least obedient to the will, will sometimes alone betray a slight and passing emotion" (p. 79). Despite our best attempts to smile bravely when we receive a poor grade on an exam, our voices, bodies, and faces are "leaky" instruments that may betray our emotional states even when we don't want them to. Four sets of features can allow a careful observer to tell whether our emotional expression is sincere (Ekman, 2003a):

- *Morphology:* Certain facial muscles tend to resist conscious control, and for a trained observer, these so-called *reliable muscles* are quite revealing. For example, the zygomatic major raises the corners of the mouth, and this happens when people smile spontaneously or when they force themselves to smile. But only a genuine, spontaneous smile engages the obicularis oculi, which crinkles the corners of the eyes (see **FIGURE 9.7**).

FIGURE 9.7
Genuine and Fake Smiles *Both spontaneous smiles (left) and voluntary smiles (right) raise the corners of the mouth, but only a spontaneous smile crinkles the corners of the eye.*



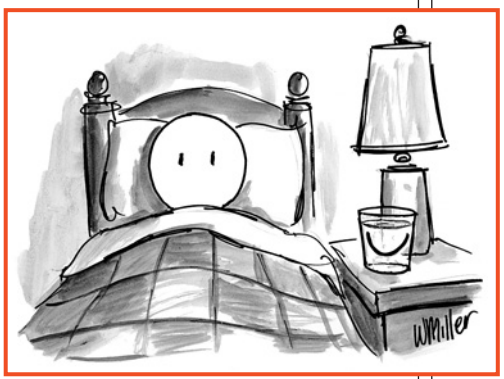
PAUL EKMAN

- *Symmetry:* Sincere expressions are a bit more symmetrical than insincere expressions. A slightly lopsided smile is less likely to be genuine than is a perfectly even one.
- *Duration:* Sincere expressions tend to last between a half second and 5 seconds, and expressions that last for shorter or longer periods are more likely to be insincere.
- *Temporal patterning:* Sincere expressions appear and disappear smoothly over a few seconds, whereas insincere expressions tend to have more abrupt onsets and offsets.

Given the reliable differences between sincere and insincere expressions, you might think that people would be quite good at telling one from the other. In fact, studies show that human lie detection ability is fairly awful. Under most conditions, most people score barely better than chance (DePaulo, Stone, & Lassiter, 1985; Ekman, 1992; Zuckerman, DePaulo, & Rosenthal, 1981; Zuckerman & Driver, 1985).

Why are people such poor lie detectors?

One reason for this is that people have a strong bias toward believing that others are sincere. In everyday life, most people are sincere most of the time, so it makes sense that we are predisposed to believe what we see and hear. This may explain why people tend to mistake liars for truth tellers but not the other way around (Gilbert, 1991). A second reason why people are such poor lie detectors is that they don't seem to know which pieces of information to attend to and which to ignore. People seem to think that certain things—such as whether a person speaks quickly or averts her gaze—are associated with lying when, in fact, they are not.



When people can't do something well (e.g., adding numbers or picking up 10-ton rocks), they typically turn the job over to machines (see **FIGURE 9.8** on page 283). Can machines detect lies better than we can? The answer is yes, but that's not saying much. The most widely used lie detection machine is the *polygraph,* which measures a variety of physiological responses that are associated

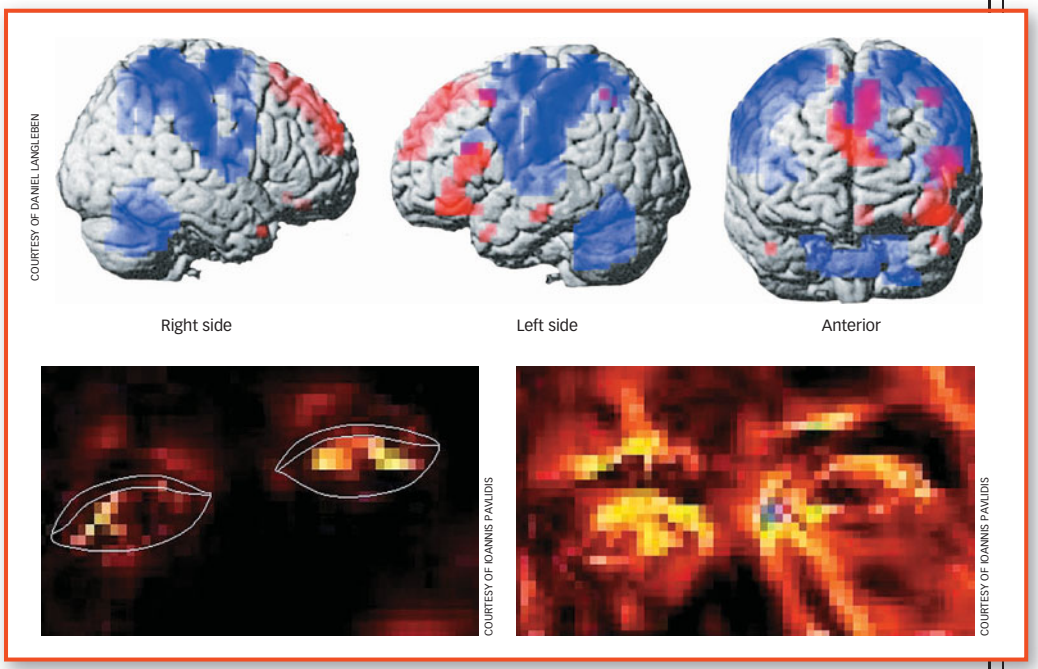


FIGURE 9.8 Lie Detection Machines *Some researchers hope to replace the polygraph with more accurate machines, such as those that measure changes in blood flow in the brain and the face. As the top panel shows, some areas of the brain are more active when people tell lies than when they tell the truth (shown in red), and some are more active when people tell the truth than when they tell lies (shown in blue) (Langleben et al., 2005). The bottom panel shows images taken by a thermal camera that detects the heat caused by blood flow to different parts of the face. The images show a person's face before (left) and after (right) telling a lie (Pavlidus, Eberhardt, & Levine, 2002). Although neither of these new techniques is extremely accurate, that could soon change.*

with stress, which people often feel when they are afraid of being caught in a lie. In fact, the machine is so widely used by governments and businesses that the National Research Council recently met to consider all the scientific evidence on its validity. After much study, it concluded that the polygraph can indeed detect lies at a rate that is significantly better than chance (National Research Council, 2003). However, it also concluded that "almost a century of research in scientific psychology and physiology provides little basis for the expectation that a polygraph test could have extremely high accuracy" (p. 212). In short, neither people nor machines are particularly good at lie detection, which is why lying continues to be a staple of human social interaction.

summary quiz [9.2]

5. Which of the following findings does *not* support the universality hypothesis?
   a. Congenitally blind people make the facial expressions associated with the basic emotions.
   b. People feel happier when asked to hold a pencil in their teeth.
   c. Infants react to bitter tastes with an expression of disgust.
   d. People are quite accurate at judging emotional expressions of happiness, sadness, anger, and fear in members of other cultures.

6. According to the facial feedback hypothesis,
   a. people unconsciously mimic the facial expressions of others.
   b. people often feel one emotion but display another.
   c. emotional expressions can cause emotional experiences.
   d. emotional experiences can cause emotional expressions.

7. Your roommate asks if you like her new outfit. You think it's hideous but smile broadly and say, "I love it!" This is an example of
   a. masking.
   b. intensification.
   c. deintensification.
   d. neutralizing.

Motivation: Getting Moved

You now know something about how emotions are produced, experienced, and communicated. But what in the world are they *for*? Emotions have several functions, and one of the most important is that they motivate behavior. **Motivation** refers to *the purpose for or cause of an action,* and it is no coincidence that the words *emotion* and *motivation* share a common linguistic root that means "to move." We act because our emotions move us to do so, and they move us in two different ways. First, emotions provide us with *information* about the world; second, emotions are the *objectives* toward which we strive. Let's examine each of these in turn.

The Function of Emotion

The first function of emotion is to provide us with information about the world. For example, most people report being more satisfied with their lives when they are asked the question on a sunny day rather than a rainy day. Why? Because people feel happier on sunny days, and they use their happiness as information about the quality of their lives (Schwarz & Clore, 1983). We all know that satisfying lives and bright futures make us feel good—so when we feel good, we naturally conclude that our lives must be satisfying and our futures must be bright. Because the world influences our emotions, our emotions provide information about the world (Schwarz, Mannheim, & Clore, 1988).

Indeed, this information is often critical. When neurologist Antonio Damasio was asked to examine a patient with an unusual form of brain damage, he asked the patient to choose between two dates for an appointment. It sounds like a simple decision, but for the next half hour, the patient enumerated reasons for and against each of the two possible dates, completely unable to decide in favor of one option or the other (Damasio, 1994). The problem wasn't any impairment of the patient's ability to think or reason. On the contrary, he could think and reason all too well. What he couldn't do was feel. The patient's injury had left him unable to experience emotion, and thus when he entertained one option ("If I come next Tuesday, I'll have to cancel my lunch with Fred"), he didn't feel any better or any worse than when he entertained another ("If I come next Wednesday, I'll have to get up early to catch the bus"). And because he *felt* nothing when he thought about an option, he couldn't decide which was better.

It is easy to explain why you want mittens, but can you explain why you want pleasure?

The second function of emotions is to give us something to strive for. People strongly prefer to experience positive rather than negative emotions, and the emotional experiences that we call happiness, satisfaction, pleasure, and joy are often the goals that our behavior is meant to accomplish. The **hedonic principle** is *the notion that all people are motivated to experience pleasure and avoid pain,* and some very smart folks have argued that this single principle can explain all human behavior. For example, Aristotle (350 BC/1998) observed that the pursuit of pleasure and the avoidance of pain "is a first principle, for it is for the sake of this that we all do all that we do."

● How do emotions give us something to strive for?

This may sound a bit extreme, but it isn't hard to convince yourself that Aristotle was on to something. If a friend asked you why you went to the mall, you might explain that you wanted to buy a new pair of mittens. If your friend then asked why you wanted to buy a new pair of mittens, you might explain that you wanted to keep your hands warm. If your friend then asked why you wanted to keep your hands warm, you might explain that warm hands are a pleasure and cold hands are a pain. But if your friend then asked you why you wanted to experience pleasure instead of pain, you'd find yourself tongue-tied. There is no answer to this question because there is no other motivation on which the desire for pleasure rests. People want many things, of course,

motivation The purpose for or cause of an action.

hedonic principle The notion that all people are motivated to experience pleasure and avoid pain.

from peace and prosperity to health and security, but the reason they want them is that these things promote pleasure and avert pain.

According to the hedonic principle, then, our emotional experience can be thought of as a gauge that ranges from bad to good, and our primary motivation—perhaps even our *sole* motivation—is to keep the needle on the gauge as close to *good* as possible. Even when we voluntarily do things that tilt the needle in the opposite direction, such as letting the dentist drill our teeth or waking up early for a boring class, we are doing these things because we believe that they will nudge the needle toward *good* in the future and keep it there longer.

KRISTY-ANNE GLUBISH/DESIGN PICS/CORBIS

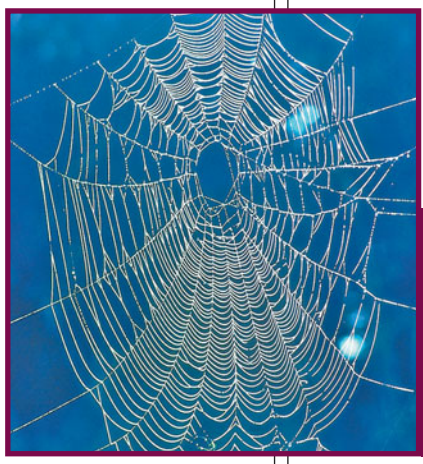
Many people voluntarily do things that cause them pain. According to the hedonic principle, people would not visit the dentist unless the pain of having dental work was ultimately outweighed by the pleasure of having had it done.

The Conceptualization of Motivation

The hedonic principle sets the stage for an understanding of motivation but leaves many questions unanswered. For example, if our primary motivation is to keep the needle on *good,* so to speak, then which things push the needle in that direction and which things push it away? The answers lie in our *instincts* and *drives*.

Instincts

When a newborn baby is given a drop of sugar water, it smiles; but when it is given a check for $10,000, it acts like it couldn't care less. By the time the baby gets into college, these responses pretty much reverse. It seems clear that nature endows us with certain motivations and that experience endows us with others. William James (1890) called the inherited tendency to seek a particular goal an *instinct,* which he defined as "the faculty of acting in such a way as to produce certain ends, without foresight of the ends, and without previous education in the performance" (p. 383). According to James, nature hardwired penguins, parrots, puppies, and people to want certain things without training and to execute the behaviors that produce these things without thinking.



JOHN MCNALLY/PHOTOLIBRARY

All animals are born with both the motivation and the ability to perform certain complex behaviors. Spiders don't teach their offspring how to build elaborate webs, but their offspring build them nonetheless.

But by 1930, the concept of instinct had fallen out of fashion. The problem was that it flew in the face of American psychology's newest and most unstoppable force: behaviorism. Behaviorists rejected the concept of instinct on two grounds. First, they believed that behavior should be explained by the external stimuli that evoke it and not by reference to the hypothetical internal states on which it depends. Second, behaviorists wanted nothing to do with the notion of inherited behavior because for them all complex behavior was learned. Because instincts were inherited tendencies that resided inside the organism, behaviorists considered the concept doubly repugnant.

Drives

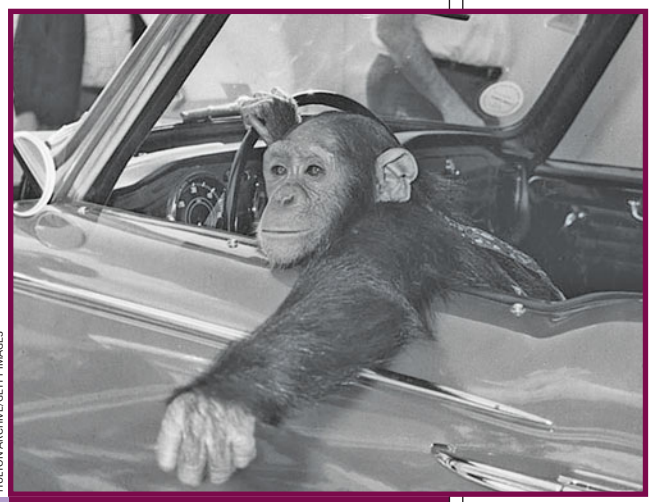
But within a few decades, some behaviorists began to realize that the strict prohibition against the mention of internal states made certain phenomena difficult to explain. For example, if all behavior is a response to an external stimulus, then why does a rat that is sitting still in its cage at 9:00 a.m. start wandering around and looking for food by noon? Nothing in the cage has changed, so why has the rat's behavior changed? What visible, measurable external stimulus is the wandering rat responding to? The obvious answer (obvious, at least, to any ordinary person) is that the rat is responding to something inside itself, which meant that one should look inside the rat if one wanted to explain its wandering.

● **How do we regulate our bodies like thermostats?**

NICK M. DO/ISTOCKPHOTO

Bodies are a bit like thermostats: they sense when something is wrong and then take action to make it right.

These behaviorists began by noting that bodies are like thermostats. When thermostats detect that the room is too cold, they send signals that initiate corrective actions such as turning on a furnace. Similarly, when bodies detect that they are underfed, they



HULTON ARCHIVE/GETTY IMAGES

All mammals experience sex drives and hunger drives. This one seems to experience Sunday drives as well.

send signals that initiate corrective actions such as eating. To survive, an organism needs to maintain precise levels of nutrition, warmth, and so on; when these levels depart from an optimal point, the organism receives a signal to take corrective action. That signal is called a **drive**, which is *an internal state generated by departures from physiological optimality.* According to this view, it isn't food per se that organisms find rewarding; it is the reduction of the drive for food. Hunger is a drive, a drive is an internal state, and when organisms eat, they are attempting to change their internal state.

The words *instinct* and *drive* are no longer widely used in psychology, but the concepts remain part of the modern conception of motivation. The concept of instinct reminds us that nature endows organisms with a tendency to seek certain things, and the concept of drive reminds us that this seeking is initiated by an internal state. Modern psychologists are more likely to talk in terms of the "needs" that motivate organisms to take action.

So what are these needs? Abraham Maslow (1954) attempted to organize the list of human needs in a meaningful way (see **FIGURE 9.9**). He noted that some needs (e.g., the need to eat) must be satisfied before others (e.g., the need to mate), and he built a hierarchy of needs that had the strongest and most immediate needs at the bottom and the weakest and most deferrable needs at the top. Maslow suggested that as a rule, people will not experience a need until all the needs below it are met. So when people are hungry or thirsty or exhausted, they will not seek intellectual fulfillment or moral clarity, which is to say that philosophy is a luxury of the well fed. Although many aspects of Maslow's theory failed to win empirical support (e.g., a person on a hunger strike may value her principles more than her physical needs; see Wahba & Bridwell, 1976), the idea that some needs take precedence over others is clearly right. And although there are exceptions, those that typically take precedence are those that we share with

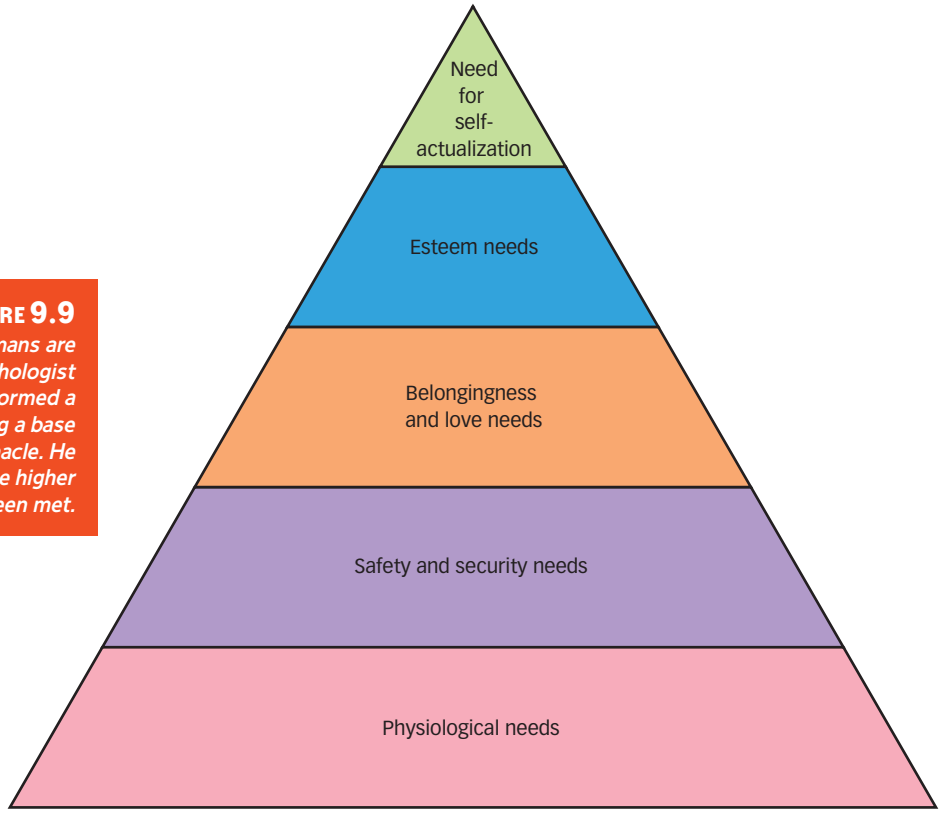


FIGURE 9.9
Maslow's Hierarchy of Needs *Humans are motivated to satisfy a variety of needs. Psychologist Abraham Maslow thought these needs formed a hierarchy, with lower-order needs forming a base and self-actualization needs forming a pinnacle. He suggested that people don't experience higher needs until the needs below them have been met.*

other mammals and that are related to our common biology. Two of these needs—the need to eat and the need to mate—are among the most powerful and well studied, so let's see how they work.

drive An internal state generated by departures from physiological optimality.

Eating

Hunger tells an organism to eat. But how does hunger arise? At every moment, your body is sending signals to your brain about its current energy state. If your body needs energy, it sends a signal to tell your brain to switch hunger on, and if your body has sufficient energy, it sends a signal to tell your brain to switch hunger off (Gropp et al., 2005). No one knows precisely what these signals are or how they are sent and received, but research has identified a variety of candidates. For example, *ghrelin* is a chemical that is produced in the stomach, and it appears to be a signal that tells the brain to switch hunger on (Inui, 2001; Nakazato et al., 2001); when people are injected with ghrelin, they become intensely hungry and eat about 30% more than usual (Wren et al., 2001). *Leptin* is a chemical secreted by fat cells, and it appears to be a signal that tells the brain to switch hunger off. Some researchers believe that there is no general state called hunger but rather that there are many different hungers, each of which is a response to a unique nutritional deficit and each of which is switched on by a unique chemical messenger (Rozin & Kalat, 1971). For example, rats that are deprived of protein will turn down fats and carbohydrates and specifically seek proteins, suggesting that they are experiencing a specific "protein hunger" and not a general hunger (Rozin, 1968).

Which chemical switches hunger on, and which switches it off?

Whether hunger is one signal or many, the primary receiver of these signals is the hypothalamus. Different parts of the hypothalamus receive different signals (see **FIGURE 9.10**). The *lateral hypothalamus* receives hunger signals, and when it is destroyed, animals sitting in a cage full of food will starve themselves to death. The *ventromedial hypothalamus* receives satiety signals, and when it is destroyed, animals will gorge themselves to the point of illness and obesity (Miller, 1960; Steinbaum & Miller, 1965). These two structures were once thought to be the "hunger center" and "satiety center" of the brain, but recent research has shown that this view is far too simple. Hypothalamic structures play an important role in turning hunger on and off, but the way they execute these functions is complex and poorly understood (Stellar & Stellar, 1985).

"Never get a tattoo when you're drunk and hungry."

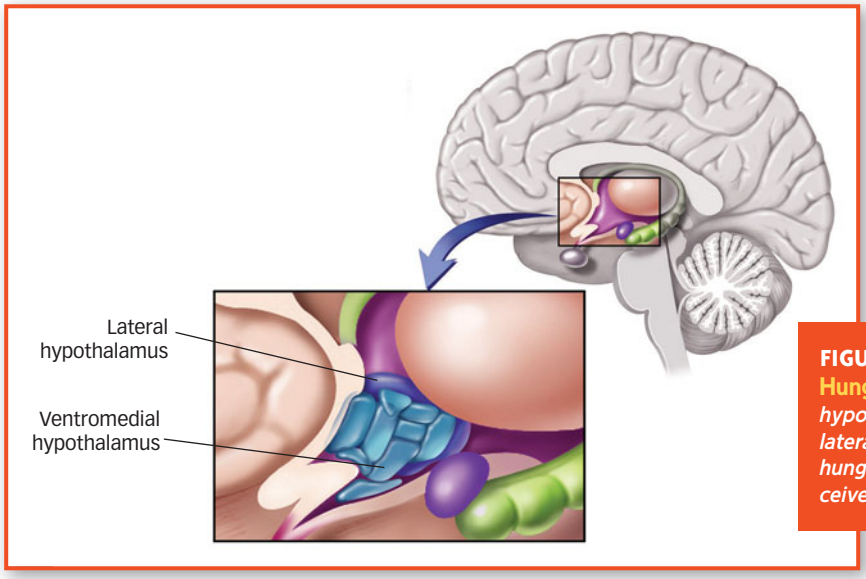


FIGURE 9.10 **Hunger, Satiety, and the Hypothalamus** *The hypothalamus comprises many parts. In general, the lateral hypothalamus receives the signals that turn hunger on and the ventromedial hypothalamus receives the signals that turn hunger off.*

CHRISTOPHER LAMARCA/REDUX

Although people who suffer from anorexia are dangerously thin, they typically see themselves as fat. Sixteen-year-old Hannah Hartney has been suffering from anorexia since she was 9 years old.

Eating Disorders

Feelings of hunger tell us when to eat and when to stop. But for the 10 to 30 million Americans who have eating disorders, eating is a much more complicated affair (Hoek & van Hoeken, 2003). For instance, **bulimia nervosa** is *a disorder characterized by binge eating followed by purging.* Individuals with bulimia typically ingest large quantities of food in a relatively short period and then take laxatives or induce vomiting to purge the food from their bodies. These people are caught in a cycle: They eat to ameliorate negative emotions such as sadness and anxiety, but then concern about weight gain leads them to experience negative emotions such as guilt and self-loathing, and these emotions then lead them to purge.

Anorexia nervosa is *a disorder characterized by an intense fear of being fat and severe restriction of food intake.* Individuals with anorexia tend to have a distorted body image that leads them to believe they are fat when they are actually emaciated. They tend to be high-achieving perfectionists who see their severe control of eating as a triumph of will over impulse. Contrary to what you might expect, people with anorexia have extremely *high* levels of ghrelin in their blood, which suggests that their bodies are trying desperately to switch hunger on but that hunger's call is being suppressed, ignored, or overridden (Ariyasu et al., 2001). Like most eating disorders, anorexia strikes more women than men, and 40% of newly identified cases of anorexia are among females who are 15 to 19 years old. Individuals with anorexia believe that thinness equals beauty, and it isn't hard to understand why. The average American woman is 5'4" tall and weighs 140 pounds, but the average American fashion model is 5'11" tall and weighs 117 pounds. Indeed, most college-age women want to be thinner than they are (Rozin, Trachtenberg, & Cohen, 2001), and nearly one in five reports being *embarrassed* to buy a chocolate bar (Rozin, Bauer, & Catanese, 2003).

How do people with anorexia respond to their bodies' attempts to turn hunger on?

Obesity

America's newest, most pernicious, and most pervasive eating-related problem is obesity, which is defined as having a body mass index of 30 or greater. **TABLE 9.1** (on page 281) allows you to compute your body mass index, and the odds are that you won't like what you learn. Approximately 3 million Americans die each year from obesity-related illnesses (Allison et al., 1999), and that number is growing fast. Obese people are viewed negatively by others, have lower self-esteem, and have a lower quality of life (Hebl & Heatherton, 1997; Kolotkin, Meter, & Williams, 2001). Indeed, the stigma of obesity is so powerful that average-weight people are viewed negatively if they even have a relationship with someone who is obese (Hebl & Mannix, 2003).

Prejudice against obese people is powerful and widespread. In this photo, members of the self-proclaimed "Bod Squad" protest against weight loss surgery in front of a San Francisco hospital.

KAREN KASMAUSKI/CORBIS

Obesity can result from biochemical abnormalities, and it seems to have a strong genetic component, but overeating is often a part of its cause. If the brain has a complex system of on and off switches that regulate hunger, why does anyone overeat? Hunger is just one of the reasons why people eat—and not always the most important one. For example, people often eat to reduce negative emotions such as sadness or anxiety, and they often eat out of habit ("It's noon") or obligation ("Everyone else is ordering lunch"), all of which can cause people to eat more than they should.

Moreover, nature seems to have designed us for overeating. For most of our evolutionary history, the main food-related problem facing our ancestors was starvation. Their brains and bodies evolved two strategies to avoid it. First, they developed a strong attraction to foods that provide large amounts of energy per bite—in other words, foods that are calorically rich—which is why most of us prefer hamburgers and milk shakes to celery

TABLE 9.1

Body Mass Index Table

	Normal						Overweight					Obese										Extremely Obese														
BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Height (Inches)	Body Weight (pounds)																																			
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215	220	224	229	234	239	244	248	253	258
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	169	173	178	183	188	193	198	203	308	212	217	222	227	232	237	242	247	252	257	262	267
60	97	102	107	112	116	123	128	133	138	143	148	153	156	163	168	174	179	184	189	194	199	204	209	215	220	225	230	235	240	245	250	256	261	266	271	278
61	100	108	111	116	122	127	132	137	143	148	153	156	164	169	174	180	186	190	195	201	206	211	217	222	227	232	238	243	248	254	259	264	269	275	280	285
62	104	109	115	120	126	131	138	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	248	251	258	262	267	273	278	264	289	295
63	107	113	118	124	130	135	141	148	152	158	163	169	175	180	188	191	197	203	208	214	220	225	231	237	242	248	254	260	265	270	278	282	287	293	299	304
64	110	118	122	128	134	140	145	151	157	163	169	174	180	188	192	197	204	209	215	221	227	232	238	244	250	258	262	267	273	279	285	291	298	302	308	314
65	114	120	128	132	138	144	150	156	162	168	174	180	186	192	193	204	210	218	222	228	234	240	246	252	258	264	270	278	282	288	294	300	308	312	318	324
66	118	124	130	138	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278	284	291	297	303	309	315	322	328	334
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	238	242	249	256	261	268	274	280	287	293	299	308	312	319	325	331	338	344
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	278	282	289	295	302	303	315	322	328	335	341	348	354
69	128	135	142	149	155	162	169	178	182	189	195	203	209	218	223	230	236	243	250	257	263	270	277	284	291	297	304	311	318	324	331	338	345	351	358	365
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	308	313	320	327	334	341	348	355	362	369	378
71	138	143	150	157	166	172	179	186	193	200	208	215	222	229	235	243	250	257	265	272	279	288	293	301	308	315	322	329	338	343	351	358	365	372	379	388
72	140	147	154	162	169	177	184	191	199	208	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331	338	346	353	361	368	375	383	390	397
73	144	151	159	166	174	182	189	197	204	212	219	227	236	242	250	257	266	272	280	288	295	302	310	318	326	333	340	348	355	363	371	378	388	393	401	408
74	148	155	163	171	179	188	194	202	210	218	225	233	241	249	258	264	272	280	287	295	303	311	319	328	334	342	350	358	365	373	381	389	398	404	412	420
75	152	160	166	178	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359	367	375	383	391	399	407	415	423	431
76	158	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	338	344	353	361	369	377	385	394	402	410	418	428	436	443

Source: Adapted from National Institutes of Health, 1998, *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report.* This and other information about overweight and obesity can be found at www.nhlbi.nih.gov/guidelines/obesity/ob_home.htm.

and water. Second, they developed an ability to store excess food energy in the form of fat, which enabled them to eat more than they needed when food was plentiful and then live off their reserves when food was scarce. We are beautifully engineered for a world in which food is generally low cal and scarce, and the problem is that we don't live in that world anymore.

● **How do our bodies react when we try to diet?**

It is all too easy for most of us to overeat and become overweight or obese, and it is all too difficult to reverse course. The human body resists weight loss in two ways. First, when we gain weight, we experience an increase in both the size and the number of fat cells in our bodies (usually in our abdomens if we are male and in our thighs and buttocks if we are female). But when we lose weight, we experience a decrease in the size of our fat cells but no decrease in their number. Once our bodies have added a fat cell, that cell is pretty much there to stay. It may become thinner when we diet, but it is unlikely to die. Second, our bodies respond to dieting by decreasing our **metabolism,** which is *the rate at which energy is used.* When our bodies sense that we are living through a famine (which is what they conclude when we refuse to feed them), they find more efficient ways to turn food into fat—a great trick for our ancestors but a real nuisance for us. Indeed, when rats are overfed, then put on diets, then overfed again and put on diets again, they gain weight faster and lose it more slowly the second time around, which suggests that with each round of dieting, their bodies become increasingly efficient at converting food to fat (Brownell et al., 1986). The bottom line is that avoiding obesity is much easier than overcoming it.

Mating

Food motivates us more strongly than sex because food is essential to our survival. But sex is essential to our DNA's survival, and thus evolution has ensured that a healthy desire for sex is wired deep into the brain of every mammal. In some ways, that wiring scheme is simple: Glands secrete hormones that travel through the blood to the brain and stimulate sexual desire. But which hormones, which parts of the brain, and what triggers the launch in the first place?

bulimia nervosa An eating disorder characterized by binge eating followed by purging.

anorexia nervosa An eating disorder characterized by an intense fear of being fat and severe restriction of food intake.

metabolism The rate at which energy is used by the body.

"Come back, young man. He needs a booster shot."

Sexual Interest

A hormone called dihydroepiandosterone (DHEA) seems to be involved in the initial onset of sexual desire. Both males and females begin producing this hormone at about the age of 6, which may explain why boys and girls both experience their initial sexual interest at about the age of 10 despite the fact that boys reach puberty much later than girls. Two other hormones have more gender-specific effects. Both males and females produce testosterone and estrogen, but males produce more of the former and females produce more of the latter. As you will learn in Chapter 11, these two hormones are largely responsible for the physical and psychological changes that characterize puberty.

The females of most mammalian species—for example, dogs, cats, and rats—have little or no interest in sex except when their estrogen levels are high, which happens when they are ovulating (i.e., when they are "in estrus" or "in heat"). In other words, estrogen regulates both ovulation and sexual interest in these mammals. But female human beings can be interested in sex at any point in their monthly cycles. Although the level of estrogen in a woman's body changes dramatically over the course of her monthly menstrual cycle, studies suggest that sexual desire changes little if at all. Somewhere in the course of our evolution, it seems, women's sexual interest became independent of their ovulation. Some theorists have speculated that the advantage of this independence was that it made it more difficult for males to know whether a female was in the fertile phase of her monthly cycle. Male mammals often guard their mates jealously when their mates are ovulating but go off in search of other females when their mates are not. If a male cannot use his mate's sexual receptivity to tell when she is ovulating, then he has no choice but to stay around and guard her all the time. For females who are trying to keep their mates at home so that they will contribute to the rearing of children, sexual interest that is continuous and independent of fertility may be an excellent strategy.

If estrogen is not the hormonal basis of women's sex drives, then what is? Two pieces of evidence suggests that the answer is testosterone—the same hormone that drives male sexuality. First, when women are given testosterone, their sex drives increase.

● What hormone regulates the sex drive in both men and women?

Second, men naturally have more testosterone than women do, and they clearly have a stronger sex drive. Men are more likely than women to think about sex, have sexual fantasies, seek sex and sexual variety (whether positions or partners), masturbate, want sex at an early point in a relationship, sacrifice other things for sex, have permissive attitudes toward sex, and complain about low sex drive in their partners (Baumeister, Cantanese, & Vohs, 2001, pp. 263–264). All of this suggests that testosterone may be the hormonal basis of sex drive in both men and women.

MICHAEL K. NICHOLS/NATIONAL GEOGRAPHIC/GETTY IMAGES

The red coloration on the female gelada's chest indicates she is in estrus and thus amenable to sex. The sexual interest of female human beings is not limited to a particular time in their monthly cycle, and they do not clearly advertise their fertility.

Sexual Activity

Men and women may have different levels of sexual drive, but their physiological responses during sex are fairly similar. Prior to the 1960s, data on human sexual behavior consisted primarily of people's answers to questions about their sex lives—and you may have noticed that this is a topic about which people don't always tell the truth. William Masters and Virginia Johnson changed all that by conducting groundbreaking studies in which they actually measured the physical responses of many hundreds of volunteers as they masturbated or had sex in the laboratory (Masters & Johnson, 1966). Their work led to many discoveries, including a better understanding of the **human sexual response cycle**, which refers to *the stages of physiological arousal during sexual activity* (see **FIGURE 9.11** on page 291). Human sexual response has four phases:

● Why was the work of Masters and Johnson considered revolutionary?

- During the *excitement phase,* muscle tension and blood flow increase in and around the sexual organs, heart and respiration rates increase, and blood pressure rises. Both men and women may experience erect nipples and a "sex flush" on the skin of the upper body and face. A man's penis typically becomes erect or partially erect and his testicles draw upward, while a woman's vagina typically becomes lubricated and her clitoris becomes swollen.
- During the *plateau phase,* heart rate and muscle tension increase further. A man's urinary bladder closes to prevent urine from mixing with semen, and muscles at the base of his penis begin a steady rhythmic contraction. A woman's clitoris may withdraw slightly, and her vagina may become more lubricated. Her outer vagina may swell, and her muscles may tighten and reduce the diameter of the opening of the vagina.
- During the *orgasm* phase, breathing becomes extremely rapid and the pelvic muscles begin a series of rhythmic contractions. Both men and women experience quick cycles of muscle contraction of the anus and lower pelvic muscles, and women often experience uterine and vaginal contractions as well. During this phase, men ejaculate about 2 to 5 milliliters of semen (depending on how long it has been since their last orgasm and how long they were aroused prior to ejaculation). Ninety-five percent of heterosexual men and 69% of heterosexual women reported having an orgasm during their last sexual encounter (Richters et al., 2006), though it is worth noting that roughly 15% of women never experience orgasm, less than half experience orgasm from intercourse alone, and roughly half report having "faked" an orgasm at least once (Wiederman, 1997). When men and women do have orgasms, they typically experience them as intensely pleasurable, and although many of us assume that these pleasurable experiences are different for men and for women, studies suggest that they are similar (Mah & Binik, 2002). Indeed, when gynecologists, psychologists, and medical students read people's descriptions of their orgasmic experiences, they cannot reliably tell whether those descriptions were written by men or by women (Vance & Wagner, 1976).
- During the *resolution phase,* muscles relax, blood pressure drops, and the body returns to its resting state. Most men and women experience a *refractory period,* during which further stimulation does not produce excitement. This period may last from minutes to days and is typically longer for men than for women.

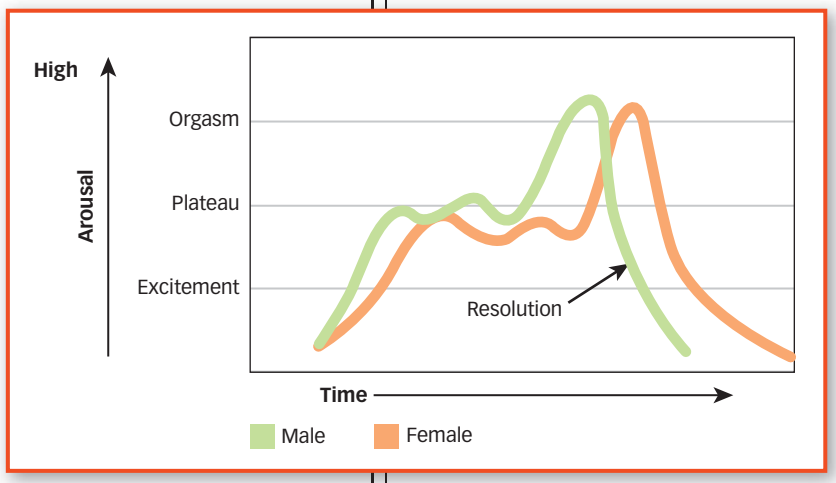


FIGURE 9.11
The Human Sexual Response Cycle
The pattern of the sexual response cycle is quite similar for men and for women. Both men and women go through the excitement, plateau, orgasm, and resolutions phases, though the timing of their response may differ.

Men and women are similar in their responses during sexual activity, and they are also similar in their reasons for engaging in sexual activity in the first place. Sex is necessary for reproduction, of course, but the vast majority of sexual acts are performed for other reasons, which include experiencing pleasure, coping with negative emotions, increasing emotional intimacy between partners, pleasing one's partner, impressing one's friends, and reassuring oneself of one's own attractiveness (Cooper, Shapiro, & Powers, 1998). It is worth noting that not all sex is motivated by one of these reasons: About half of college-age women and a quarter of college-age men report having unwanted sexual activity in a dating relationship (O'Sullivan & Allegeier, 1998). We will have much more to say about sexual attraction and relationships in Chapter 15.

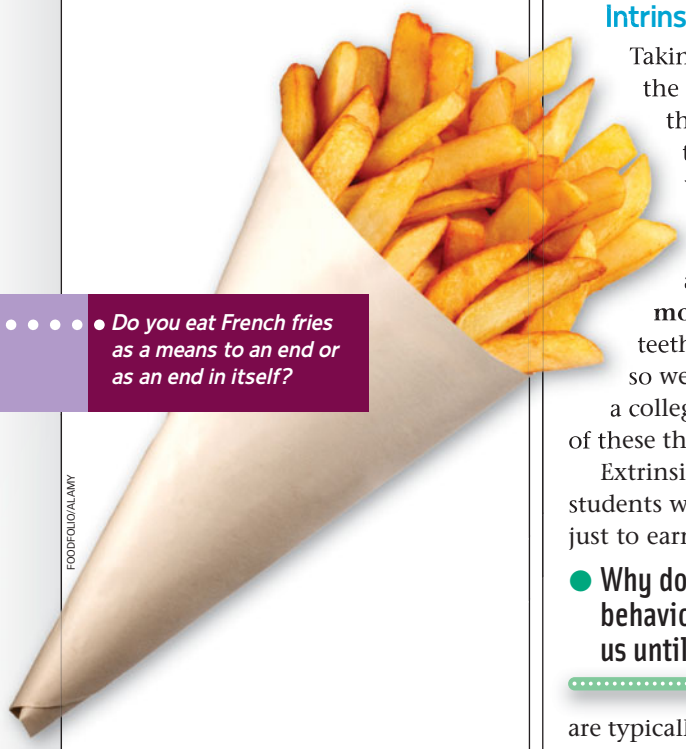
Kinds of Motivation

Eating and mating are two things that human beings are strongly motivated to do—but what are the others, and how do they relate to each other? Alas, there is no widely accepted list of human motivations, which has made it difficult for psychologists to

human sexual response cycle The stages of physiological arousal during sexual activity.

develop theories about where motivations come from and how they operate. Nonetheless, psychologists have made initial progress by identifying several of the dimensions on which motivations differ. Three of those dimensions are especially important.

Intrinsic versus Extrinsic



FOODFOLIO/ALAMY

Do you eat French fries as a means to an end or as an end in itself?

Taking a psychology exam is not like eating a french fry. One makes you tired and the other makes you fat, one requires that you move your lips and one requires that you don't, and so on. But the key difference between these activities is that one is a means to an end and one is an end in itself. An **intrinsic motivation** is *a motivation to take actions that are themselves rewarding*. When we eat a french fry because it tastes good, exercise because it feels good, or listen to music because it sounds good, we are intrinsically motivated. These activities don't have to *have* a payoff because they *are* a payoff. An **extrinsic motivation** is *a motivation to take actions that lead to reward*. When we floss our teeth so we can avoid gum disease (and get dates), when we work hard for money so we can pay our rent (and get dates), and when we take an exam so we can get a college degree (and get money to get dates), we are extrinsically motivated. None of these things directly brings pleasure, but all may lead to pleasure in the long run.

Extrinsic motivation gets a bad rap. Americans tend to feel sorry for or disdainful of students who choose courses just to please their parents and parents who choose jobs just to earn a lot of money. But the fact is that our ability to engage in behaviors that are unrewarding in the present because we believe they will bring greater rewards in the future is one of our species' most significant talents, and no other species can do it as well as we can (Gilbert, 2006). In research on the ability to delay gratification, people are typically faced with a choice between getting something they want right now (e.g., a scoop of ice cream) or waiting and getting more of what they want later (e.g., two scoops of ice cream). Studies show that 4-year-old children who can delay gratification are judged to be more intelligent and socially competent 10 years later and that they have higher SAT scores when they enter college (Mischel, Shoda, & Rodriguez, 1989). In fact, the ability to delay gratification is a better predictor of a child's grades in school than is the child's IQ (Duckworth & Seligman, 2005). Apparently there is something to be said for extrinsic motivation.

Why do we often engage in behavior that won't benefit us until much later?

KIRK WEDDLE PHOTOGRAPHY

Will this child enjoy swimming when he grows up? Studies suggest that extrinsic motivators, such as money, can undermine a person's intrinsic interest in performing activities such as swimming.

There is a lot to be said for intrinsic motivation, too. People work harder when they are intrinsically motivated, they enjoy what they do more, and they do it more creatively. Both kinds of motivation have advantages, which is why many of us try to build lives in which we are both intrinsically and extrinsically motivated by the same activity—lives in which we are paid the big bucks for doing exactly what we like to do best. Who hasn't fantasized about becoming a professional artist, a professional athlete, or a professional chocolatier? Alas, research suggests that it is difficult to eat your chocolate and have it too because extrinsic rewards can undermine intrinsic rewards (Deci, Koestner, & Ryan, 1999; Henderlong & Lepper, 2002). For example, in one study, college students who were intrinsically interested in a puzzle either were paid to complete it or completed it for free, and those who were paid were less likely to play with the puzzle later on (Deci, 1971). It appears that under some circumstances, people take rewards to indicate that an activity isn't inherently pleasurable ("If they had to pay me to do that puzzle, it couldn't have been a very fun one"), and thus rewards can cause people to lose their intrinsic motivation.

When do rewards backfire?

Conscious versus Unconscious

When prizewinning artists or scientists are asked to explain their achievements, they typically say things like "I wanted to liberate color from form" or "I wanted to cure

diabetes." They almost never say, "I wanted to exceed my father's accomplishments, thereby proving to my mother that I was worthy of her love." A **conscious motivation** is *a motivation of which one is aware,* and an **unconscious motivation** is *a motivation of which one is not aware.*

A person who is shopping for mittens may be simultaneously motivated to increase her happiness, to keep her hands warm, and to find the mitten aisle in the store—so which of these motives will be conscious and which will be unconscious? Notice that some of these motivations are quite general (increasing happiness) and some are quite specific (looking for mittens). Robin Vallacher and Daniel Wegner have suggested that people tend to be aware of their general motivations unless the complexities of executing an action force them to become aware of their specific motivations (Vallacher & Wegner, 1985, 1987). For example, if a person is changing a lightbulb and is asked about her motivation, she may say something like "I'm helping my dad out." But the moment the lightbulb gets stuck, her answer will change to "I'm trying to get these threads aligned." The person has both motivations, of course, but she is conscious of her more general motivation when her action is easy and of her more specific motivation when her action is difficult.

When are people likely to be aware of their motivations?

Approach versus Avoidance

The poet James Thurber (1956) wrote, "All men should strive to learn before they die / what they are running from, and to, and why." "Running to" corresponds to what psychologists call an **approach motivation,** which is *a motivation to experience a positive outcome,* and "running from" corresponds to an **avoidance motivation**, which is *a motivation not to experience a negative outcome.* These are not just two ways of saying the same thing: Pleasure and pain are independent phenomena that occur in different parts of the brain (Davidson et al., 1990).

Research suggests that, all else being equal, avoidance motivations tend to be more powerful than approach motivations. As you learned in Chapter 4, most people will turn down a chance to bet on a coin flip that would pay them $10 if it came up heads but would require them to pay $8 if it came up tails because they believe that the pain of losing $8 will be more intense than the pleasure of winning $10 (Kahneman & Tversky, 1979).

Although avoidance motivation tends to be stronger than approach motivation overall, there are people who naturally favor one or the other. For instance, in one study, participants were given an anagram task. Some were told that they would be paid $4 for the experiment, but they could earn an extra dollar by finding 90% or more of all the possible words. Others were told that they that they would be paid $5 for the experiment, but they could avoid losing a dollar by not missing more than 10% of all the possible words. People who naturally tended to think in terms of achieving gains performed better in the first case than in the second. But people who naturally tended to think in terms of avoiding losses performed better in the second case than in the first (Shah, Higgins, & Friedman, 1998).

intrinsic motivation A motivation to take actions that are themselves rewarding.

extrinsic motivation A motivation to take actions that are not themselves rewarding but that lead to reward.

conscious motivation A motivation of which one is aware.

unconscious motivation A motivation of which one is not aware.

approach motivation A motivation to experience positive outcomes.

avoidance motivation A motivation not to experience negative outcomes.

MICHAELBROWN/GETTYIMAGES

People are motivated to avoid losses and achieve gains, but whether an outcome is seen as a loss or a gain often depends on how it is described. Smart retailers refer to price discrepancies such as this one as a "cash discount" rather than a "credit card surcharge."

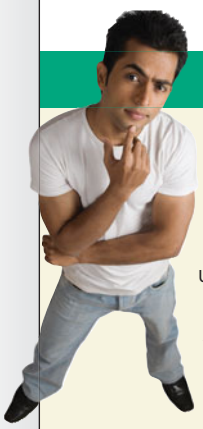
summary quiz [9.3]

8. The notion that organisms are motivated to approach pleasure and avoid pain is known as
a. the hedonic principle.
b. Maslow's hierarchy of needs.
c. drive theory.
d. the instinct principle.

9. According to Maslow, the weakest and most deferrable need(s) is (are)
a. belongingness and love needs.
b. need for self-actualization.
c. esteem needs.
d. safety and security needs.

10. Which is true of human sexual drives?
- a. Men and women experience different sequences of physiological arousal.
- b. Women's sex drives are regulated by estrogen, whereas men's are regulated by testosterone.
- c. Men and women engage in sex for very different reasons.
- d. Boys and girls both experience their initial sexual interest at about the same age.

11. When we floss our teeth to avoid gum disease or get a job so we can pay our rent, we are displaying what kind of motivation?
- a. unconscious motivation
- b. intrinsic motivation
- c. extrinsic motivation
- d. achievement motivation



WhereDoYouStand?

Here Comes the Bribe

Americans prize their right to vote. They talk about it, they sing about it, and they die for it. They just don't use it very much.

The U.S. Census Bureau estimates that about 60% of American citizens who are eligible to vote in a presidential election actually do so, and the numbers are significantly lower for "off-year" elections. Not all countries have this problem. Belgium, for instance, has a voter turnout rate close to 100% because for the better part of a century, failing to vote in Belgium has been illegal. (If you failed to vote in Belgium, don't worry; this only applies to Belgians.) Belgians who fail to vote may be fined; and if they fail to vote several times in a row, they may be "legally disenfranchised," which makes it difficult for them to get a job. Although some people have suggested that America should join the long list of countries that have compulsory voting, Americans generally don't like the threat of punishment.

But they sure do love the possibility of reward—and that's what led Arizona ophthalmologist Mark Osterloh to propose the Arizona Voter Reward Act, which would have awarded $1 million to a randomly selected voter in every election. As soon as Osterloh announced his idea, people lined up against it. An editorial in the *Yuma Sun* summed up the opposition: "A jackpot is not the right motivator for voting. . . . People should vote because they want to and because they think it is important. . . . Bribing people to vote is a superficial approach that will have no beneficial outcome to the process, except to make some people feel good that the turnout numbers are higher" (Editorial, 2006). Nonetheless, 185,902 of Osterloh's fellow Arizonans thought his idea had merit, and they signed their names to get his proposed measure on the ballot.

In November 2006, Arizonans defeated the measure by a sound margin, but Osterloh wasn't dejected. "I believe somebody is eventually going to bring this back and get this approved somewhere around the world, and it's going to spread," he said days after the election. "If anybody has a better idea of how to get people to vote, let me know and I will support it" (Rotstein, 2006).

Should our government motivate people to vote with extrinsic rewards or punishments? We know where Arizonans stand on this issue. How about you?

CHAPTER REVIEW

Summary

Emotional Experience: The Feeling Machine

- Emotion has two underlying dimensions: arousal and valence.
- The James-Lange theory suggests that physiological reactions precede emotional experience; the Cannon-Bard theory suggests that emotional experiences and physiological reactions occur simultaneously. Two-factor theory suggests that a stimulus causes physiological arousal that people then interpret as emotion in a given context.
- The amygdala is a key structure in producing emotion, particularly in rapid appraisal of the emotional relevance of stimuli.
- People can use strategies such as reappraisal to regulate their own emotions.

Emotional Communication: Msgs w/o Wrds

- The voice, the body, and the face all communicate information about a person's emotional state.

- Emotional expressions are the same for all people and are universally understood.
- Not all emotional expressions are sincere; people use display rules to help them decide which emotions to express. People are generally poor at determining when an expression is sincere.

Motivation: Getting Moved

- Emotions motivate us by providing information about the world and by giving us something to strive for.
- The hedonic principle suggests that organisms approach pleasure and avoid pain and that this basic motivation underlies all others.
- When the body experiences a deficit, we experience a drive to remedy it; hunger and mating are two powerful biological drives.
- Motivations may be classified in many ways, including intrinsic versus extrinsic, conscious versus unconscious, and approach versus avoidance.

Key Terms

emotion (p. 271)
James-Lange theory (p. 272)
Cannon-Bard theory (p. 272)
two-factor theory (p. 272)
appraisal (p. 274)
emotion regulation (p. 276)
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emotional expression (p. 278)
universality hypothesis (p. 279)
facial feedback hypothesis (p. 280)
display rules (p. 280)
motivation (p. 284)
hedonic principle (p. 284)
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bulimia nervosa (p. 288)
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avoidance motivation (p. 293)

Critical Thinking Questions

1. More than two millennia ago, Roman emperor Marcus Aurelius wrote, "If you are distressed by anything external, the pain is not due to the thing itself, but to your estimate of it; and this you have the power to revoke at any moment." Does research support this claim? What about your personal experience? Have you ever had a painful emotion that you were able to revoke?
2. Although a wide variety of human languages are spoken across the globe, evidence suggests that facial displays of at least six emotions—anger, disgust, fear, happiness, sadness, and surprise—are universal. How can you explain this?
3. The hedonic principle is the notion that all people are motivated to experience pleasure and avoid pain. According to Aristotle, *all* other motivations rest on this one. If this is true, then how can you explain the fact that people go to war?

Answers to Summary Quizzes

Summary Quiz 9.1

1. b; 2. c; 3. a; 4. d

Summary Quiz 9.2

5. b; 6. c; 7. a

Summary Quiz 9.3

8. a; 9. b; 10. d; 11. c