

CHAPTER 9

Emotion and Stress



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Motivation and emotion are closely connected. Emotions can motivate behavior both by preceding it, as when a child's anger leads to kicking a bedroom wall, or by being a consequence of our actions, as when behaviors induce feelings of happiness, joy, excitement, and pride.

Emotions do more than motivate our behavior, however. Can you imagine life without them? In this

chapter we explore emotions in an effort to find out more about what they are, how they come about, what brain structures enable them, and how they influence our lives. We also explore a closely related topic: stress, the effect of stress on our lives, and the ways in which we can moderate some of the negative effects of stress.

THE COMPONENTS OF EMOTION

Emotions

An individual's subjective feelings and moods. The term applies to both physiological and behavioral responses to specific stimulus situations.

Although the terms emotions and *feelings* are often used interchangeably, a careful analysis reveals that feelings are only one aspect of **emotion**. In fact, lower animals clearly have emotional states, but little or no feeling at all. Human emotions include four integral components: cognitive processes, affect or subjective feelings, physiological arousal, and behavioral responses.

Cognitive Processes

One component of emotions is cognitive processes. Although psychologists differ in the extent to which they emphasize the role of cognition in emotional arousal and expression, there is a general consensus that perception, learning, and memory are all very much involved in experiencing emotions. Listening to music, or even just thinking about a favorite song, often elicit conditioned or learned emotions.

Affect

All emotions also include an *affective* component involving both a general positive or negative state such as joy, anger, fear, or disgust. When psychologists attempt to ascertain a person's emotional state, they typically ask the individual to describe the emotions he or she is experiencing. Most people respond by describing their feelings "I am depressed"; "I am extremely happy"; "I feel nervous and apprehensive." Thus, for most individuals, these *subjective feelings* constitute emotion even though they are only one aspect of them. Often these feelings can be described on a 1–10 Likert scale. Such as my anger is at a 9 today. Or I feel a 10 in terms of joy. These subjective numbers are often asked in order to chart affective changes that a person might feel after counseling.

Physiological Arousal

A third component of emotions is *physiological arousal*. When someone describes their anger by saying "the juices were flowing," this account is close to the mark. The "juices," in the form of epinephrine and other hormones associated with the arousal of anger, probably were flowing. As a result of this increased endocrine activity, we might guess that for a few moments at least heart rate increased dramatically, blood pressure probably increased significantly, and breathing may have become rapid and uneven.

Indeed, emotions are associated with mild to extreme changes in the physiological processes occurring within our bodies. In addition to the changes we just listed, these processes may include metabolic changes, altered muscle tension, changes in activity of the salivary and sweat glands, modified digestive processes, and changes in the levels of certain neurotransmitters in the brain. (Recall that the autonomic nervous system is involved in most of the physiological changes associated with emotional arousal.) In other

species these physiological processes can lead to changes in coloration, facial expression, piloerection, and other signs of emotion.

Behavioral Responses

Finally, emotion also includes *behavioral response*. Emotions often motivate us to act out or express our feelings. These expressions may range from crying, screaming, or verbal outbursts to smiling or laughing. Tone of voice, posture, and other kinds of body language are all common signals of emotion. In addition to being expressive, behavioral reactions to emotions may also serve to either promote or reduce the emotion. For example, avoiding a situation that produces fear or going out of your way to meet a special person are examples of behavior maintained by a change in emotion.

THE RANGE OF HUMAN EMOTION

Adoration, amazement, amusement, anger, anxiety, contempt, disgust, distress, ecstasy, embarrassment, envy, fear, guilt, humiliation, interest, jealousy, joy, loathing, rage, reverence, sadness, shame, sorrow, surprise, terror—these are just a few of the emotions we recognize.

Some of these emotions overlap: Ecstasy and joy, for instance, clearly share certain elements. Thus, differences between emotions are often more a matter of degree than of kind. Furthermore, many emotional experiences may represent a blending of more basic emotions.

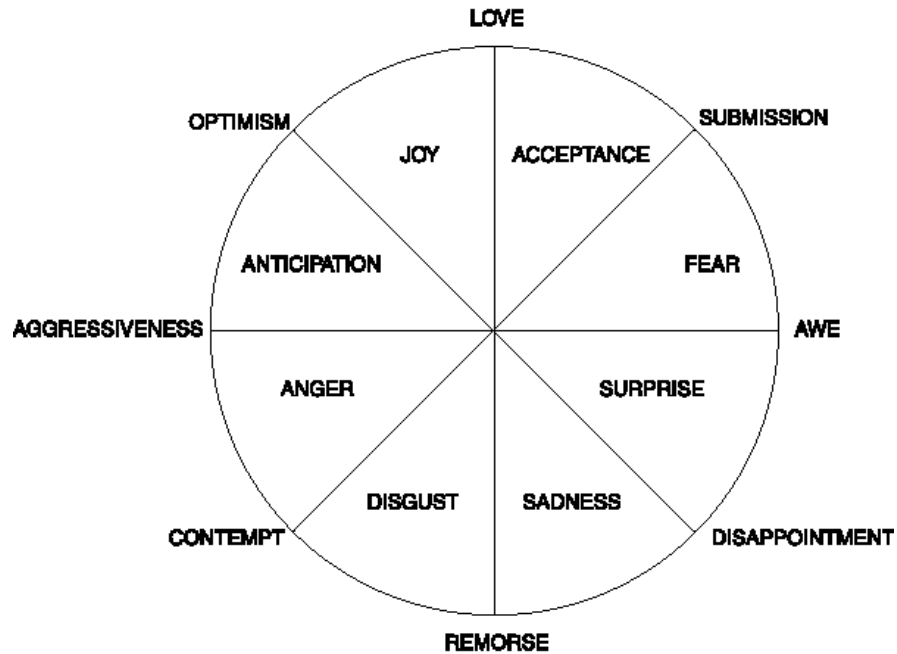
Plutchik's Emotional Wheel

According to Plutchik (1980), there are eight primary or basic human emotions, which consist of four pairs of opposites: acceptance and disgust, fear and anger, surprise and anticipation, and sadness and joy. Plutchik adopted the unique approach of arranging these eight primary emotions on an emotion wheel (see Figure 9.1). He maintains that all human emotions are variations or derivations of these eight. The closer to one another those emotions lie on the wheel, the more they have in common. For example, anticipation and joy both share an element of expectation, whereas fear and surprise share the quality of the unknown. Plutchik maintains that adjacent emotions blend to form the more complex feelings listed on the outer rim of the emotion wheel. Many of us would probably agree that love involves at least some elements of joy and acceptance, and that contempt certainly involves components of both anger and disgust. Plutchik's (1980) psychoevolutionary theory of basic emotions has ten postulates.

1. The concept of emotion is applicable to all evolutionary levels and applies to animals as well as to humans.
2. Emotions have an evolutionary history and have evolved various forms of expression in different species.

FIGURE 9.1 Plutchik's Emotional Wheel

According to Robert Plutchik, there are eight primary human emotions consisting of four opposite pairs. Adjacent emotions (such as joy and acceptance) blend to form more complex emotions (like love).



3. Emotions served an adaptive role in helping organisms deal with key survival issues posed by the environment.
4. Despite different forms of expression of emotions in different species, there are certain common elements, or prototype patterns, that can be identified.
5. There is a small number of basic, primary, or prototype emotions.
6. All other emotions are mixed or derivative states; that is, they occur as combinations, mixtures, or compounds of the primary emotions.
7. Primary emotions are hypothetical constructs or idealized states whose properties and characteristics can only be inferred from various kinds of evidence.
8. Primary emotions can be conceptualized in terms of pairs of polar opposites.
9. All emotions vary in their degree of similarity to one another.
10. Each emotion can exist in varying degrees of intensity or levels of arousal.

THEORIES OF EMOTION

We have learned that emotional expression is a complex process involving cognitions, subjective feelings, physiological arousal, and behavioral reactions. How do these processes interact to produce an emotional response? What is the usual sequence of events? Is it

necessary to think before we feel, or do we feel an emotion and then later interpret it as fear or happiness? Psychologists have proposed contradictory answers to these questions, in a controversy that sometimes resembles the well-known debate about whether the chicken or the egg came first. We examine the evidence here as we review several historical perspectives as well as several contemporary theories of emotion.

Historical Perspectives

THE JAMES-LANGE THEORY Imagine that after having trouble sleeping, you decide to take a midnight walk. It is dark and still; no one else is in sight. Suddenly, you hear a rustling in the bushes behind you, followed by rapidly approaching footsteps. Your response will probably be one of terror: You are likely to run for your life.

What would activate your fear in this situation? Is it triggered by the sounds you hear, which in turn induce you to run? Or is it more likely that your awareness of danger causes your heart to beat faster and your legs to carry you away, and that these physical responses trigger your emotional response of fear? Decide which of these interpretations seems correct, and why, before reading on.

When such questions are put to students, the vast majority answer that hearing noises in the dark causes fear, which in turn triggers a flood of physical reactions. This “common-sense” interpretation of the activation of emotion seems quite logical (see Figure 9.2). We perceive and interpret a particular stimulus, in this case threatening noises, and these cognitive processes give rise to an emotion (fear), which triggers certain physiological responses and body movements. Along these lines, we would also conclude that we cry because we feel sad, rather than becoming sad because we cry, and that we laugh because we are happy, rather than being happy because we laugh.

However, the American psychologist William James (1884), and the Danish physiologist Carl Lange (1885), writing independently of each other, both questioned this common-sense view. Their interpretation, referred to as the **James-Lange theory**, suggests that environmental stimuli trigger physiological responses from viscera (the internal organs such as the heart and lungs). For instance, heart rate and respiration both increase. At the same time, the body may also respond with muscle movements, as when we jump at an unexpected noise. These visceral and muscular responses then activate emotional states. Thus James and Lange would argue that your fear stems from your awareness of specific bodily responses that you associate with fear—a pounding heart, rapid breathing, running legs, and so forth—rather than from your cognitions about noises in the dark.

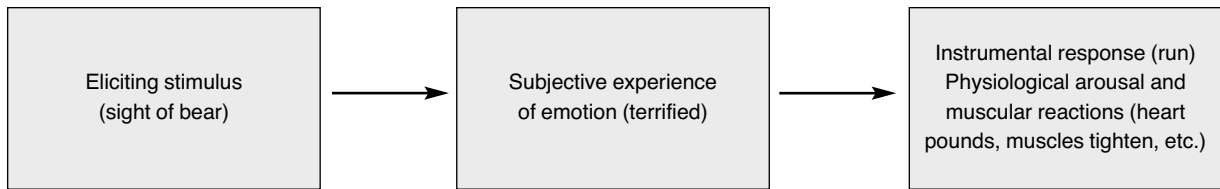
Although it might seem to contradict common sense, the James-Lange theory makes sense at some level. We have all encountered unexpected situations in which we seemed to respond automatically, before we had a chance to experience emotion. For example, if a car suddenly veered onto the sidewalk and threatened to run you down, you would no doubt leap out of the way. You might not label your heightened arousal and reactive state as one of “fear” until a moment later, when the danger had passed and you suddenly became aware that your knees were shaking and your heart was pounding. In such situa-

James-Lange theory

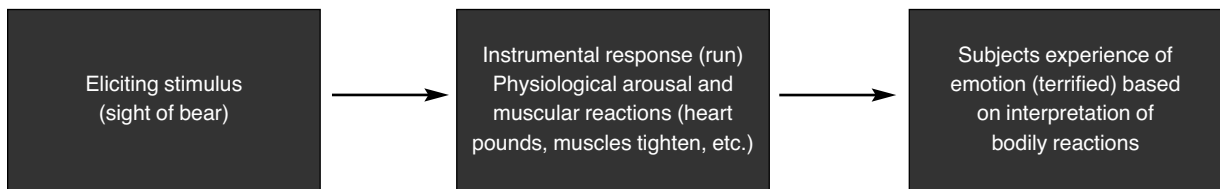
Theory that explains emotional states (such as fear) resulting from an organism's awareness of bodily responses to a situation, rather than from cognitions about that situation.

FIGURE 9.2 Theories of Emotion

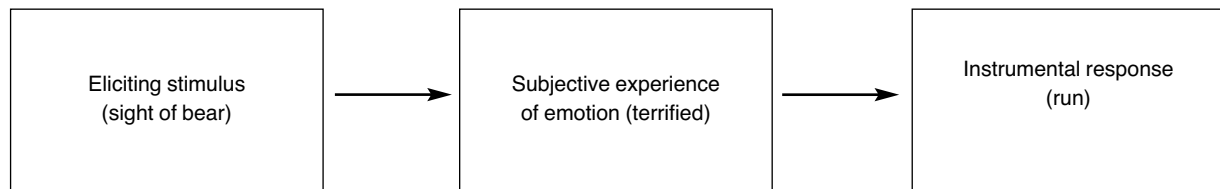
The “Commonsense” View of Emotion. We perceive and interpret a particular stimulus, and these cognitive processes give rise to an emotion that triggers certain physiological reactions and body movements. “I see a bear, feel fear, experience a flood of physiological reactions, and run because I am afraid.”



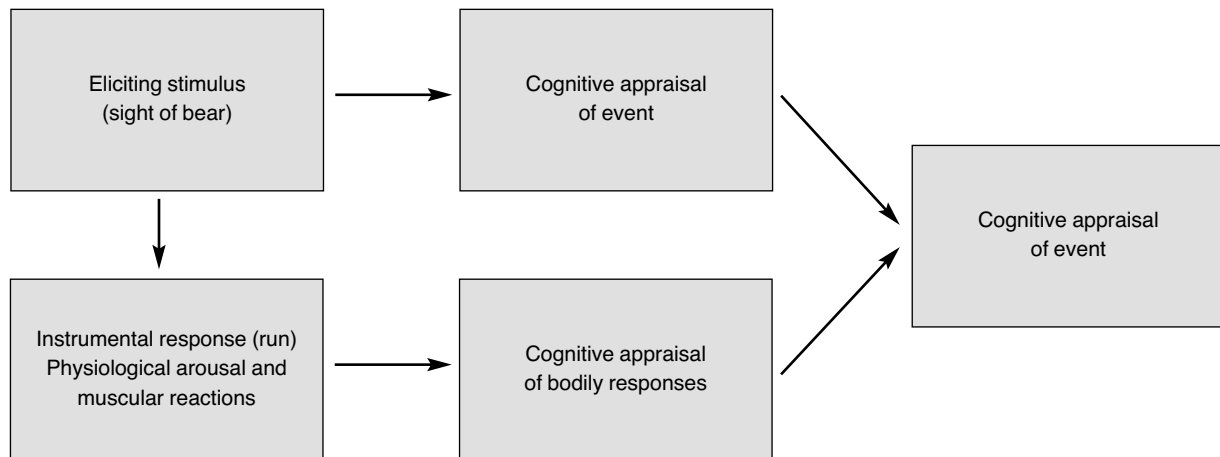
The James-Lange Theory. Environmental stimuli triggers physiological responses and bodily movements, and emotion occurs when the individual interprets his or her visceral and muscular responses. “I must be afraid because my heart is pounding and I am running like crazy.”



The Cannon-Bard Theory. Emotion is a cognitive event that is enhanced by bodily reactions. Bodily reactions do not cause emotion but rather occur simultaneously with the experience of emotion. “I am afraid because I know bears are dangerous.”



The Schachter-Singer Theory. Emotions depend upon a kind of double cognitive interpretation: We appraise the emotion-causing event while also evaluating what is happening with our bodies. “I am afraid because I know bears are dangerous and because my heart is pounding.”



tions, the emotions seem to follow the bodily changes and behavioral reactions. James and Lange argued that we often encounter situations in which behavioral and physiological reactions occur too quickly to be triggered by emotions.

Some intriguing evidence collected from human subjects with spinal cord injuries provides some support for the James-Lange theory. If feedback from the internal organs through the autonomic nervous system is important, we might expect that individuals with damage high on the spinal cord (quadriplegics) would experience emotional feelings of lower intensity than those with low injury (paraplegics), because a high injury would cut off feedback from a greater portion of the body. This conclusion is exactly what research has revealed. The higher the injury to the spinal cord, and consequently the less sensory feedback received, the less intense are the emotional feelings reported by an individual (Hohmann, 1966). One quadriplegic with high injury describes these altered feelings, comparing them to the intensity of emotions he used to feel before his injury.

Now, I don't get a feeling of physical animation. It's sort of cold anger. Sometimes I act angry when I see some injustice. I yell and cuss and raise hell, because if you don't do it sometimes, I've learned people will take advantage of you, but it just doesn't have the heat to it that it used to. It's a mental kind of anger. (Hohmann, 1966, p. 151)

While such evidence seems to support the James-Lange theory, this interpretation has also been challenged. Prominent American physiologist Walter Cannon (1927) and his student, Philip Bard, objected to the idea that different emotions have distinct patterns of visceral and muscular responses that we recognize and then interpret as emotions. Cannon and Bard collected laboratory evidence indicating that physiological changes associated with happiness, sadness, and anger were quite similar. Increased breathing and heart rate, secretion of epinephrine, and pupil dilation typically accompany all of these emotions. How can people distinguish between different emotions that are accompanied by very similar physiological responses?

Psychologists today hesitate to reject the notion that people are able to discriminate between subtle differences in visceral and muscular patterns associated with specific emotions. Recent research has demonstrated that although different emotions are associated with similar physiological changes, these changes are not identical. For example, subtle distinctions have been demonstrated between emotions such as anger, fear, happiness, and sadness. These include variations in heart rate, resistance of the skin to the passage of a weak electrical current (galvanic skin response), temperature of the hands, patterns of activity in facial muscles, and neural activity in the frontal lobes of the brain.

Certainly, these more recent findings do not prove the James-Lange theory. There is little concrete evidence that people are able to discriminate accurately between varied, often highly similar patterns of physiological and muscular responses to determine what emotions they are experiencing. However, it is possible that we are sensitive to a wide variety of these responses, and that enough of these changes occur sufficiently quickly to serve

as the basis for feelings of emotion. For example, it is not uncommon for patients beginning drug treatment for high blood pressure to report that they feel less anxious and stressed. Blood pressure medication lowered their blood pressure, which they had interpreted as stress and anxiety.

THE CANNON-BARD THEORY Walter Cannon not only criticized the James-Lange theory, he proposed an alternate theory of emotion. Cannon argued that autonomic and muscular changes are not the cause of emotion. Instead, emotional experiences and physical changes occur simultaneously. This viewpoint, as modified by Philip Bard (1934), is known as the **Cannon-Bard theory**.

Cannon-Bard theory

Theory that emotions occur simultaneously with physiological changes, rather than deriving from body changes as the James-Lange theory suggests.

Cannon and Bard theorized that the thalamus plays a key role in our emotional responses. It not only channels sensory input to the cerebral cortex, where it is interpreted, but at the same time it sends activation messages through the peripheral nervous system to the viscera and skeletal muscles. These activation messages trigger the physiological and behavioral responses that typically accompany emotions. Cannon and Bard would explain your emotional response to being approached in the dark in the following manner. The sensory input of the sounds you heard in the dark was relayed simultaneously to your cerebral cortex and your internal organs and muscles. This activity allowed you to perceive fear at the same time that your internal organs and muscles were reacting to the stimulus. Cannon and Bard would contend that when you feel fear the emotion occurs at the same time as your pounding heart, rapid breathing, and flight from the source of the noise. James and Lange would suggest that your fear was caused by these physical changes. We will see that while both theories are partially correct, both are incomplete.

More recent research has revealed that the hypothalamus, amygdala, and certain other structures in the limbic system are the brain centers most directly involved in integrating emotional responses—not the thalamus. However, the Cannon-Bard theory should be credited with pointing out the important role of central brain processes in our emotional responses. The James-Lange theory, on the other hand, correctly identified the important role of peripheral, autonomic processes in emotion.

A more recent theory, known as the Schachter-Singer theory, presents an interesting assessment of the role of appraisal or judgment (cognitions) in our ability to correctly identify a variety of emotions from very few distinct physiological states.

Schachter-Singer theory

Theory that a given body state can be linked to a variety of emotions depending on the context in which the body state occurs.

Contemporary Theories

THE SCHACHTER-SINGER THEORY In the early 1960s, Stanley Schachter and Jerome Singer (1962) developed the **Schachter-Singer theory** of emotions, which combined elements from both the James-Lange and the Cannon-Bard theories. Schachter and Singer believed that emotion follows behavioral and physiological reactions, as suggested by James and Lange, but they also agreed with Cannon and Bard that cognitive processes are central to emotional experience.

Instead of viewing emotion as a joint effect of both physical reactions and cognitive appraisal, Schachter and Singer maintained that emotions depend on a kind of double cognitive interpretation: We appraise the emotion-causing event while also evaluating what is happening with our bodies. The key process in emotional arousal is how we interpret feedback from our bodies in light of our present situation.

For example, suppose you have just run several blocks across campus to avoid being late to a class. You probably note that you are panting and sweating and that your heart is pounding, but you are unlikely to experience an emotional response to these heightened physical reactions. If you experience these same physical responses under different circumstances, however—for example, while running across a farmer's field to escape an enraged bull—you would probably interpret your arousal as fear.

The James-Lange view proposed that a given state of bodily reaction and arousal produces a specific emotion. Schachter and Singer suggested that a given physiological state could produce a variety of emotions, depending on the context within which it occurs. From this point of view, we might interpret highly similar patterns of arousal as reflecting distinctly different emotions in different contexts.

Schachter and Singer (1962) designed an ingenious experiment to test this theory. Male college student volunteers were told they would be participating in an experiment dealing with vision. All were given an injection of a substance the experimenters called Suproxin, which was described as a vitamin compound that would temporarily affect vision. In reality, some subjects were injected with the hormone epinephrine, which is known to increase heart and respiration rates and blood pressure, produce muscle tremors, and generally cause a jittery feeling. Other subjects, the control group, were merely injected with a placebo that produced no physical effects. The experimenters manipulated their subjects' cognitions about the cause of their arousal by providing accurate or inaccurate information about the connection between their symptoms and the earlier injection. Some of these subjects (the *informed group*) were told that some people react to Suproxin with the side effects just described. A second group of subjects (the *uninformed group*) received no information about side effects, and a third group (the *misinformed group*) received false information, for example that the drug might cause itching or facial numbness.

Next, all subjects experienced certain staged social cues during a 20-minute "waiting period" before the vision test (which never actually took place). Subjects were placed, one at a time, in the waiting room with another person who was introduced as a fellow subject, but who was actually a confederate of the experimenters. Half of the waiting subjects were exposed to a euphoria condition in which the accomplice behaved in a happy manner, engaging in such playful activity as shooting baskets by throwing paper wads into a trash can. These subjects were repeatedly asked to join in the good fun. In contrast, the other half of the subjects were assigned to an anger condition. They and the accomplice were asked to fill out a questionnaire, to which the accomplice reacted by grumbling loudly, tearing up the questionnaire, and eventually storming out of the room in a state of high anger. During these staged waiting periods, the subjects' behavior

was observed through a one-way mirror; each subject was also questioned about his emotional state.

Assuming that Schachter and Singer's view of emotional arousal is correct, what pattern of results would you predict in this experiment? Were the subjects' assessments of their physiological state influenced by the confederate's antics? Were there differences between the informed, uninformed, and misinformed group? Before reading on, take some time and attempt to predict the probable outcome of this experiment.

Schachter and Singer predicted that subjects in the informed group, who knew that the injected drug was the cause of their physical arousal, would not experience any strong emotion. It was assumed that they would observe their trembling hands and pounding heart and conclude that the drug was really doing its stuff. In contrast, subjects in the uninformed and misinformed groups would be aware of their arousal but have no obvious explanation for it. Therefore, it was assumed that they would cognitively appraise their environments for a logical explanation and a suitable label for the arousal they were experiencing (see Table 9.1).

The researchers' hypothesis is essentially what occurred. The subjects who had been uninformed or misinformed tended to use the confederate's behavior as a relevant cue for identifying and labeling their own unexplained arousal as either anger or euphoria. In contrast, subjects in the informed group or the control group, who were either not aroused or who had an appropriate explanation for their arousal, tended not to share the confederate's emotional state.

The Schachter-Singer theory has directed the attention of psychologists to the important role of cognitive interpretation in emotional experience. However, Schachter and Singer's theory and supporting research are not without critics. Several researchers have criticized the design of the classic 1962 experiment, and some attempts to replicate its findings have produced somewhat inconsistent results (Leventhal & Tomarken, 1986; Marshall & Zimbardo, 1979; Maslach, 1979). Furthermore, our own everyday experiences suggest that many emotions, particularly those that are triggered spontaneously and instantly by sudden stimuli, do not appear to result from interpreting and labeling unexplained arousal. For example, if you heard screeching tires as you were walking across a street, you would probably experience fear long before you had cognitively assessed why your heart was in your throat.

TABLE 9.1 Result from the Schachter and Singer Experiment

Informed Group	Misinformed Group
Hmm—my hands are shaking, my heart is pounding, and I feel jittery all over. It must be the effects of the drug.	Euphoria condition: Boy, I feel great—on top of the world just like that other guy over there. Anger condition: I don't blame the other guy for being mad. I'm ticked too.

TOMKINS' FACIAL FEEDBACK THEORY Still another explanation of emotions relates directly to some studies conducted by Charles Darwin in the late nineteenth century (1872). According to Darwin, each emotional “state of mind” was associated with a stereotyped set of reactions that were common within each species. In addition, emotional states that were essentially opposite were associated with an opposite set of reactions. For instance, in greeting its master a dog displays a submissive posture like that shown in the top illustration in Figure 9.3a. This set of reactions is opposite to those displayed in the aggressive posture shown in the second image in Figure 9.3a.

Can you think of reasons why opposite emotional states are displayed with essentially opposite postures? What selective advantage might this have? Darwin believed that the advantage of opposite postures for opposite emotional states was that this minimized the possibility of emotional states being confused. Because there are few, if any, postural similarities between aggressive and submissive postures, they are unlikely to be treated similarly.

Darwin also believed that many human emotional expressions, particularly patterns of facial display, result from inherited traits that are universal in the human species. Enlisting the aid of missionaries and other people from all over the world, he conducted the first recorded study of facial expression of emotions. Darwin asked his recruits to observe and record the facial expressions of the local population in a variety of emotional contexts. Comparing their observations, he found a remarkable consistency in the facial expressions associated with such emotions as anger, fear, disgust, and sadness.

Darwin's findings were borne out a century later in studies by Paul Ekman and his associates (Ekman, 1982; Ekman & Friesen, 1984). These researchers demonstrated that people in various parts of the world not only show emotion with similar facial expressions, they also interpret these expressions in the same way. Ekman and his colleagues took photographs of American faces depicting happiness, anger, sadness, surprise, disgust, and fear. (Figure 9.4 shows examples of these six emotions.) They then asked people from several different cultures (including the United States, Japan, Brazil, Chile, Argentina, and the Fore and Dani tribes in remote regions of New Guinea) to identify the emotions shown in the photographs. People from all of these cultures were able to identify the emotion from the facial expression with better than 80 percent accuracy. Furthermore, American college students who viewed videotapes of emotions expressed facially by members of the Fore society were also able to identify these basic emotions, although they sometimes confused fear and surprise.

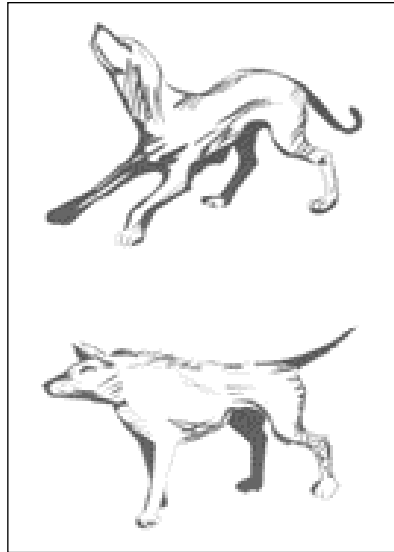
A number of researchers have argued that facial muscles respond very rapidly and with sufficient differentiation to account for a wide range of emotional experience; some have theorized that feedback from our own facial expressions determines our emotional experiences. Perhaps the most influential proponent of this **facial feedback theory** is Sylvan Tomkins (1962, 1963). Like James and Lange, Tomkins argues that different kinds of physical actions precede different brain mechanisms linked to the emotions of fear, anger, happiness, sadness, surprise, interest, disgust, and shame. Tomkins also argues that a specific facial display is universally associated with each of these neutral programs. Emotion,

Facial feedback theory

Theory that specific facial displays are universally associated with the expression of the emotions of fear, anger, happiness, sadness, surprise, interest, disgust, and shame.

FIGURE 9.3 Emotional Expression in Animals

a. Emotional expression in dogs. Note that opposite postures represent opposing emotions.



b. Emotional expression in chimpanzees. These illustrations show the facial expressions of chimpanzees:

- | | |
|--------------------|-----------------|
| (a) glaring anger | (g) frustration |
| (b) barking anger | (h) sadness |
| (c) fear | (i) crying |
| (d) submission | (j) excitement |
| (e) fear-affection | (k) playfulness |
| (f) affection | |

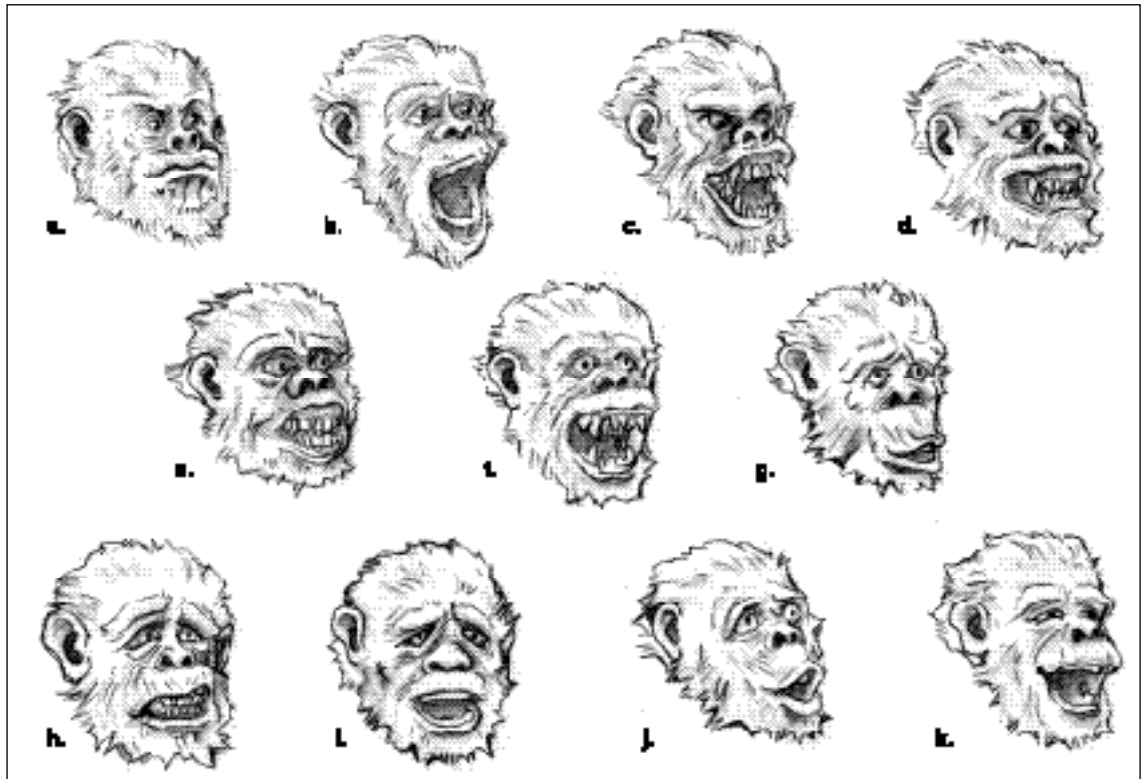
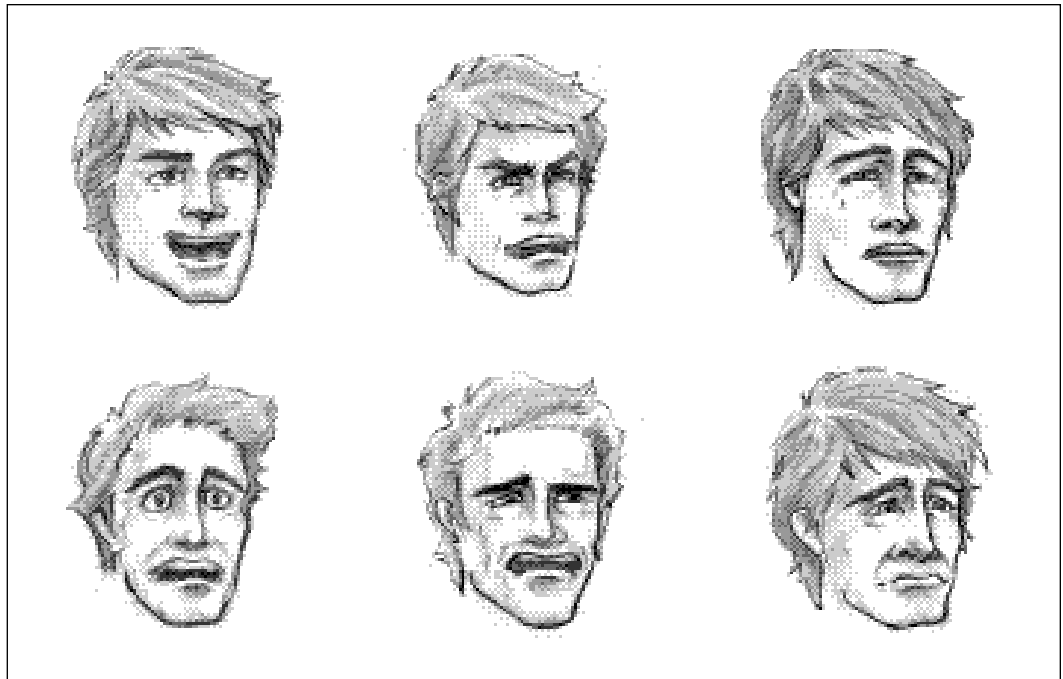


FIGURE 9.4 Facial Expressions Used by Paul Ekman

The faces, from left to right, were intended to represent happiness, anger, sadness, surprise, disgust, and fear.



according to Tomkins, is independent of cognition and is part of one's genetic endowment. More current research with infants supports this contention (Demos, 1993).

Tomkins' notion of universal facial expressions was supported by the cross-cultural research just discussed, and further support was provided by an intriguing two-part experiment conducted by Paul Ekman and his associates (1983). Here, professional actors were employed as subjects. In the first part of the experiment, each subject was coached, with the aid of a mirror, to assume a specific facial expression corresponding to each of the six emotions in Figure 9.4. They were told exactly which muscles to contract, but they were not asked to feel or express a particular emotion. As a control measure, some actors were coached to move muscles not involved in a particular emotional expression. As the subjects molded their facial expressions, several physiological responses were measured, including heart rate, galvanic skin response, temperature of the hands, and muscle tension in the arms. In the second phase of this experiment, subjects were simply asked to think of emotional experiences in their lives that produced each of the six emotions. For example, subjects might recall a recent encounter that made them angry.

Two major findings emerged from this study. First, the researchers noted that each of the four negative emotions of anger, fear, disgust, and sadness, whether induced by facial modeling or thinking of an emotional experience, was accompanied by a distinct physiological "fingerprint" or pattern of physical responses. For example, heart rate was much greater in anger than in disgust and the hands were colder in fear than in anger. Table 9.2 shows the increases or decreases in heart rate and skin temperature for each of the six acted

TABLE 9.2 Heart Rate and Skin Temperature

Both heart rate and skin temperature were associated with different acted emotions in Ekman's experiment.

Specific Emotion	Change in Heart Rate (beats/min.)	Change in Skin Temperature (degrees C)
Anger	+8.0	+ .16
Fear	+8.0	-.01
Distress	+6.5	+.01
Joy	+2.0	+.03
Surprise	+1.8	-.01
Disgust	-0.3	-.03

SOURCE: Ekman, Levenson, and Friesen (1983)

emotions. Ekman's findings seem to support James and Lange's assertion that different emotions are associated with distinct patterns of physiological response.

The second and perhaps the most intriguing finding in this experiment is that when the subjects simply followed instructions to move their facial muscles to mirror a given emotion, they also experienced patterns of physiological arousal that were comparable to those recorded when they relived an actual emotional experience. In some instances, the physiological signs of emotion were more pronounced when the subjects merely moved their facial muscles than when they thought of an emotional experience.

Can you think of a possible application of the research findings of Paul Ekman and his colleagues? Might this information be applied to enhance our emotional lives? Think about this question for a moment or two before reading on.

Ekman's findings do have some practical implications. We have all heard the sage advice to "keep our chins up" or to "put on a happy face" when we are feeling sad or depressed, and this research suggests that there may be some validity to this advice. Subjects felt happy just by contracting the facial muscles associated with happiness. Perhaps if we make the effort to act cheerful, smile, and laugh when we feel down in the dumps, we will in turn feel more cheerful and less sad.

Several studies have provided experimental support for this speculation (Izard, 1990). For example, in one study subjects were instructed either to suppress or exaggerate the facial expression associated with the fear and discomfort of receiving electric shocks. The researchers monitored physiological arousal during the course of shock administration and also obtained written self-reports of the subjects' feelings. The results revealed that subjects who had been told to suppress their facial expression demonstrated lower physiological arousal and reported less negative feelings than the participants who were not instructed to conceal their facial reactions (Lanzetta et al., 1976).

These results should be interpreted with some caution, however. Masking our true feelings may not always be helpful, and in some instances it may actually impede our ability to deal effectively with our feelings. Nevertheless, we all experience circumstances in

which we would like to feel just a bit more cheerful. Perhaps in these situations, masquerading the desired emotion may be helpful.

SOLOMON AND CORBIT'S OPPONENT-PROCESS THEORY The author has a brother who is an avid rock climber. Some years ago he experienced a climbing accident that almost ended his life. However, he is now back rock climbing with just as much zest and enthusiasm as before, perhaps even more. What accounts for his continued participation in a sport that must arouse intense emotion at both ends of the scale—both high fear and ecstatic exhilaration? For that matter, why do people jump out of airplanes with a parachute strapped on their backs, shoot the rapids of wild rivers, ski off extremely steep mountain slopes, or return to a sport that almost killed them?

Some years ago psychologists Richard Solomon and J. D. Corbit (1974) proposed a theory of emotion that attempts to answer these questions. According to their **opponent-process theory of emotion**, people are inclined to maintain a relatively even keel or balance in their emotional lives. When a strong emotional response to a particular stimulus event disrupts this homeostatic balance, an *opponent-process*, or opposite emotional response, is eventually activated to restore equilibrium in our emotional state. Thus, if our initial response to being confronted with Class 5 (wild water) rapids is sudden terror, we will probably subsequently experience elation after successfully negotiating the rapids—a positive or opposite emotion that cancels out the original negative emotion, thus restoring us to a neutral or balanced emotional state.

From this perspective, emotions are viewed as possessing *hedonic value*, which is to say they vary from being extremely positive or pleasant to being very negative or unpleasant (Solomon, 1980, 1982). When an emotion of a particular hedonic value is aroused, it will be followed shortly by its hedonic opposite. Thus, when we are elated we can expect that this emotion may eventually give way to feeling somewhat down or depressed. Likewise, fear is replaced with elation (or at least relief), pain with pleasure, anxiety with calm, boredom with interest, and so forth.

Solomon and Corbit theorized that under normal conditions, when we encounter a particular emotion-arousing stimulus only now and then, the opponent emotional states would be sufficiently equalized in intensity to balance each other out. Thus if we go rock climbing only once each year, we can expect to continue experiencing the same relative intensities of high terror and elation that serve to balance our emotional equilibrium. However, what happens if we become avid climbers after our initial encounter with this exhilarating sport? Solomon and Corbit would argue that when we repeatedly expose ourselves to a situation that arouses the same intense emotion, our initial emotional reaction will gradually weaken over time while the opponent emotional reaction will grow stronger. Therefore, we can expect that our terror of heights will gradually diminish to a level of anxiety just sufficient to get the adrenaline pumping. In contrast, our euphoria after successfully negotiating a steep pitch can be expected to become more intense or powerful as time goes on.

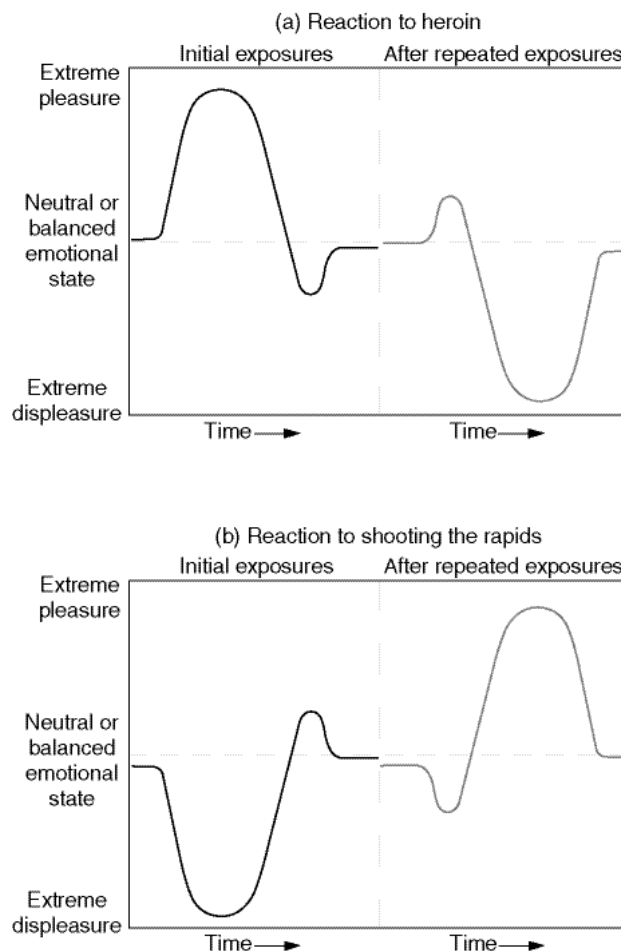
Opponent-process theory of emotion

Theory that when a strong emotional response to a particular stimulus disrupts emotional balance, an opposite emotional response is eventually activated to restore emotional equilibrium.

This weakening of the initial emotional response together with the eventual dominance of the opponent-process emotion explains why river runners, rock climbers, skydivers, race car drivers, and other risk takers find that the more they engage in their thrilling sports the more enjoyable these activities become. The opponent-process theory has also been used to explain addiction to certain addictive drugs like nicotine, heroin and cocaine (Ettenberg, et al., 1999; Knackstedt, et al., 2002; Watkins, 2000). Most people experience intense pleasure and an emotional high during their initial exposure to cocaine. However, as any addict can attest, the pleasure associated with using this drug typically decreases with repetitive use. Animals, for example, will initially seek the location where cocaine is administered, but later avoid that location. This is additional evidence that the motivation to seek the drug is eventually replaced by motivation to avoid withdrawal (see Figure 9.5).

FIGURE 9.5 Opponent-Processes

Part (a) demonstrates how, with repeated use of heroin, the pleasure decreases while the displeasure associated with withdrawal increases. Part (b) portrays the likely response of a river runner as he repeatedly shoots the rapids. Each encounter with this sport may result in decreased fear and an increase in the pleasure associated with it.



This drug-related phenomenon stands as stark testimony to Solomon's observation that people who seek pleasure often pay for it later, and that with repeated pleasure seeking the pleasure itself often loses much of its intensity. Of course, as previously noted, the reverse is also true: the fear component of risky, thrill-seeking activities often diminishes over time as exhilaration and euphoria intensify with each additional experience. It is in this way that the opponent-process theory accounts for the apparent shift in motivation for many activities. For instance, the motivation to use drugs the first few times may be the intense euphoria associated with those drugs. Later, the motivation shifts to the avoidance of the aversive nature of drug withdrawals. Before reading on, try to think of other examples of where the motivation and emotion associated early on with an activity have been replaced by its opposite.

In concluding our discussion of theories of emotion, we must acknowledge that many questions remain to be answered. Instead of one comprehensive theory that encompasses all human emotional expression, we have discussed several diverse theories. Each theory helps to explain at least a part of the process whereby emotions are activated, and all of them are supported to some degree by research. In the next section we will examine one emotion, stress, and its relation to our well-being in more detail.

STRESS

We have all learned that negative emotions such as fear, anxiety, anger, and depression often exact a price in our lives in the form of impaired functioning, fatigue, symptoms of physical discomfort, and even illness. Disruptive, unpleasant thoughts and emotions play a major role both in contributing to stress and as key components in the manifestation of reactions to stress. Thus we end this chapter with a somewhat detailed discussion of the topic of stress, including comments about the nature of stress and stressors, physiological and psychological responses to stress, and the relationship between stress and illness.

The Nature of Stress

Although we are all familiar with stress, it is an elusive concept to define. One reason for this is that stress means so many different things to different people, researchers and laypersons alike. Some of us think of stress as sweaty palms, a fast-beating heart, gritted teeth, and a churning stomach. Consistent with this impression, researchers have for many years focused on the physiological changes that accompany stress. More recently, however, the study of stress responses has been expanded to include emotional, cognitive, and behavioral changes as well as physical reactions. When we are feeling stressed we may be more inclined to describe our condition as being unprepared for an exam, feeling crowded in our apartments, or being embarrassed by a friend, rather than focusing on our bodily or psychological responses.

Stress

Process of appraising events or situations as harmful, threatening, or challenging, of assessing potential responses, and of responding to those events. Also, a pattern of physiology that accompanies threatening events.

Most contemporary researchers believe that an adequate definition of stress must take into account the interplay between external stressors and our physical and psychological responses. This relationship is neither simple nor predictable, for it varies from person to person and from day to day. As we see later in our discussion, this variation occurs because stress is inextricably connected to our cognitive appraisals of events (Lazarus & Folkman, 1984; Lazarus, 1993). According to Lazarus, **stress** is the process of appraising events (as harmful, threatening, or challenging), of assessing one's potential to control or cope with the event, and continuing reappraisal as new information becomes available. Appraisal and reappraisal do not always result in less stress; they may actually lead to an increase in stress if coping strategies are not effective or available. In the following paragraphs we examine physiological and psychological responses to stress as well as the situations that produce stress. We then explore what we know about the role stress plays in some common illnesses.

Physiological Responses to Stress

In the 1930s Canadian researcher Hans Selye was conducting research that he hoped would lead to the discovery of a new sex hormone. The leads were promising. When he injected rats with extracts of ovary tissue, the results were consistent: bleeding ulcers in the stomach and small intestine, enlargement of the adrenal cortex, and shrinkage of the thymus gland. Since no hormone was known to produce these effects, Selye was convinced that he was on the track of identifying a new one. His elation was quickly dampened, however, for when he injected extracts from other tissues, the effects were identical. Furthermore, the same thing occurred when he injected toxic fluids that were not derived from tissues.

Selye was devastated by this turn of events. But instead of giving up, he tried to determine what had happened. The answer occurred to him only when he stopped trying to relate his findings to the discovery of a new sex hormone. In his own words,

It suddenly struck me that one could look at [my ill-fated experiments] from an entirely different angle. [Perhaps] there was such a thing as a single nonspecific reaction of the body to damage of any kind. (1976, p. 26)

Selye went on to study how animals responded to a wide range of stressful events other than injections. He exposed rats to a variety of adverse conditions such as extreme cold and fatigue, electric shock, immobilizing restraint, and surgical trauma—and noted the same physiological response pattern he had originally observed with injections of tissue extracts. As we see later in this chapter, Selye also learned that humans respond to stress with fairly consistent physiological patterns (1936, 1956, 1974, 1976). The awareness that stress can have harmful effects on our bodies has led to many more studies, as well as techniques for reducing the impact of stress on our own lives.

Hans Selye's observations of how his rats responded to stressors led him to formulate the concept of the **general adaptation syndrome (GAS)**. According to this notion, when

General adaptation syndrome (GAS)

Progressive responses to prolonged stress in which an organism mobilizes for action and compensates for stress.

an organism is confronted with a stressor, its body mobilizes for action. This mobilization effort is mediated by the sympathetic nervous system, and it works primarily through the action of specific stress hormones on the body's muscles and organ systems. The response to stress is *nonspecific*, for the same physiological reactions occur regardless of the stressor. Selye also noted that repeated or prolonged exposure to stress that is not adequately managed or reduced results in tissue damage (such as bleeding ulcers), increased susceptibility to disease, and even death in extreme cases.

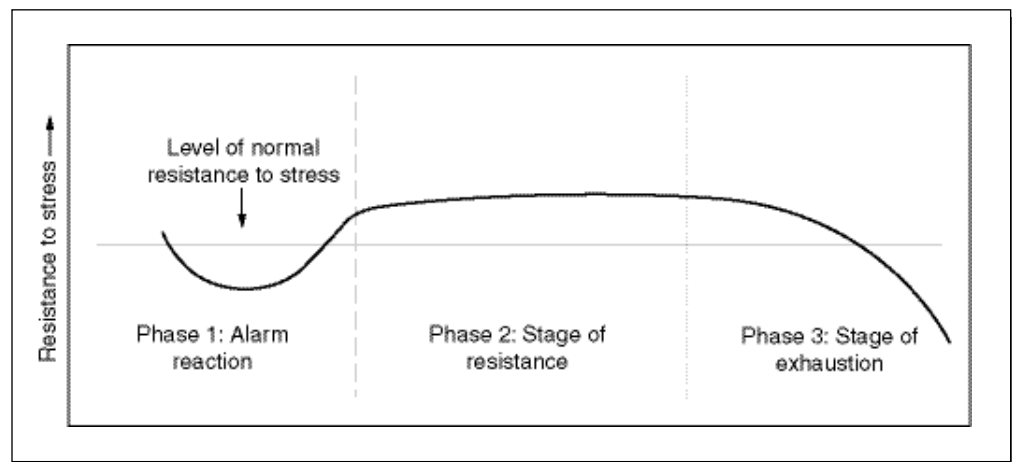
ALARM, RESISTANCE, AND EXHAUSTION (ARE) Selye described three phases of the general adaptation syndrome: alarm, resistance, and exhaustion (see Figure 9.6). When an organism is exposed to a stressful event, it first experiences an alarm reaction in which it mobilizes to meet the threat. A sudden arousal of the sympathetic nervous system produces a flood of stress hormones—corticosteroids from the adrenal cortex and epinephrine (often called adrenaline) and norepinephrine from the adrenal medulla.

These hormones prepare the body for “fight or flight” by producing a number of physiological reactions. First, our heart rate is likely to increase, as is blood pressure. This activity forces blood to parts of the body that may need it for strenuous physical activity such as flight away from danger. We experience this response as a pounding heart, like the rapid-fire thumping you may have felt after barely avoiding an accident on the freeway. Sugars and fats also flood the blood to provide fuel for quick energy. This emergency response provides extra reserves, with the result that people are often able to perform seemingly superhuman feats (such as lifting a heavy beam off a person trapped in a mine cave-in) that they could not otherwise perform. Digestion slows or ceases during the alarm stage, making more blood available to the muscles and brain.

Our breathing rate also accelerates to supply increased oxygen to muscles poised for greater than normal output. Thus people often have difficulty catching their breath after a

FIGURE 9.6 Three Phases of Selye's General Adaptation Syndrome

SOURCE: Adapted from Selye, 1956



severe fright. Still another response to stress is a tensing of the muscles in preparation for an adaptive response. This explains the stiff neck, sore back, and painful aching legs that many people experience after a long, hard exam or a rough day at work.

We also tend to perspire more when under stress—a response that acts as a kind of built-in air conditioner that cools our energized bodies. It also allows us to burn more energy (which produces heat) when we are faced with emergency situations. This is why many people find themselves drenched with perspiration after giving a speech or undergoing a stressful interview.

Finally, clotting agents are released into the blood when we are under stress, so that our blood will clot more rapidly if we are injured. One reason why we may not notice an injury we receive during an accident or fight is because the wound may have bled very little. Table 9.3 summarizes these responses to stress.

We are not able to maintain the alarm phase's high level of bodily response or sympathetic activity for very long. Eventually the parasympathetic nervous system comes into play, providing a braking mechanism for the organs activated by the sympathetic system. At this point the organism enters into the second stage of resistance. Now the body continues to draw upon resources at an above-normal rate, but it is less aroused than in the alarm state.

If the stress is prolonged or repeated, an organism is likely to enter the third stage of exhaustion. As a direct result of the continued drain on resources, the body tissues may begin to show signs of wear and tear during the exhaustion stage. Susceptibility to disease also increases, and continued exposure to the stressor is likely to deplete the organism's adaptive energy. The symptoms of the initial alarm reaction are likely to reappear, but resistance is now decreased and the alarm reaction is likely to continue unabated. If the organism is unable to develop strategies to overcome or cope with stress, serious illness or even collapse and death may result.

Selye's model has had a profound impact on our understanding of stress and its links to illness. It not only provides a way of conceptualizing our physiological response to events in the environment, it also provides a plausible explanation for the relationship between stress and disease. Few medical experts today disagree with Selye's basic contention that prolonged stress will often produce bodily wear and tear and erode our ability to resist disease if it is not effectively coped with. However, Selye's theory has also been criticized on a few

TABLE 9.3 Some Physiological Responses to Stress

-
- Heart rate and blood pressure increase, forcing blood to parts of the body that may need it for strenuous physical activity
 - Digestion slows or ceases, so that more blood is available to other organs
 - Breathing rate accelerates to provide increased oxygen to bloodstream
 - Muscles tense in preparation for an emergency response
 - Perspiration increases, acting to cool the body
 - Clotting agents are released in the blood to prevent loss of blood in case of injury
-

counts. One criticism is that Selye failed to acknowledge the important role of psychological factors in stress responses. For example, the significant role of cognitive appraisal in determining the extent to which we assess a particular environmental event as stressful. Furthermore, some newer evidence suggesting that particular stressors may be associated with distinctly different physiological responses calls into question Selye's assumption of non-specificity in reaction to stress. For example, exercise stress produces a pattern of physiology quite different from emotional stress (Dimsdale and Moss, 1980).

Another Way to Look at Stress Management

In the author's classes, he sometimes will raise a glass of ice tea and ask, "how heavy is this glass of tea?"

The answers range from 20g to 450g. I then reply the absolute weight of the glass and tea does not matter. It really depends on how long you choose to hold on to it. If I hold it for a minute, that is not usually a problem. If I hold onto it for a day, you will need to send me to the hospital. In each case, it is the same weight, but the longer I hold onto it the heavier it becomes.

Stress Management is very similar. We often carry our burdens around most of the time, as the burden becomes increasingly heavy, we will eventually not be able to carry on. Just as with the tea, we have to put it down for a while and rest before picking it up again. When you feel refreshed, you can pick it up again and carry on.

So, before you get home tonight, leave the burden of work at work. Do not carry it home. Whatever your burdens are, let them down for a moment and breathe deeply. You can always pick them up later.

Remember life keeps coming at us.

There will always be time to get back in the Stress Game.

Psychological Responses to Stress

Most of Selye's work focused on endocrine responses to stress in nonhuman animals, most notably rats. In recent years, however, increased attention has been directed to assessing the importance of psychological factors in stress reactions. It is now widely recognized that stress affects not only our bodies but also how we think, feel, and behave.

STRESS ASSOCIATED WITH A CONFLICTUAL RELATIONSHIP It has been reported hundreds of times anecdotally as well as in literature, (Kiecolt-Glaser and others, 1993), that the greatest form of stress happens when relationships are in conflict. A certain level of disagreement is essential and healthy for the re-establishment of boundaries and the understanding of the other person's needs as well as desires. When conflict becomes excessive, then there is value in looking at the dynamics of the relationship in a closer way.

When evaluating the impact of a conflictual relationship, one might look at the Spillover theory of Stress and observe how just such a process can, and often does affect all

areas of our life. It is the author's belief that an unhappy marriage will affect a person's work life as well as their social interest.

Marital spats are not good for health. Ninety healthy newlyweds spent a half an hour discussing problem areas in their marriage; some couples became angrier than others, and they suffered more immune system suppression the following day (Kiecolt-Glaser and others, 1993)

COGNITIVE RESPONSES TO STRESS If you think back to a situation in which you were under a great deal of stress—after breaking up with a partner, for instance, or perhaps receiving a rejection letter from a special school you were set on—it is quite possible that your cognitive responses stand out more clearly in your memory than your physiological responses. Typical cognitive responses may include reduced ability to concentrate, higher than normal levels of distractibility, impaired performance on cognitive tasks (such as reading or doing your homework), and sometimes a tendency to be plagued by disruptive or morbid thoughts. People who are under a great deal of stress often find that their attention wanders and that they are easily distracted. It is also common to be troubled by intrusive, repetitive thoughts such as “I'm worthless” or “I just don't have what it takes,” especially after experiencing a setback such as the loss of a job.

We often react to stressful events by employing one or more *defense mechanisms*, unconscious strategies for avoiding anxiety. For example, we may seek to minimize the harm or threat of a stressful event by blocking it from our conscious awareness (a defense mechanism known as *repression*), engaging in *rationalization* (the professor gives impossible tests and that is why I failed the test), or *cognitive dissonance* (I had to cheat to keep up with the cheaters in the class), and so on.

Stress may also result in positive cognitive responses, as we learn new ways to cope with or neutralize the stressful event. For example, you may learn to cope with the stress of getting caught in rush-hour traffic by leaving for class earlier or not scheduling courses at times that coincide with heavy commuter traffic, or you may take a basic course in auto mechanics to avoid the stress of a car that does not operate properly. Or perhaps you know a really good and reliable mechanic that you can call if you have car trouble.

Why do some stressful situations produce negative effects, whereas others have a positive outcome? Psychologist Richard Lazarus (1999) proposes that our cognitive appraisal and conclusion of a stressor makes a difference in our immediate response as well as our ability to cope with the stressor in the long run. Lazarus maintains that when we confront situations that may be potentially stressful, we first engage in a process of *primary appraisal* to determine if the event is positive, neutral, or negative. If we consider an event to be negative, we further appraise it to determine how harmful, threatening, or challenging it is.

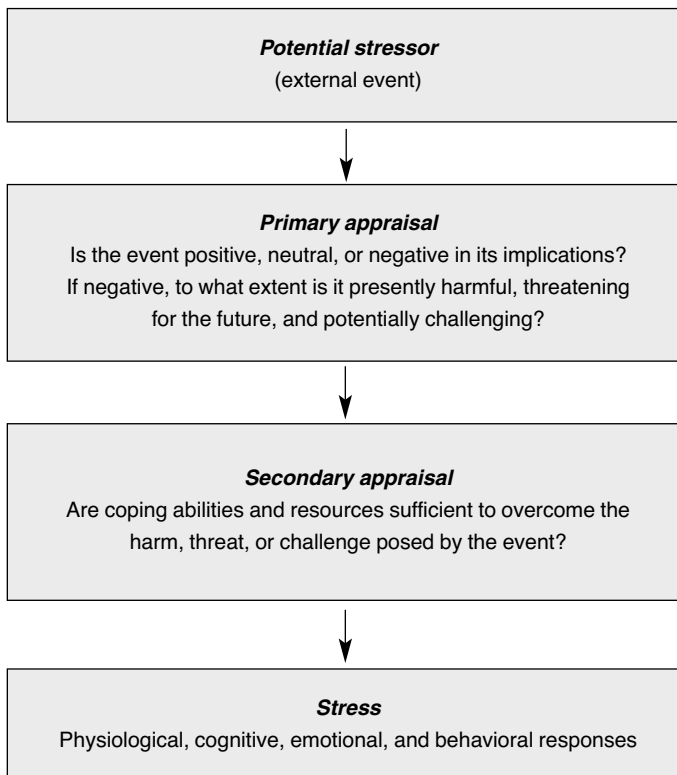
For example, suppose your girlfriend just broke up with you after 2 years. This potentially very stressful event is one you might appraise according to the three dimensions of harm, threat, and challenge. *Harm* is your assessment of the damage inflicted immediately by the event, such as damaged reputation, lowered self-esteem, loss of intimacy, and the

conclusion that you have failed. *Threat* is your assessment of possible future damage that may result from the unpleasant occurrence, such as a reluctance to develop another close intimate relationship out of fear that the same painful experience will be repeated. Finally, you may appraise your broken engagement in terms of the *challenge* it provides to overcome and profit from the event. Perhaps you had second thoughts yourself about the relationship, and you may see your new unattached status as providing opportunities for other involvements.

Once we complete the process of primary appraisal of potentially stressful events, Lazarus suggests that we engage in a *secondary appraisal* to determine whether or not our coping abilities and resources will allow us to overcome the harm or threat and successfully meet the challenge. The end result, in terms of the amount of stress we actually experience, represents a blending or balance between these two processes of primary and secondary appraisal. If we perceive the harm and/or threat to be very high, we are likely to experience a high degree of stress. On the other hand, if we think we can cope with the situation, we are likely to experience far less stress. Figure 9.7 summarizes Lazarus' psychological model of stress.

EMOTIONAL RESPONSES TO STRESS Negative emotional states are strongly associated with stress. Emotional responses to stress include such feelings as anxiety, irritability,

FIGURE 9.7 Lazarus' Psychological Model of Stress



anger, embarrassment, depression, helplessness, and hostility. Anxiety is potentially one of the most damaging emotional reactions. It is especially likely to develop when we perceive a marked imbalance between the threat posed by a stressor and our personal resources for coping with it. We have seen in previous discussions how devastating anxiety can be. People who are unable to cope effectively with anxiety become physically and psychologically drained, a condition that increases their susceptibility to a variety of disorders (Parker, 1975).

BEHAVIORAL RESPONSES TO STRESS There are so many behavioral responses to stress that are only limited by a person's creativity. We have seen, however, that two general classes of adaptive behavioral responses are suggested by the biological response of fight or flight. In some cases we take some kind of assertive action (*fight*) to confront stressors. For example, if you find that your home environment is stressful because of a parent who is constantly nagging at you, you may eventually confront the complaining parent. By confronting the source of your stress, you may be able to clear the air and find mutually acceptable ways of reducing or eliminating this stressor in your life. Sometimes, however, people prefer to withdraw from a threatening or harmful situation (*flight*). That is, you may decide you will experience less stress if you move into your own place, give yourself time to reevaluate, and come up with a different approach.

Our strategies for coping with stress are not always either a clear confrontation or a clear withdrawal. A third alternative is to try to *adapt* to the stress. For example, assume you live near elevated train tracks and once every hour, at about the same time, you are disturbed by the loud noise caused by a passing train. If you are trying to study in your home, this intrusive and cacophonous noise could be a major source of stress in your life. You might neutralize this stressor simply by taking short hourly study breaks whenever a train passes. However, there are many people who might choose to move at the end of their lease. Eventually you might develop the ability to ignore the sound, often referred to as *habituation*. The Health, Psychology, and Life discussion at the end of this chapter proposes several physiological, cognitive, and behavioral strategies for reducing the effects of stress.

Recent research at McGill University suggests that early experiences can have a profound impact upon how an organism responds to stress (Bredy et al., 2001; Meaney, 1990; Meaney et al., 1988). Meaney and his associates demonstrated that rats gently handled during the first few weeks of life were subsequently better able to turn off physiological responses to stress than a comparable group of animals that were not handled during their early weeks of development. Since the nonhandled rats were unable to turn off the stress response, they were exposed to significantly higher levels of stress hormones throughout their lives than their handled counterparts (the experiment lasted 30 months, roughly the length of a typical rat's lifespan). Extensive exposure to stress hormones can cause degeneration of cells in the hippocampus, a brain structure known to play an important role in learning and memory. This fact is consistent with the research team's finding that older handled animals performed much better on a learning task than older nonhandled rats.

The research of Meaney and his colleagues poses a number of important questions. Can an organism's early experiences influence its ability to cope with stress later in life? Can the capacity to cope with stress predict whether an organism's intellect is impaired at some later point in development? And perhaps most importantly, are humans similar to rats in that individual differences in intellectual functioning among elderly people might be related to their ability to cope with stress? The answer to all of these questions appears to be yes.

Stressors

We have been looking at the ways we respond to stress, but so far we have said relatively little about the situations or events that produce stress in our lives. Are some kinds of events more likely to cause stress than others? Are stressors always negative events? We explore these questions next.

FACTORS THAT CONTRIBUTE TO STRESS Our cognitive assessments have a lot to do with the degree of stress an event will produce in our lives, but it is not true to say that all events have the same potential for eliciting stress. What characteristics increase the likelihood that we will perceive an event as stressful?

Lack of Control Have you ever heard of someone saying, "I just don't like surprises"? One of the most essential factors that contributes to the stressfulness of a situation is our lack of control over it. Thus, it is much less stressful for you to stick a hot needle into your hand (for example, when removing a splinter) than to have a physician stick a needle into your arm. Research reveals that uncontrollable or unpredictable events are generally more stressful than those we can control or predict. You might think that certain experiences, such as excessive noise, a nagging parent, or a series of painful rehabilitative exercises after a serious accident, would be stressful for anybody exposed to these events. This conclusion is not necessarily warranted, however. When people believe that they can predict, modify, or end an unpleasant event, they are likely to experience it as being less stressful (even if they take no action to modify it). The knowledge that some action can be taken may be sufficient to reduce the stress. Numerous experiments with laboratory animals support this argument.

Suddenness A second variable influencing how stressful we perceive an event to be is the suddenness with which it overtakes us. When people experience accidents, the sudden death of a loved one, or an unexpected pink slip at work, they may find it very difficult to mobilize adequate coping mechanisms. In general, it is easier to cope with challenges that we can foresee. Thus a person who loses a loved one after a protracted illness, or who loses a job after expecting to be terminated for months, may be much less stressed by these average events.

Ambiguity In general, a stressor that we perceive as ambiguous is likely to induce more stress than one that is clear-cut. In well-defined situations we may be able to deter-

mine an appropriate course of action (fight, flight, or adapt), but ambiguity forces us to spend resource-depleting energy trying to figure out the nature of the stressor and possible strategies to cope effectively with it. Research demonstrates that role ambiguity is a major cause of stress on the job. If you have a job in which your role is not clearly defined so that you do not know what is expected of you, you are likely to experience far more stress than if your employer's expectations are made clear.

Stress and Disease

Stress is widely recognized as a major factor in a wide range of physical illnesses. It has been estimated that as many as three out of four visits to physicians are prompted by stress-related problems (Charlesworth & Nathan, 1982). Furthermore, stress and stress-related behaviors may be the leading contributors to early death.

Table 9.4 compares the leading causes of death in the United States in the early 1900s and in 1997. The major health problems of the early 1900s were infectious diseases (numbers 2, 3, and 4 in the table are all infectious diseases and total 539 per 100,000), followed by cardiovascular diseases. Today the leading health problems are no longer infectious diseases but cardiovascular diseases, cancers, and strokes. Although these diseases are not new, the proportion of people who die from them has increased dramatically since 1900. Most importantly, these are all diseases that in some part can be attributed to individual behavior and lifestyle and all of them have been linked to stress. This stress link may be direct through impaired immune function or indirect through cigarette smoking, excessive drinking, poor diet, and/or lack of exercise. In this section we explore the evidence linking stress with three common, but severe, physical disorders: coronary heart disease, hypertension, and cancer.

Coronary heart disease (CHD)

Any illness that causes a narrowing of the coronary arteries.

CORONARY HEART DISEASE **Coronary heart disease (CHD)** is a general label for illnesses that cause a narrowing of the coronary arteries, the vessels that supply the heart with blood. CHD accounts for nearly 40 percent of all deaths in the United States each year (American Heart Association, 2003), many of which occur when people are still

TABLE 9.4 The Eight Leading Causes of Death in the United States, 1900 and 1997 (rates per 100,000 population)

1900	Rate	1997	Rate
1. Cardiovascular diseases (heart disease, stroke)	345	1. Cardiovascular diseases (heart disease, stroke)	331
2. Influenza and pneumonia	202	2. Cancer	201
3. Tuberculosis	194	3. Chronic obstructive pulmonary diseases	41
4. Gastritis, duodenitis, enteritis, and colitis	143	4. Accidents	34
5. Accidents	72	5. Influenza and pneumonia	33
6. Malignant neoplasms	64	6. Diabetes	23
7. Diphtheria	40	7. Suicide	11
8. Typhoid fever	31	8. Chronic liver diseases and cirrhosis	9

SOURCE: Figures for 1900 from Historical Statistics of the United States: Colonial Times to 1970, U.S. Bureau of the Census, 1975, Washington DC, U.S. Government Printing Office. Figures for 1997 from National Vital Statistics Report, vol. 47, No. 4, 1998.

in the prime of life. Millions of Americans also experience reduced quality of life as a result of the ravages of CHD.

While factors such as smoking, obesity, diabetes, family history, diets high in fat, high serum cholesterol levels, physical inactivity, and high blood pressure are all linked to CHD, these risk factors considered together account for less than half of all diagnosed cases of CHD (American Heart Association, 2003). Something else besides genetics, diet, exercise, and general health habits must be a factor in CHD, and research over the last three decades has strongly implicated stress. According to researchers, the risk of death increased by between 20 and 40 % among those individuals that had a BMI or body-mass index or (height divided by weight) of 30 or more (*The New England Journal of Medicine*, 2006).

The story of how stress was first linked with heart disease begins with an unexpected discovery by cardiologists Meyer Friedman and Ray Rosenman (1974). In the late 1950s, Friedman and Rosenman were studying the relationship between eating behavior and disease among a sample of San Francisco couples. They found that although the women consumed amounts of cholesterol and animal fat equal to those consumed by their husbands, the women were dramatically less susceptible to heart disease than the men in the study. Since most of the men were employed and their wives were not, Friedman and Rosenman began to suspect that job-related stress might be implicated in the sex differences in CHD. Following up on this hunch, they mailed questionnaires to hundreds of physicians and business executives, asking them to speculate about what had caused the heart attacks of their patients, friends, and colleagues. Their responses overwhelmingly blamed job-related stress.

Type A

Individuals who are hard-driving, ambitious, competitive, easily angered, time conscious, and demanding of both themselves and others, as described by Friedman and Rosenman in their study of coronary heart disease.

Type B

Individuals who are relaxed, easygoing, not driven to achieve perfection, happy in their jobs, understanding, and not easily angered, as described by Friedman and Rosenman in their study of coronary heart disease.

The next step was to conduct a field study. A sample of 40 tax accountants was studied over several months, commencing at the first of the year. During the first three months, laboratory measures of two warning indicators, blood-clotting speed and serum cholesterol levels, were generally within the normal range. This changed, however, as the April 15 tax-filing deadline approached. During these few weeks the accountants were under a great deal of pressure to finish their clients' tax returns, and both blood-clotting measures and serum cholesterol rose to dangerous levels. Once the tax-filing crunch passed, both measures returned to normal.

Convinced that responses to stress may be a major contributor to coronary heart disease, Friedman and Rosenman embarked on a nine-year study of several thousand men, ages 35 to 39, who were physically healthy at the outset of their investigation. Each subject was asked specific questions about his work and eating habits and his usual ways of responding to stressful situations. Using subjects' responses as well as observations of their behavior, the researchers divided participants into two groups roughly equal in size. Subjects in the **Type A** group tended to be hard-driving, ambitious, very competitive, hostile, easily angered, very time conscious, and demanding of perfection in both themselves and others. In contrast, **Type B** subjects were relaxed, easygoing, not driven to achieve perfection, happy in their jobs, understanding and forgiving, and not easily angered (Friedman & Rosenman, 1974; Friedman & Ulmer, 1984).

By the end of the long-term study, it was clear that Type A subjects were far more prone to heart disease than their Type B counterparts. Over the nine-year period, 257 subjects in the total research population had suffered heart attacks, and approximately 70 percent of these subjects were Type As. In other words, Type A subjects were more than twice as vulnerable as Type Bs. More recent research, however, has failed to consistently demonstrate a connection between Type A behaviors in general and CHD risk. Evidence suggests, however, that specific components of Type A behavior, like hostility and anger, may be as important as smoking and hypertension as risk factors for CHD (Bunker et al., 2003; Welin et al., 1995).

Hypertension

Commonly referred to as high blood pressure; a condition of excessive blood flow through the vessels that can result in both hardening and general deterioration of the walls of the vessels.

HYPERTENSION **Hypertension**, commonly referred to as high blood pressure, occurs when blood flow through the vessels is excessive, a condition that may cause both hardening and general deterioration of tissue in the vessel walls. It has been estimated that roughly 50 million Americans suffer from hypertension and that annually about 45,000 die as a direct result of this condition (American Heart Association, 2003).

A number of physical factors may contribute to hypertension, including such things as obesity and genetic predispositions. However, there is also substantial evidence linking stress and Type A personality factors to hypertension. In fact, a recent study involving 3,142 subjects over 15 years revealed that subjects who scored high on time urgency and impatience (TUI), both subscales for Type A personality, were twice as likely to have high blood pressure than those scoring lower. The TUI component of Type A is characterized by a persistent preoccupation with time and pronounced impatience. If you find yourself annoyed following slower traffic or while standing in long lines you may also be at greater risk for developing hypertension (Yan et al., 2003).

Some people are genetically predisposed toward hypertension and they may be more reactive to stress than those not genetically predisposed. Reactive people show a more pronounced blood pressure response to a range of stressors (such as exposure to cold water, public speaking, or participation in a challenging cognitive task) than do people without hypertension. It appears that reactive individuals display variants in genes coding for angiotensin receptors (Romano-Spica et al., 2003). Angiotensin is an important hormone involved in regulating fluid balance, and it is a primary target for drugs used to control hypertension.

IS IT TRUE THAT EXCESSIVE CAFFEINE ALONE CAN INCREASE YOUR STRESS LEVELS, ANXIETY, AND FEELINGS OF DEPRESSION? Many years ago, the author conducted a study on the physiological and psychological effects of excessive caffeine ingestion. The reported symptoms include feelings of dizziness, headache, and frontalis muscle group tension. Hypervigilance, general motor tension, restlessness, and difficulty sleeping.

My research showed that excessive caffeine ingestion could mimic a generalized anxiety disorder.

By reducing your caffeine intake, you can reduce these symptoms almost immediately. Some sources of caffeine include coffee, some tea, hot chocolate, cocoa, cola drinks and some

headache medications. Check your medication labels and be aware that caffeine is central nervous system stimulant. It can be a major player in your stress levels (Parker,1972).

Cancer

A collection of many diseases, all of which result from genetic alterations in cells that produces runaway cell growth.

CANCER Evidence linking stress to cancer is certainly more controversial than that for CHD or hypertension. However, many specialists in the fields of oncology and behavioral medicine strongly suspect a connection. **Cancer** is a collection of many diseases, all of which result from genetic alterations in cells that produces runaway cell growth. Although researchers do not completely understand all the mechanisms and agents involved in cancer, compelling evidence suggests a relationship between stress and cancer (Moynihan, 2003).

Animal studies provide information not available in human research. For example, rats that are inoculated with cancerous cells and then exposed to inescapable electric shocks are less able to reject the cancerous cells than are rats that are subjected to escapable shocks (Visintainer et al., 1983). This research suggests that the greater stress associated with an uncontrollable event may have reduced the animals' resistance to cancer. Other studies, in which animals have been exposed to stressors such as cold-water immersion, have also reported higher incidences of malignancies than among nonstressed animals (Ben-Eliyahu et al., 1991).

Researchers have also investigated the biological mechanisms linking stress to cancer, and they have implicated that stress hormones weaken the immune system. As we will see, the immune system guards against invaders and foreign tissue of all kinds, including



Corbis

A hospitalized cancer patient

Psychoneuro-immunology

The scientific study of the relationships between behavior and disease processes.

Immune system

A complex surveillance system that guards the body by recognizing and removing bacteria, cancer cells, and other hazardous foreign substances.

cancerous cells. In fact, the immune system may produce tumor-specific chemicals that attack and destroy cancerous growth. Since we know that prolonged or severe stress can suppress immune response, it follows that stress may also allow cancer cells to proliferate more rapidly than might otherwise occur. In the past few years we have witnessed a rapid expansion in research related to how psychological factors contribute to disease. The new field of **psychoneuroimmunology** and the establishment of new scientific journals such as *Brain, Behavior, and Immunity*, are evidence that the medical community now takes seriously the influence of the mind on disease processes.

STRESS AND THE IMMUNE SYSTEM The **immune system** is an exceedingly complex surveillance system that guards the body by recognizing and removing bacteria, viruses, cancer cells, and other hazardous foreign substances. When such substances are detected, our immune systems respond by stimulating lymphocytes (white blood cells) to attack and destroy these invaders. The actions of the *lymphocytes*, as well as other immune-system responses, are delicately regulated in an extremely complex process. If the immune system is suppressed, we become more vulnerable to a variety of infectious organisms and cancers. Conversely, a breakdown in the body's homeostasis may cause the immune system to become overactive, turning on itself to attack and destroy healthy body tissues. (This phenomenon occurs in autoimmune disorders such as rheumatoid arthritis.) While diet, age, heredity, and general health all affect the functioning of the immune system, stress also exerts a marked influence on *immunocompetence*, the immune system's ability to defend our bodies successfully (Moynihan, 2003).

For instance, many studies of nonhuman animals have demonstrated that experimentally manipulated stressors, such as separation from mother, isolation from peers, exposure to loud noise, and electric shock, can reduce immunocompetence by suppressing the activity of the lymphocytes. Research with human subjects has revealed similar results. High-stress periods such as final exam week have also been linked to reduced immunocompetence—a finding that helps explain why people may be more likely to become ill during finals (Jemmott et al., 1983). Research on adult subjects has also linked symptoms of a variety of infectious diseases, including colds, influenza, herpes, and mononucleosis, to stressful events (Cohen & Williamson, 1991; Jemmott & Locke, 1984).

In summary, there is considerable evidence linking stress with depressed immune function and the onset and progression of both infectious diseases and cancer. Studies with animals have demonstrated strong relationships between the stress of shock, isolation, and loud noise and the ability of the immune system to fight off infectious diseases as well as cancerous tumors. Interpreting data from humans is more difficult because of the difficulty in controlling for the amount and type of stress, but consistent with animal studies. Evidence suggests that the suppression in immune function that follows severe stress is mediated by the release of stress hormones.

HEALTH, PSYCHOLOGY, AND LIFE**Managing Stress**

Recent evidence linking stress with a variety of illnesses has prompted many health professionals to turn their attention to developing techniques for managing stress. These techniques take aim not only at our physiological, cognitive, and behavioral responses to stress but also at behaviors and thought patterns that may induce or increase stress. The following paragraphs summarize some of the strategies that have been successfully applied in various stress-management programs offered at hospitals, clinics, and corporations. For more information about these techniques or programs, check your library or bookstore for some of the many excellent self-help stress-management books currently available.

MANAGING PHYSIOLOGICAL RESPONSES TO STRESS

Much of the physical damage associated with stress results from our bodies' physiological responses. These include the release of hormones and corticosteroids into the blood resulting in increases in metabolism, heart rate, blood pressure, and muscle tension, and a decrease in the ability of our immune system to respond effectively to invasion. Many techniques have been developed to minimize these reactions; three of the most effective are biofeedback, relaxation training, and exercise.

Biofeedback We are seldom aware of the subtle physiological changes that take place when we are under stress, such as rising blood pressure or increased heart rate. The theory behind biofeedback is that if we learn to recognize these destructive changes we can also learn to control them. Biofeedback provides individuals with information about their bodily processes that they can use to modify these processes. For instance, people who suffer from high blood pressure might be hooked up to a biofeedback apparatus that constantly monitors their blood pressure, sounding a tone that changes in pitch as their blood pressure rises or falls. Through this process, they may eventually learn to recognize symptoms of high blood pressure even when they do not hear a tone, so that they can apply techniques to control this response. Although biofeedback is not a panacea for all stress-related disorders, it has been helpful in treating migraine headaches, tension headaches, muscle tension, high blood pressure, and chronic pain.

Relaxation Training Virtually every formal stress-management program teaches some kind of relaxation technique. One of these is *progressive relaxation*, in which a person first tightens the muscles in a given area of the body (such as the legs), then relaxes them, then progresses systematically to other body areas until the entire body is relaxed. The idea that physical relaxation can lead to mental relaxation has been supported by experience, and progressive relaxation is now a key element in many stress-management programs.

How effective is relaxation in controlling stress-induced effects such as muscle tension and high blood pressure? In one recent study, several hundred heart attack survivors were randomly assigned to one of two groups. One group received standard advice about proper diet and exercise; the other received the same advice, plus counseling on how to relax and slow down. In the ensuing three years, subjects in the group that received relaxation counseling experienced only half as many recurrent heart attacks as those who had received the standard medical advice (Friedman & Ulmer, 1984).

Relaxation training is also being used with some success in delaying the recurrence of some kinds of terminal cancer. It is believed that relaxation training may play a role in facilitating the body's immune system to fend off the rapid growth of cancer cells. While it is too early at this time to critically evaluate this evidence, a number of treatment programs have begun to adopt relaxation training as part of cancer treatment.

Exercise Have you ever noticed that some types of exercise, such as jogging a few miles or playing tennis, can help to relieve stress? Exercise helps to distract us from sources of stress, and it can also help to moderate some potentially damaging physical effects of stress by lowering blood pressure, improving circulation, and strengthening the heart muscle. In addition, people who regularly engage in some form of exercise are more likely to adopt a healthful diet and be non-smokers.

Modifying Cognitive Antecedents of Stress People involved in stress-management programs learn to pay attention to what they are thinking just before they

(continues)

Managing Stress, *continued*

experience stress. One of the benefits of this self-monitoring is the awareness of how frequently our own upsetting thoughts or negative self-talk trigger our feelings of stress. Negative self-talk such as, "I'll never be able to pass this exam" can make the difference between good performance and failure; it can also help to bring on the elevated physical reactions typical of stress responses.

To modify these common cognitive antecedents of stress, Canadian psychologist Donald Meichenbaum (1993) suggests a technique he calls *stress inoculation*, in which we learn to replace negative self-statements with positive coping statements. For example, when faced with the stress of an exam, we might use positive self-talk such as, "There's no point in imagining the worst; I've prepared as well as anyone and I'll do the best I can." Although it may take some time to learn to alter negative self-talk successfully, the effect can be a reduction in anxiety and stress.

Modifying Behavioral Antecedents of Stress Many of us bring stress on ourselves by certain maladaptive behaviors. For instance, we may use our time poorly and then suddenly find ourselves under pressure, or we may habitually take on too many tasks to accomplish in the time we have. Stress management programs offer a variety of techniques for modifying such stress-producing behaviors. The following abbreviated list illustrates a number of these behaviors, as well as some strategies that are helpful in combating them.

- *Procrastination.* Time-management training can help people pace themselves to avoid leaving too much for the last minute.
- *The "superperson syndrome."* For some people, an important part of stress management is learning to say "no" and to delegate tasks to others. Time-management training can also help people recognize their limits so that they do not commit to more work than they can complete.
- *Disorganization.* Stress-management programs often help people deal with disorganization by providing training in how to set goals for each day, establish priorities, avoid wasting time, and become task-oriented.
- *Lack of assertiveness.* People who have difficulty standing up for their rights may be "boiling inside," generating tremendous amounts of stress. To combat this tendency, many stress-management programs incorporate *assertiveness training*, which teaches people to confront such situations rather than tiptoe around them.
- *Going it alone.* Facing stress alone is much more damaging than facing it with the support of people who care about us. Talking with others provides us with new perspectives; it may also boost our self-esteem and our sense that we are valued. Thus an important tactic in managing stress is to talk things over with someone. If friends or family members are not able to provide support, a campus counseling center, community health center, or private clinic may be a valuable resource.

STRESS QUIZ

This is a quick, informal, “eye-opener” to help you recognize some of the life conditions that determine your level of stress. Assign each question a number from 0–5

(0 = Never 1 = Rarely 2 = Infrequently 3 = Sometimes 4 = Most of the time 5 = Always)

- I have a lot on my mind that worries me—at work, at home or both.
- I have too much responsibility.
- My family makes too many demands on me.
- My work situation is unclear; there are too many people to satisfy.
- I don't have enough time for leisure and to take care of personal needs.
- There is a great deal of pressure at work.
- I have a great deal difficulty expressing how I feel about situations or people.
- I have trouble focusing on a task.
- I have difficulty communicating with my spouse, significant other, children, family boss or coworkers.
- I handle most things alone with little support from anyone.
- I am very independent.
- I do not have enough say in things that directly affect me.
- My personal needs are in conflict with my organization or family.
- Other people or situations keep me from doing what I want to or have to do.
- I am often fatigued.
- People or things often irritate me.
- There is considerable illness in my life—of mine or in my family.
- I am short of cash flow and have financial concerns.
- My life is one crisis after another.
- I regularly have headaches. (Twice a week=5)
- I have muscle tension in my shoulders, neck or back.
- I have stomach pains, indigestion or other digestive problems.
- I take aspirin, indigestion medication, sleeping pills, tranquilizers, regularly.
- I have a tendency to overeat, especially sweets. I graze in front of the refrigerator.
- I regularly have a drink to either to “wind down” or “turn off my mind”.
- I drink a great deal of coffee or other caffeine drinks. Four plus in a day.
- I am not satisfied with my sex life.
- Family, friends, people at work tell me I drink too much.
- Most of my time is spent sitting—I get little exercise because I am too tired.
- I smoke.
- I have extremely high standards for myself.
- I would like to make changes in my life but I do not know how.
- Total points**

Under 35: Congratulations! You're in good shape.

35–63: Average—but you could lower your stress level.

66–85: Think seriously about changes in your life.

85 & Above: Act now to reduce your Stress.

DR. MARTIN PARKER'S TEN-STEP PLANNING PROGRAM FOR DEALING WITH STRESS

This is an outline that you can do anywhere. It is a step- by- step plan to assist you in coping with your Stress. It draws upon your internal cognitive processes and the ability to choose those techniques that have worked for you in the past. It is my firm belief that to be proactive, if possible, in dealing with Stress, instead of reactive, is a more effective manner in which to handle stress.

1. Let's talk about your symptoms? Why do you think that you are feeling them now? When was the first time that you felt these feelings? What is the frequency and duration of the signs? What are you worried about? Where specifically are you feeling pain? List as many as you feel.
 1. _____
 2. _____
 3. _____
 4. _____
 5. _____

2. Now be specific about the problem. Does it relate to work, love, social interactions, finances, spirituality, lack of organization, or something else? It is very important to give a listing of most to least, in order of the most stressful. A ten would be considered the most Stress and a one the least.
 1. _____
 2. _____
 3. _____
 4. _____
 5. _____

3. In what ways did you learn to solve previous problems? Which solutions did not work? In what ways could you both use the coping strategies that you once employed in combination with new ways of dealing more effectively with these recently emerged set of stressors?
 1. _____
 2. _____
 3. _____
 4. _____
 5. _____

4. List your resources and available support network. What are your current Stress Skills? Do these skills need to be modified or enhanced?
 1. _____
 2. _____
 3. _____
 4. _____

5. How do you feel psychologically regarding your ability to confront your issues? Are you confident or somewhat hesitant? Ten being the most confident and one being the least. Please list your readiness to confront your stressors.

6. Now let's be very specific in terms of what do you want to accomplish. In addition, a period would also be helpful.

I would like to reach the following goals, by the following dates.

1. _____
2. _____
3. _____
4. _____
5. _____

7. Now a specific plan is in order. Now it is important to list the ways in which you are going to reach the goals that you have listed.

1. _____
2. _____
3. _____
4. _____
5. _____

8. Divide your goals into short term, or within the next month. Intermediate or within the next six months. Long term or the next year. Track your progress.

9. In the research regarding goal attainment, the ideal goals are ones that are neither too difficult nor too easy. Therefore, with that in mind, are your goals and plans moderately difficult to achieve? Be specific.

10. Align and revise your goals weekly, as necessary

SUMMARY

THE COMPONENTS OF EMOTIONS

1. Motivation and emotion are closely connected. Emotions often motivate our actions.
2. Emotions are composed of four integral components: cognitive processes, affect, physiological arousal, and behavioral reactions.

THE RANGE OF HUMAN EMOTION

3. According to Plutchik's Emotion Wheel there are eight primary human emotions, which consist of four pairs of opposites: acceptance and disgust, fear and anger, surprise and anticipation, and sadness and joy.

THEORIES OF EMOTION

4. According to the James-Lange theory, environmental stimuli trigger physiological responses from the viscera and muscle movements. These visceral and muscular responses then activate emotional states.
5. Recent evidence has demonstrated that different emotions are associated with similar, but not identical, physiological changes. However, there is little concrete evidence that people are able to make fine discriminations between the varied, often highly similar patterns of physiological and muscular responses to determine what emotions they are experiencing.
6. The Cannon-Bard theory suggests that internal physiological changes and muscular responses are not the cause of emotion, but rather that emotional experiences and physical changes occur simultaneously.
7. The Schachter-Singer theory combines elements from both the James-Lange and Cannon-Bard theories. Schachter and Singer maintained that

emotions depend on a kind of double cognitive interpretation: We appraise the emotion-causing event while also evaluating what is happening physiologically with our bodies.

8. According to the facial feedback theory, facial muscles respond very rapidly and with sufficient differentiation to account for a wide range of emotional experience. Feedback from our own facial expressions helps determine our emotional experiences.
9. Solomon and Corbit's opponent-process theory maintains that when a strong emotional response to a particular stimulus event disrupts emotional balance, an opponent-process is eventually activated to restore equilibrium in one's emotional state. Repeated exposures to stimuli that arouse intense emotions result in a gradual weakening of the initial emotional reaction as the opponent process becomes stronger.

STRESS

10. There is a powerful relationship between emotion and stress. Stress may be defined as the process of appraising events (as harmful, threatening, or challenging), of assessing potential responses, and of responding to those events.
11. Selye's observation of organisms' physiological responses to stress led him to formulate the concept of a general adaptation syndrome (GAS) composed of three phases: alarm, resistance, and exhaustion. The alarm phase is characterized by a flood of stress hormones that prepare the body for fight or flight. In the resistance stage the body returns to a less aroused state, but one in which it continues to draw upon resources at an above-normal rate. If the stress is not alleviated, an organism is likely to enter the third state of exhaustion in which its body tissues begin to

- show signs of wear and tear, and susceptibility to disease increases.
12. Typical cognitive responses to stress include reduced ability to concentrate, distractibility, impaired performance on cognitive tasks, and a tendency to be plagued by disruptive or morbid thoughts.
 13. Emotional responses to stress include such feelings as anxiety, irritability, anger, embarrassment, depression, and hostility.
 14. A myriad of possible behavioral responses to stress include assertive action to confront stressors, withdrawal from a stressful situation, and adapting to the source of stress.
 15. Factors that contribute to the stressfulness of a situation include our lack of control over it, its sudden onset, and a degree of ambiguity that forces us to spend resource-depleting energy trying to figure out the nature of the stressor.
 16. Response to stress may be a major contributor to coronary heart disease.
 17. Type A people, particularly those who display anger and hostility, are more prone to CHD than Type B people, who are more relaxed, easygoing, and not driven to achieve perfection.
 18. People who deal with anger by suppressing it and those who exhibit Type A behavior may be particularly predisposed to develop hypertension.
 19. Stress hormones exert a pronounced effect on the immune system's ability to defend our bodies successfully against disease.
 20. Positive self-talk can be an effective strategy for dealing with stress.

The preponderance of research over the last forty years clearly points to the conclusion that Stress, although debilitating, it can also be dealt with effectively. It is the author's belief that it generally is not the knowledge of effective strategies for coping but rather the willingness to (1) accept that we have a problem and (2), that we are willing to take the time and devote the energy to changing old and ineffective habits that perpetuate the struggles.

TERMS AND CONCEPTS

emotion
 James-Lange theory
 Cannon-Bard theory
 Schachter-Singer theory
 facial feedback theory
 opponent-process theory of emotion
 stress
 general adaptation syndrome (GAS)
 coronary heart disease (CHD)

Type A
 Type B
 hypertension
 cancer
 psychoneuroimmunology
 immune system
 coping strategies
 self-talk

