3/The Science of Stress

Why do I need to understand the *science* of stress? I just want to learn to relax.

What is the purpose of the fight-or-flight response?

What really happens in my body when I am feeling stress?

Is the physiological response to stress different in males and females?

REAL PEOPLE, REAL STORIES

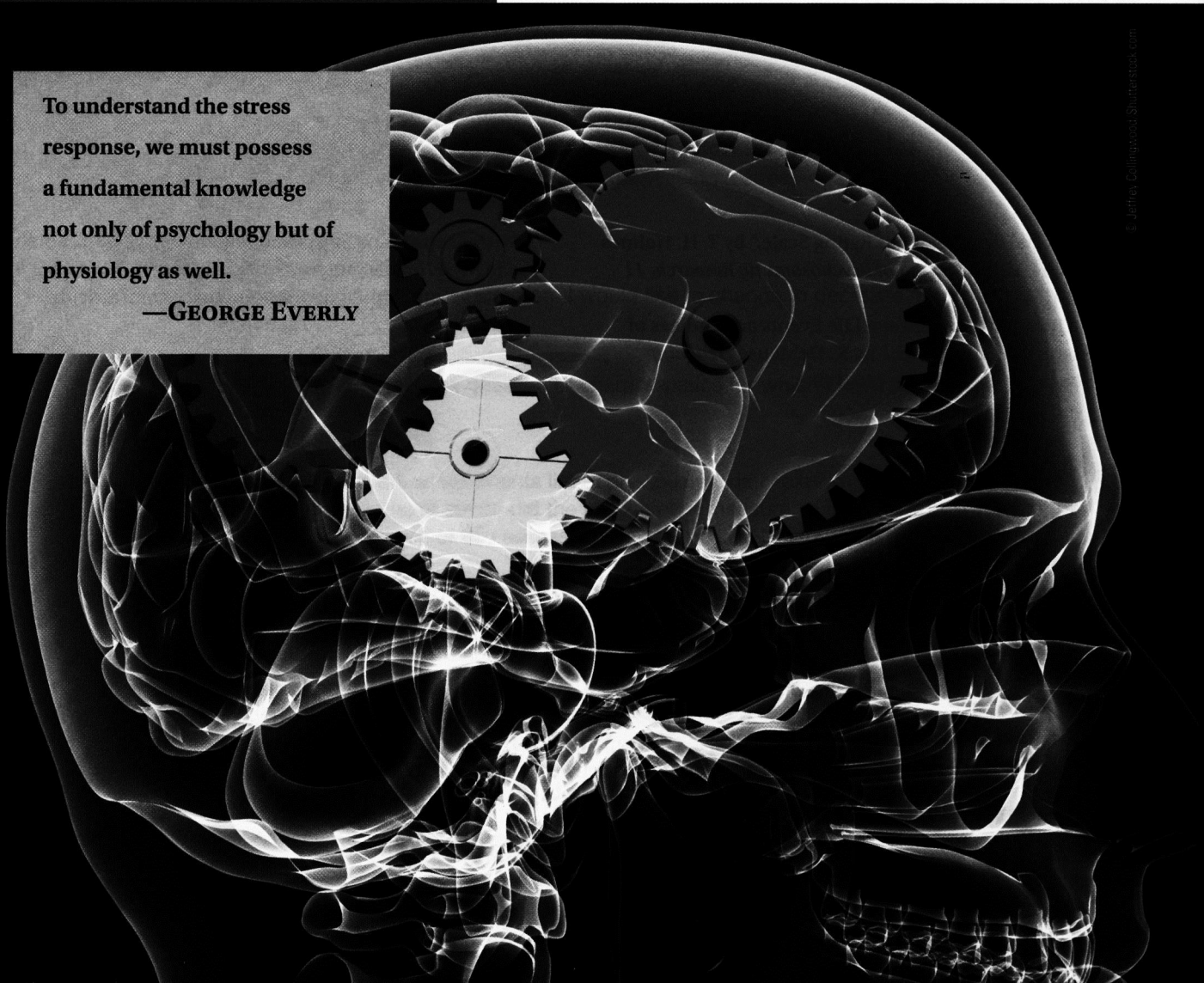
Superwoman Have you ever heard stories of people displaying almost superhuman powers when confronted with an emergency situation? How can we explain this superhuman response that releases power and strength beyond anything we have imagined or experienced previously? What physical and psychological factors are responsible for these amazing abilities? Here is a true story that Sarah shared in class

* * *

One summer night Sarah was out camping at the lake with some friends. They were having a great time laughing and hanging out around the campfire. Some of them were drinking and, as the night went on, a couple guys decided to drive into town to make a beer run. One of Sarah's friends, Dave, hopped in the car and backed out of the campsite. He stopped when he realized he had run over something, but thinking it was a log from the fire, he kept backing up. He slammed on the brakes when he heard the screams to stop. Dave had run over one of their friends who was trapped under the front tire. In a moment of panic, Sarah and a friend rushed over and lifted the heavy car while their friend was pulled out. This was a feat way beyond their normal limits. Sarah's fight-or-flight response saved a life that night.

To understand the stress response, we must possess a fundamental knowledge not only of psychology but of physiology as well.

—GEORGE EVERLY



Student Objectives

Study of this chapter will enable you to:

1. Describe the human fight-or-flight response to stress.
2. List the physiological changes associated with the stress response.
3. Identify the stages of the general adaptation syndrome.
4. Explain how the science of stress relates to stress management and prevention.

The Science of Stress

Just mention *stress* and everyone groans. Too much stress just does not feel good. What are the instant mind/body reactions that result in irritability and fatigue? What about the even more serious health problems down the road? The story of stress is a long one, beginning with our ancestors many generations ago. Throughout history, people have experienced stress related to everything from war to poverty to disease to money. The quest for understanding stress has resulted in a surge of research during the past half-century. More is known about the physiology and psychology of stress than ever before.

This chapter and the next one provide a scientific foundation on principles, theories, and models of stress to help you understand the physiology and psychology of stress. In keeping with the experiential focus of this book, the intent of this chapter is not to teach you everything there is to know about the physiology of stress. Entire books have been written on this subject. The purpose of this chapter is to provide you with sufficient knowledge to understand how stress affects your body.

Discovering what actually happens in your body and your mind will help you understand the mechanics behind the stress-prevention and stress-management skills you will be learning. Knowledge of the science and theory of stress provides strong, credible support for why and how stress-management techniques work.

Stress and the Big Bear

Why do you feel stress in the first place? What is the purpose of this complex interaction among nerves, hormones, muscles, organs, and body systems that leads to unpleasant symptoms such as headaches, fatigue, feeling emotionally upset, and a host of other side effects? To answer these questions, we have to go back several thousand years to see what life was like for our ancestors. This will help us understand how our bodies are programmed to respond to threats and danger today.

In order to understand the origins of this programming, consider the following scenario: Imagine that you and I live in a remote place many thousands of years ago, where we find no trace of modern conveniences. We do not have comfortable homes, telephones or television, indoor plumbing, electricity, or any of our modern-day comforts. For the sake of this story, let's say we live in caves that are out in the "wilds" of some remote area.

I have invited you to my dwelling because we just killed a large animal and are roasting it in a pit. Several of our friends are here with us enjoying some relaxing time together after the hunt.

Suddenly we notice a rustling of bushes in the distance. Then, charging mightily—or hungrily—toward us emerges a huge, ferocious-looking bear. This enormous creature has smelled our food and wants some of it for itself. It is a menacing creature that could easily put us out of commission with a single swipe of its mighty forearms.

***

As you imagine yourself in this scenario, one of the *first thoughts* that likely will pop into your mind is something like: "Uh-oh! I'm in trouble here!" or "I'm in danger and I'm likely to feel some pain!" These immediate thoughts are followed closely by the next thought: *"Run!"* You sense the immediate need to get away from this ominous animal. You don't want to be

FYI

Men and Meat

Researchers at McGill University found that images of cooked meat made men calmer and less aggressive. "You would've already used your aggression to acquire the meat," explained researcher Frank Kachanoff. Makes sense when you understand the fight-or-flight response.

Source: "Good Week for Carnivores," *The Week: The Best of the U.S. and International Media* (10) (Dec.24, 2010–Jan.7, 2011): 4.

its dinner. Or your next thought could be, instead, "I need to kill this creature to protect my family, myself, and my friends! *Fight!*"

The Fight-or-Flight Response

Immediately following the initial awareness of danger, a surge of physiological processes floods the body automatically and precisely. This is a state of physiological and psychological hyperarousal. The cascade of nervous system activity and release of stress hormones lead to immediate responses that help a person deal with danger by either fighting or running.

Harvard physiologist Walter Cannon coined the term **fight-or-flight response** to describe the body's automatic response anytime we perceive a threat or danger. This primitive response gives us strength, power, and speed to avoid physical harm. As you read in Sarah's story in the opening vignette, the fight-or-flight response can be activated to protect both ourselves and others when we perceive danger.

The fight-or-flight response is designed to help us do one thing, and only one thing, very well: *survive!* Physiologically, the stress response is characterized by activation of the sympathetic nervous system, which results in the secretion of chemicals into the bloodstream, mobilizing the behavioral response. Whether the response culminates in "fight" or "flight" depends on whether we perceive the threat or stressor as surmountable or insurmountable. Thus, an appropriate stress response is essential to survival. Figure 3.1 illustrates the fight-or-flight response.

Because we are designed for survival, our body systems react to protect us from pain and death in life-threatening or dangerous situations. In the short run, this response is a powerful and useful process. If kept "on" for a longer period, however, it can produce serious problems.

Scientists use the term ***homeostasis*** (*homeo* = the same; *stasis* = standing) to define the physiological and emotional limits at which the body functions efficiently and comfortably. Stress disturbs homeostasis by creating a state of imbalance. When we are in homeostasis, we are in a state of balance. Then something happens in our surroundings—something equivalent to a big bear charging out of the forest. This perception of danger automatically initiates the fight-or-flight response.

Once we sense no more danger, we experience exhaustion and fatigue because we have expended a tremendous amount of energy while running or fighting. We are exhausted, and the stress response is no longer activated. Because we feel safe again, the functions in the body that activate the stress response are turned off and we gradually return to normal (homeostasis).

The fight-or-flight response is generally regarded as the prototypical human response to stress. The tend-and-befriend theory, as explained in the Culture Connection, provides some intriguing food for thought by proposing that the stress response may be different in men and women.

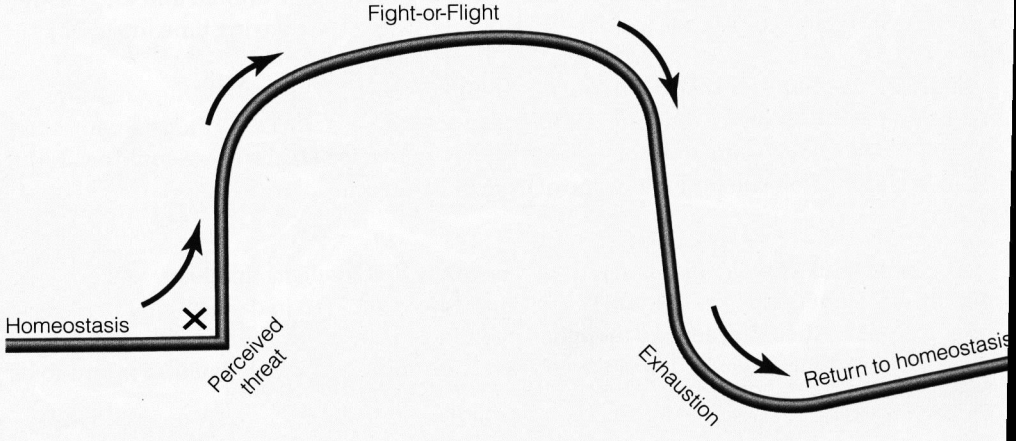


FIGURE 3.1 Fight-of-Flight Response

CULTURE Connection Tend-and-Befriend, Not Fight-or-Flight

Is the stress response different for men and women? If so, is the difference a result of cultural influences and learned behavior, basic physiology, or both? For the last five decades the fight-or-flight theory has dominated stress research. Our understanding of how the body responds to stressors has increased dramatically during this time. Note that the biobehavioral fight-or-flight theory has been disproportionately based on studies of males. This is attributable in part to the fact that females experience natural, cyclical variations in hormonal and neuroendocrine responses, which can lead to confusing results. Therefore, the processes involved in stress responses in females are less well understood.

A team of scientists supported by the National Institute of Mental Health formulated a theory that characterizes female responses to stress by a pattern it terms **tend-and-befriend** rather than fight-or-flight. This research supports the premise that the female stress response has evolved selectively to simultaneously maximize the survival of self and offspring. Women respond to stress with brain chemicals that encourage them to tend and befriend other women. Thus, the tend-and-befriend pattern involves females' nurturing offspring under stressful circumstances, exhibiting behaviors that protect their offspring from harm (tending), and befriending (creating and joining social groups to exchange resources and provide protection). The scientists propose that these responses build on the biobehavioral attachment-caregiving processes that depend in part on oxytocin, estrogen, and other sex-linked hormones.

In addition, the literature on human and nonhuman primates alike provides evidence that unlike males, when females are under stress their preference is to affiliate, meaning to make close connections with others. This research might also help explain why women outlive men. Female friendships may help women live longer. Research is strong that social ties reduce women's risk of disease by lowering blood pressure and heart rate. The tend-and-befriend pattern likely is maintained by social and cultural roles, in addition to sex-linked, neuroendocrine responses to stress. This new theoretical model opens a fresh field of inquiry into research on stress.

Source: "Tend and Befriend: Biobehavioral Bases of Affiliation Under Stress," by S. Taylor, *Current Directions in Psychological Science, 15*(6) (2006): 273–277.

While this research is still in the early stages, it seems that physiologically, women have the life-saving option of joining together for mutual support when confronted with stress. Although we know that there may be some differences in how males and females respond to stress physiologically, we also know that the male and female responses have many similarities. The fight-or-flight response explains most clearly the chain of events that occurs in response to stress.

Physiological Response to Stress

When the stress response is initiated, immediate and powerful changes come about because a branch of the nervous system called the **autonomic nervous system** (ANS) is activated. The ANS is responsible for many functions in the body that typically occur involuntarily, such as digestion, heart rate, blood pressure, and body temperature. The activity of the autonomic nervous system takes place primarily beyond our conscious control. It is automatic.

The two branches of the ANS are designed to regulate the fight-or-flight response on a constant basis:

1. The **sympathetic nervous system** (SNS) is the part of the ANS responsible for initiating the fight-or-flight response each time we have a thought of potential or actual danger or pain. Anytime we think we are in danger, whether we really are or not, the flood of physiological and emotional activity is turned on to increase our power, speed, and strength.
2. The **parasympathetic nervous system** (PNS), the other branch of the ANS, is designed to return the physiology to a state of homeostasis, or balance, after the threat, danger, or potential pain is no longer perceived to be imminent. The example of our state of mind as we enjoyed a primitive barbecue is a good example of how homeostasis works. The parasympathetic branch is responsible for counterbalancing the body's sympathetic activity, which restores calm, promotes relaxation, and facilitates digestive functions, energy storage, and tissue repair and growth.[1] Breathing is slow, as is the heart rate. Blood pressure and body temperature drop. In general, muscle tension decreases. During parasympathetic activity (general relaxation), the body regenerates and restores for future activity.

The autonomic nervous system is controlled by the **hypothalamus,** located in the **diencephalon** area of the brain. The diencephalon is the central portion of the brain and is responsible for regulating emotions, among other things. The hypothalamus plays a key role in the stress response because it is the chief region for integrating sympathetic and parasympathetic

activities. When the hypothalamus receives the message of danger from the higher-order thinking part of the brain, it is like an alarm system going off deep in your brain, which delivers a message through the nervous system that connects to every other system of the body.

The hypothalamus also delivers a message to the endocrine system to initiate the secretion of hormones. The stress hormones, including epinephrine and cortisol, flood the bloodstream and travel throughout the body, delivering information to cells and systems that will aid in generating the body's ability to be more speedy and powerful, as demonstrated in Sarah's story in the opening vignette.

These stress hormones are produced by the **adrenal glands,** two triangle-shaped glands positioned on top of the kidneys. **Epinephrine** (adrenaline) and **norepinephrine** (noradrenaline) are released into the bloodstream from the **adrenal medulla. Cortisol,** the other key stress hormone, is released from a portion of the adrenal glands called the **adrenal cortex.** Together, these hormones flood every cell in the body with the specific message to prepare for fight-or-flight—for more power and speed—when we are faced with an imminent threat. The dual response of the nervous and endocrine systems constitutes the stress response. In an instant, with the interpretation of a stimulus as potentially threatening, your body leaps into alert mode. This reaction gave early humans the energy to fight aggressors or run from predators. It helped the species survive.

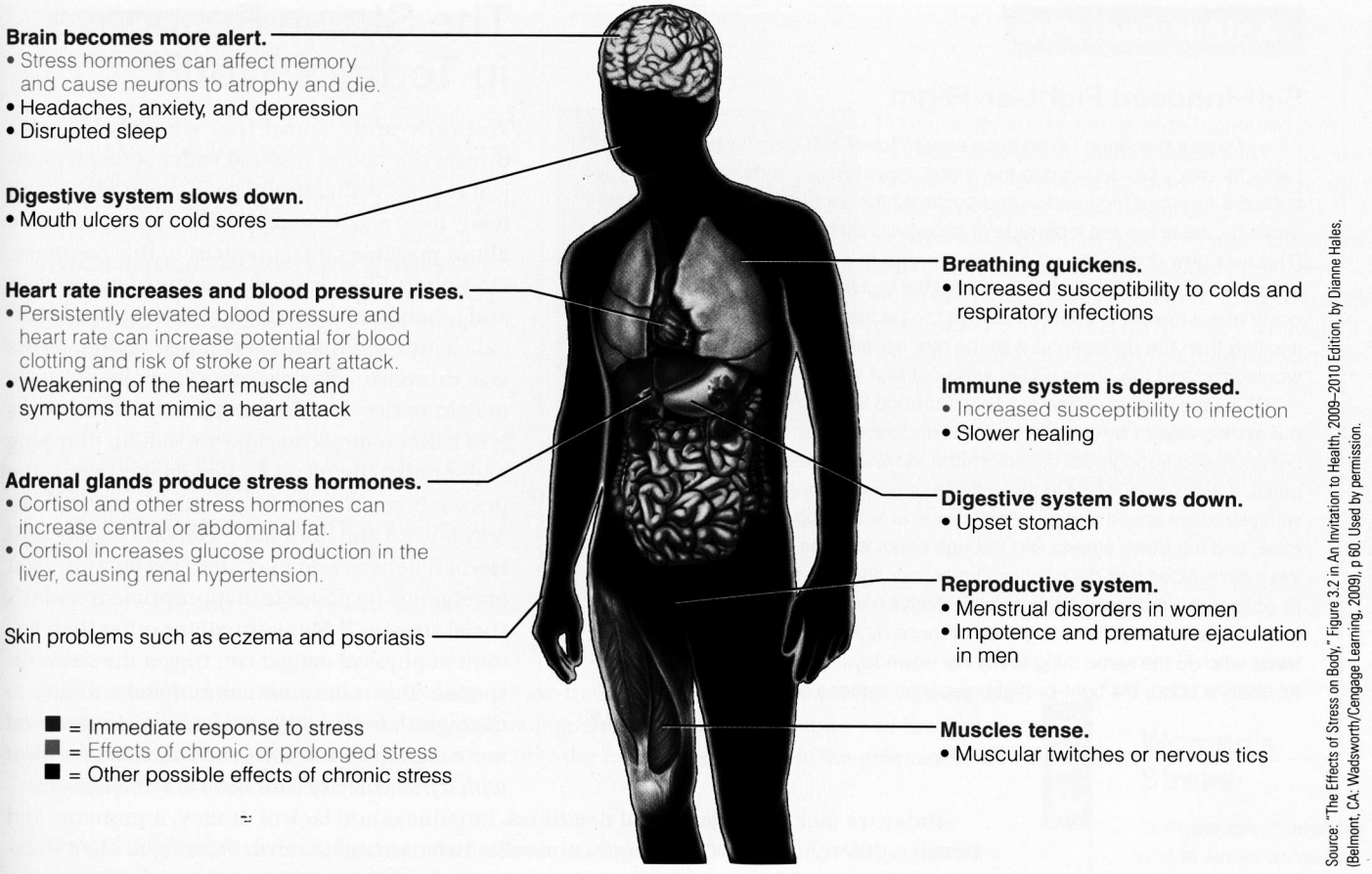
Consider this scenario:

> A dry twig in the jungle snaps and our common ancestor—your father, my father, 1,500 generations ago—leaps into alert mode. Adrenaline floods his system, causing lipid cells to squirt fatty acids into his bloodstream for quick energy. His breathing becomes shallow and rapid, and his heart beats faster, increasing the flow of oxygen to his muscles, enhancing his strength and speed. His blood vessels constrict, minimizing bleeding if he's injured, and his body releases natural coagulants and painkillers. His sweat glands open, leaving his skin slippery and hard for a predator to grasp. His hair stands on end, making him appear larger and more threatening. His pupils dilate, increasing his ability to scan dark jungle terrain. All this happens in less than a second, and—zip—Dad's off and running, far enough ahead of the tiger to ensure that your bloodline, and mine, makes it to the next generation.[2]

This scenario demonstrates some of the physiological changes that prepare the body for emergency action. Our ancestors developed this response to help keep them alive. This precise and automatic protective reaction remains with us still today.

Autonomic Nervous System Responses Figure 3.2 shows the effects of stress on the human body. The immediate physiological changes that result from activating the sympathetic nervous system are:

- Increased central nervous system (CNS) activity
- Increased mental activity
- Increased secretion of adrenaline (epinephrine), noradrenaline (norepinephrine), and cortisol into the bloodstream and to every cell in the body
- Increased heart rate
- Increased cardiac output
- Increased blood pressure
- Increased breathing rate
- Dilation of breathing airways
- Increased metabolism
- Increased oxygen consumption
- Increased oxygen to the brain
- Shunting of blood away from the digestive tract and directing it into the muscles and limbs
- Increased muscle contraction, which leads to increased strength
- Increased blood coagulation (blood-clotting ability)
- Increased circulation of free fatty acids
- Increased output of blood cholesterol
- Increased blood sugar released by the liver to nourish the muscles
- Release of endorphins from the pituitary gland
- Dilation of the pupils of the eyes
- Hair standing on end
- Blood thinning
- Increased brainwave activity



Source: "The Effects of Stress on Body," Figure 3.2 in An Invitation to Health, 2009–2010 Edition, by Dianne Hales, (Belmont, CA: Wadsworth/Cengage Learning, 2009), p 60. Used by permission.

FIGURE 3.2 Effects of Stress on the Body

Source: "The Effects of Stress on Body," Figure 3.2 in *An Invitation to Health,* Choosing to Change 14th Edition, by Dianne Hales, (Belmont, CA: Wadsworth/Cengage Learning, 2011), p 69. Used by permission.

- Increased secretion from sweat glands
- Increased secretion from apocrine glands, resulting in foul body odor
- Constriction of capillaries under the surface of the skin (which consequently increases blood pressure)

When the fight-or-flight response is activated, the nervous system processes in the body decrease in the following ways:

- Immune system is suppressed
- Blood vessels are constricted, except the vessels that go to the muscles used for running and fighting
- Reproductive and sexual systems stop working normally
- Digestive system stops metabolizing food normally
- Excretory system turns off
- Saliva dries up
- Pain perception decreases
- Kidney output decreases
- Bowel and bladder sphincters close

To enable us to escape from threatening situations, we do not need this last set of functions and systems to operate at high capacity. Their work, therefore, is suppressed to divert energy to the vital systems involved in increasing speed and power.

In contrast to the fight-or-flight response is a principle called the rest-and-digest response. In short, if you are required to run from a mugger, both nap time and digesting lunch—the rest-and-digest response—can wait. The SNS and PNS often operate simultaneously in response to stress. For example, the heart rate increases (SNS) while the digestive system shuts down (PNS). Understanding the nervous system's response to stress is important in explaining the stress-related diseases and conditions covered in the next chapter.

Author Anecdote

Self-Induced Fight-or-Flight

When I was a teenager, I lived in an area of town with nothing but homes and parks for many blocks. During the winter months my friends and I assembled behind a four-foot high hedge and prepared for oncoming cars. When they drove by, we unloaded a barrage of snowballs on the unsuspecting drivers. (This was how during the off-season we kept our arms in shape for baseball season!) The person who was awarded the highest honors was the one who could make the best "dent" sounds in the pegged car or truck. Even more exciting than the dent sound was the rare occasion when the car or truck would stop and the driver would jump out and start chasing after us.

Of course, nobody knew our neighborhood like we did, so the possibility of our getting caught by even the swiftest of pursuers was remote. As we were being chased through our neighborhood, down the streets, and across the parks, it was obvious that in those times of pursuit, we suddenly were gifted with incredible speed and power. We were able to jump over high fences with ease, and run down streets and through parks with the velocity of Olympians. We even noticed that during those times, our ability to see where we needed to go to make it to safety (this activity always took place at nighttime) improved dramatically. I am not proud of those days and find myself irritated at teens who do the same thing to my car nowadays, but I learned some powerful lessons about the fight-or-flight response in those early years.

—MO

The Stress Response in Today's World

You now understand that when faced with threats, our bodies respond with a series of physical reactions that mobilize internal forces and ready us to act. Researchers caution us, however, about possible consequences of this response. Dr. Robert Eliot, former director of prevention and rehabilitative cardiology at St. Luke's Medical Center in Phoenix, explains: "When stress was primarily physical, people really did have to fight or flee. For the most part, modern stress is of a different nature, and we end up pumping high-energy chemicals for low-energy needs. The price is high; over the long haul you turn the energy inward and burn out."[3] Harvard cardiologist Herbert Benson remarked that "the fight-or-flight emergency response is inappropriate to today's social stresses."[4] Many situations other than imminent physical danger can trigger the stress response. This is because *our bodies are unable to distinguish between life-threatening dangers and more mundane problems, such as a disagreement with a friend, credit card debt, or a major exam.*

Today we face traffic jams and deadlines, loneliness and lack of money, arguments and exams—different types of challenges, none of which demand that we run or fight. Most situations today benefit from a calm, rational, controlled, socially sensitive approach. Essentially, our fight-or-flight response is an outdated mechanism to which our primitive systems have not yet adapted. We are 21st century minds living in our primitive ancestors' bodies.

In the short term, we need to control our stress response to be effective in our daily life. In the long term, we need to keep it under control to avoid the consequences of burnout and poor health. Understanding the way our bodies work in response to our thoughts validates the importance of being proactive, rather than just reactive, in coping with the effects of stress.

Acute Stress The way the stress response works in the short run helps us generate great strength, focus more clearly, increase our speed, and perform at a higher level when a threat is present. Occasionally we can use this source of immediate energy to help us when we do find ourselves, or others, in actual danger, facing potential pain or even death. Sarah demonstrated this acute stress response in the Real People story at the beginning of the chapter. You probably can think of times when your body has responded to a danger in a manner similar to Sarah's response.

Here is a sampling of circumstances of acute stress in which the demand, danger, or threat is immediate and very real:

- Being chased by an angry dog
- A blown tire on the highway
- A trip and fall down a steep hiking trail
- An earthquake
- A lightning strike

You get the point. Occasionally we experience acute stress. Activation of the stress response at these times is beneficial and may even save your life. In reality, however, these types of experiences are rare in everyday life. Unless you work in a high-risk occupation such as being a police officer, soldier in combat, firefighter, or whitewater rafting guide, your days will not likely involve threats to your life.

Contrary to how our world may appear from watching the evening news, our society today is not one in which *real* acute threats or dangers are a daily occurrence. An upcoming exam

The irony is this: Our bodies react to stress in exactly the same way whether or not we have a good reason for being stressed. The body doesn't care if we're right or wrong. Even in those times when we feel perfectly justified in getting angry—when we tell ourselves it's the healthy response—we pay for it just the same.

—Doc Childre

Research HIGHLIGHT

Surprise Attack **Myocardial stunning** refers to a unique medical condition in which severe emotional stress causes heart abnormalities, including heart failure. A small, descriptive study was conducted to identify possible causes for myocardial stunning. The subjects were previously healthy patients presenting to a medical center with chest pain or heart failure following an episode of acute emotional stress. The most common emotional stressor that initiated cardiac stunning was the news of an unexpected death, although some subjects had experienced the condition following an event such as a surprise party or a surprise reunion.

Authors of the study propose the following as possible causes for myocardial stunning: (1) coronary artery spasm from increased sympathetic tone due to mental stress and (2) microvascular spasm within the heart in response to a sudden release of stress hormones.

This study provides objective measures showing that emotional stress can injure the heart. Studies such as these can help us understand the powerful effect of stress on the body. You might want to think twice before you plan the surprise 90th birthday party for Grandpa Joe!

© Britt Erlanson/Getty Images

Surprise! You might think twice about surprising Grandpa Joe. Sudden emotional stress can damage the heart.

Source: "Emotional Stress May Precipitate Severe, Reversible Left Ventricular Dysfunction," by L. Barclay and C. Vega, *Medscape Medical News*, February 9, 2005. Retrieved 11-10-09 from http://www.medscape.com.

or being late to work may make us feel like we are in danger, but in reality we don't need our primitive survival forces of fight-or-flight to manage these situations. What we will recognize, in upcoming chapters, is that the way we perceive the events of our lives is the primary factor that activates the stress response.

Chronic Stress If the stress response is allowed to stay in the "on" position longer than necessary to escape danger, the result can be damaging to health. If stressful situations pile up one after another, the body has no chance to recover. *Chronic stress* is the term we use to describe this state of continued sympathetic nervous system activation. Instead of returning to homeostasis, the fight-or-flight response is activated for an extended time. This long-term activation of the stress-response system can disrupt nearly all body processes. Figure 3.3 illustrates chronic stress.

Your body is a wise instrument. It is designed to give feedback about the choices you make. Consider the person who deliberately gets drunk during an evening of partying. When he wakes up in the morning hung over from the excessive alcohol, his body sends messages of discomfort, including headache, nausea, unclear thinking, and muscle pain. This feedback provides a clue that drinking was not a healthy decision. Or when someone eats too much sugar at one time, she may experience feelings of nausea, tiredness, and irritability. By contrast, a jog or walk can result in your feeling balanced, alert, refreshed, and energized. The body is sending messages that running was a healthy decision. The body lets us know what is good and what is bad for us—what is healthy and what isn't.

Our body gives us feedback about unhealthy chronic stress with a host of signals indicating imbalance. Listen to the messages your body sends. Although stress is not listed among

FYI

Women's Stress

In similar circumstances and at similar stages of life, women consistently report feeling more stress than men do. Some researchers attribute women's greater stress to the many roles they play—spouse, mother, homemaker, employee, supervisor, caregiver. We do know that women's stress hormones and blood pressure, unlike those of men, tend to remain elevated at the end of the workday.

Source: "Three for 2003: Reducing the Burden of Stress," *Harvard Women's Health Watch*, *10*(5) (2003).

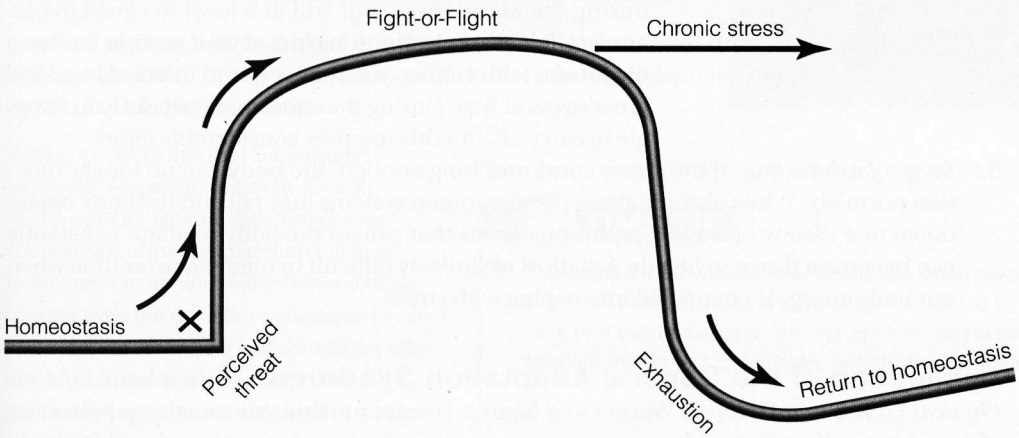


FIGURE 3.3 Chronic Stress

Pressure and stress is the common cold of the psyche.

—Andrew Denton

the top ten causes of death in the United States, it is linked to many illnesses. This does not necessarily mean that stress *causes* problems, but it does mean that stress contributes to problems. Additional problems associated with chronic activation of the stress response will be explored in Chapter 4.

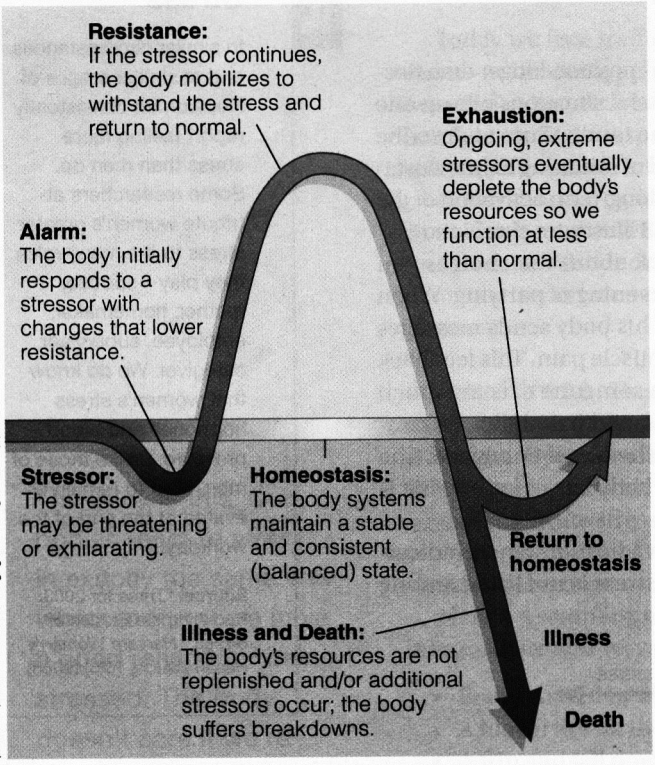
The General Adaptation Syndrome

One of the best known biological theories of stress is the **general adaptation syndrome** (GAS), a process by which the body tries to adapt to stress. The general adaptation syndrome provides a summary of the physiological changes that follow stress as the body attempts to return to homeostasis.

History of the General Adaptation Syndrome Stress pioneer Dr. Hans Selye developed the GAS theory as a result of his research on the physiological effects of chronic stress on rats. Whenever he injected an animal with a toxin, he observed several specific responses:[5]

- The animal's adrenal glands enlarged.
- The animal's lymph nodes shrank.
- Eosinophils (white blood cells) dropped significantly.
- Severe bleeding ulcers developed in the animal's stomach and intestine.

Ten years earlier, as a medical student, he had noticed similar responses in people. Selye theorized that the same pattern of changes occurs in the body in reaction to any kind of stress and that the pattern is what eventually leads to disease conditions such as ulcers, arthritis, hypertension, arteriosclerosis, or diabetes. Selye called the pattern the general adaptation syndrome. For decades, researchers have studied the syndrome, and Selye's theories have held up to scientific scrutiny.[6] Figure 3.4 depicts the stages of the general adaptation syndrome.



Source: "General Adaptation Syndrome," Figure 3.1 in An Invitation to Health, by Dianne Hales (Belmont, CA: Wadsworth/Cengage Learning). Used by permission.

FIGURE 3.4 The Three Stages of Selye's General Adaptation Syndrome

Source: "General Adaptation Syndrome," Figure 3.1 in *An Invitation to Health,* Choosing to Change 14th Edition, by Dianne Hales (Belmont, CA: Wadsworth/ Cengage Learning, 2011), p. 68. Used by permission.

Stages of the General Adaptation Syndrome

Dr. Selye identified three stages of the general adaptation syndrome:

1. *Alarm stage.* When a stressor occurs, the body responds in what has been described previously as the fight-or-flight response. Homeostasis has been disrupted. Several body systems are activated, especially the nervous and endocrine systems, to prepare the body for action. If the stressor subsides, the body returns to homeostasis.
2. *Stage of resistance.* If the stressor continues, the body mobilizes its internal resources in an effort to return to a state of homeostasis, but because the perception of a threat still exists, the body does not achieve complete homeostasis. The stress response stays activated, usually at less intensity than during the alarm stage, but still at a level to cause hyperarousal. For example, if you learn that your mother has been diagnosed with cancer, you may respond intensely and feel great stress at first. During the subsequent weeks, you struggle to carry on, but this requires considerable effort.
3. *Stage of exhaustion.* If the stress continues long enough, the body can no longer function normally. When chronic stress persists, organ systems may fail and the body breaks down in a variety of ways. Continuous stress that causes the body to adapt constantly can become a threat to health. A state of wellness is difficult to maintain over time when our body energy is channeled into coping with stress.

Application of the General Adaptation Syndrome In their book *Lifetime Physical Fitness and Wellness,* Werner and Sharon Hoeger provide this excellent application of the GAS to college test performance.

The bottom line is that we need to take responsibility to slow down and carefully assess our choices for living wisely. This book is filled with strategies to help you. Don't underestimate the immediate consequences of stress to drain the joy from life and the long-term consequences of serious health concerns.

Five Myths About Stress

This is a good time to review some of what you have learned in the first three chapters by examining common myths about stress. See if you agree with these myths.

Myth 1: In an ideal world, there would be no stress Stress is not always bad for you. Too little stress leads to boredom and can make us miserable. Stress can be the spice of life if we learn how to manage it. Managed stress makes us productive and happy.

Myth 2: What is stressful to me is stressful to you Absolutely not true. Stress is different for each of us. Situations are rarely stressful in and of themselves. What causes one person to totally lose it might not even ruffle another. Stress is something we create and depends on how we interpret situations. The good news is that if our mind creates our stress, then our mind can decrease our stress.

Myth 3: Only unpleasant situations are stressful Falling in love can be just as stressful as breaking up, and winning the lottery can be as stressful as losing your job. Change, whether positive or negative, is the key ingredient in causing stress.

Myth 4: No symptoms, no stress Not so. Absence of symptoms does not mean the absence of stress. While symptoms are the warning signs that stress is at work in the body, stress can be taking its toll even before symptoms are apparent, especially if you are not tuned into the messages your body is sending. Camouflaging symptoms with medications, other drugs, or alcohol may deprive you of the signals you need to begin reducing physiological and psychological strain.

Myth 5: Stress is inevitable, so you can't do anything about it Not true. You can plan your life so that stress does not overwhelm you. You can learn specific techniques that not only help you cope with stress, but actually prevent some stress from ever happening in the first place.

Conclusion

Your body is designed to respond to acute stress in a predictable manner for one outcome—your survival. This response, the fight-or-flight or stress response, is critical to your ability to survive life-threatening situations throughout your life. Through the actions of the autonomic nervous system, your body is programmed for a response that will protect you from harm.

In today's world, many of our challenges are not acute, physical challenges. Today our stressors are primarily psychological and social, such as having too much to do, financial debt, concern for a loved one, loneliness, or unhealthy relationships. The physiological response is not well suited to deal with these types of stressors. When our bodies stay in a state of physiological hyperarousal without release, negative health consequences accumulate.

Take a few minutes to think about the connections between the concepts presented in this chapter. Consider the relationship between the fight-or-flight response, acute and chronic stress, and the general adaptation syndrome. Relating these concepts to events in your life will help you see the relevance of the science of stress to your understanding of how stress affects you. This knowledge also will give you a foundation for understanding how relaxation techniques have the potential to intercept the stress response. In Chapter 4 you will learn more about the powerful mind/body connection and its impact on health and disease.