

Stress



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■ WHAT IS STRESS?

Most of us have more firsthand experience with stress than we care to remember. Stress is being stopped by a police officer after accidentally running a red light. It is waiting to take a test when you are not sure that you have studied enough or studied the right material. It is missing a bus on a rainy day full of important appointments.

Stress is a negative emotional experience accompanied by predictable biochemical, physiological, cognitive, and behavioral changes that are directed either toward altering the stressful event or accommodating to its effects.

What Is a Stressor?

Initially, researchers focused on stressful events themselves, called **stressors**. In the United States, for example, people report that money, the economy, work, family health problems, and family responsibilities are their top five stressors (American Psychological Association, 2008).

But an experience may be stressful to some people but not to others. If “noise” is the latest rock music playing on your radio, then it will probably not be stressful to you, although it may be to your neighbor.

Appraisal of Stressors

Stress is the consequence of a person’s appraisal processes: **primary appraisal** occurs as a person is trying to understand what the event is and what it will mean. Events may be appraised for their harm, threat, or challenge. Harm is the assessment of the damage that has already been done, as for example being fired from a job. Threat is the assessment of possible future damage, as a person anticipates the problems that loss of income will create for him and his family. But events may also be appraised in terms of their challenge, that is, the potential to overcome or even profit from the event. For example, a man who lost his job may regard his unemployment as an opportunity to try something new. Challenge assessments lead to more confident expectations that one can cope with the stressful event, more favorable emotional reactions to the event, and lower blood pressure, among other benefits (Blascovich, 2008).

Secondary appraisals assess whether personal resources are sufficient to meet the demands of the environment. When a person’s resources are more

than adequate to deal with a difficult situation, he or she may feel little stress and experience a sense of challenge instead. When the person perceives that his or her resources will probably be sufficient to deal with the event but only with a lot of effort, he or she may feel a moderate amount of stress. When the person perceives that his or her resources will probably not be sufficient to overcome the stressor, he or she may experience a great deal of stress.

Stress, then, is determined by **person-environment fit** (Lazarus & Folkman, 1984; Lazarus & Launier, 1978). It results from the process of appraising events (as harmful, threatening, or challenging), of assessing potential resources, and of responding to the events. To see how stress researchers have arrived at this current understanding, we examine the origins of stress research.

■ ORIGINS OF THE STUDY OF STRESS

Fight or Flight

The earliest contribution to stress research was Walter Cannon’s (1932) description of the **fight-or-flight response**. Cannon proposed that when an organism perceives a threat, the body is rapidly aroused and motivated via the sympathetic nervous system and the endocrine system. This concerted physiological response mobilizes the organism to attack the threat or to flee; hence, it is called the fight-or-flight response.

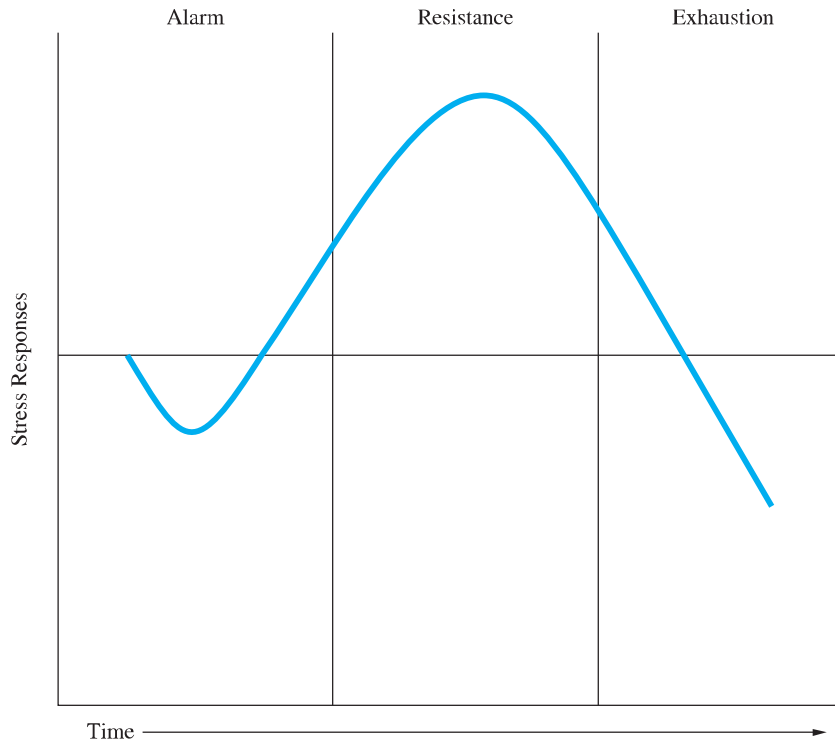
At one time, fight or flight literally referred to fighting or fleeing in response to stressful events such as attack by a predator. Now, more commonly, *fight* refers to aggressive responses to stress, such as getting angry or taking action, whereas *flight* is reflected in social withdrawal or withdrawal through substance use or distracting activities. On the one hand, the fight-or-flight response is adaptive because it enables the organism to respond quickly to threat. On the other hand, it can be harmful because stress disrupts emotional and physiological functioning, and when stress continues unabated, it lays the groundwork for health problems.

Selye’s General Adaptation Syndrome

Another important early contribution to stress was Hans Selye’s (1956, 1976) work on the **general adaptation syndrome**. Selye exposed rats to a variety of stressors, such as extreme cold and fatigue, and

FIGURE 6.1 | The Three Phases of Selye's General Adaptation Syndrome

Hans Selye, a pioneering stress researcher, formulated the General Adaptation Syndrome. He proposed that people go through three phases in response to stress. The first is the alarm phase, in which the body reacts to a stressor with diminished resistance. In the second stage, the stage of resistance that follows continued exposure to a stressor, stress responses rise above normal. The third phase, exhaustion, results from long-term exposure to the stressor, and at this point, resistance will fall below normal.



observed their physiological responses. To his surprise, all stressors, regardless of type, produced essentially the same pattern of physiological changes. They all led to an enlarged adrenal cortex, shrinking of the thymus and lymph glands, and ulceration of the stomach and duodenum.

From these observations, Selye (1956) developed the general adaptation syndrome. He argued that when a person confronts a stressor, it mobilizes itself for action. The response itself is nonspecific with respect to the stressor; that is, regardless of the cause of the threat, the person will respond with the same physiological pattern of reactions. (As will be seen, this particular conclusion has now been challenged.) Over time, with repeated or prolonged exposure to stress, there will be wear and tear on the system.

The general adaptation syndrome consists of three phases. In the first phase, *alarm*, the person be-

comes mobilized to meet the threat. In the second phase, *resistance*, the person makes efforts to cope with the threat, as through confrontation. The third phase, *exhaustion*, occurs if the person fails to overcome the threat and depletes physiological resources in the process of trying. These phases are pictured in Figure 6.1.

Criticisms of the General Adaptation Syndrome

Selye's model has been criticized on several grounds. First, it assigns a very limited role to psychological factors, and researchers now believe that the psychological appraisal of events is critical to experiencing stress (Lazarus & Folkman, 1984). A second criticism concerns the fact that not all stressors produce the same biological responses (Kemeny, 2003). How people respond to stress is influenced by their personalities, emotions, and biological constitutions

(e.g., Moons, Eisenberger, & Taylor, 2010). A third criticism concerns whether exhaustion of physiological resources or their chronic activation is most implicated in stress; research suggests that continued activation (the second phase) may be most important for accumulating damage to physiological systems, rather than exhaustion. Finally, Selye assessed stress as an outcome, that is, the endpoint of the general adaptation syndrome. In fact, people experience many debilitating effects of stress after an event has ended and even in anticipation of its occurrence. Despite these limitations and reservations, Selye's model remains a cornerstone in the field.

Tend-and-Befriend

In response to stress, people (and animals) do not merely fight, flee, and grow exhausted. They also affiliate with each other, whether it is the herding behavior of antelope in response to a predator or the coordinated responses to a stressor that a community shows when it is under the threat of a hurricane. S. E. Taylor and colleagues (Taylor, Klein, et al., 2000) developed a theory of responses to stress termed **tend-and-befriend**. The theory maintains that, in addition to fight or flight, people and animals respond to stress with social affiliation and nurturant behavior toward offspring. These responses to stress may be especially true of women.

During the time that responses to stress evolved, men and women faced somewhat different adaptive challenges. Whereas men were responsible for hunting and protection, women were responsible for foraging and child care. These activities were largely sex segregated, with the result that women's responses to stress would have evolved so as to protect not only the self but offspring as well. These responses are not distinctive to humans. The offspring of most species are immature and would be unable to survive, were it not for the attention of adults. In most species, that attention is provided by the mother.

Tend-and-befriend has an underlying biological mechanism, in particular, the hormone oxytocin. Oxytocin is a stress hormone, rapidly released in response to some stressful events, and its effects are especially influenced by estrogen, suggesting a particularly important role in the responses of women to stress. Oxytocin acts as an impetus for affiliation in both animals and humans, and oxytocin increases affiliative behaviors of all kinds, especially mothering

(Taylor, 2002). In addition, animals and humans with high levels of oxytocin are calmer and more relaxed, which may contribute to their social and nurturant behavior.

Research supports some key components of the theory. Women are indeed more likely than men to respond to stress by turning to others (Luckow, Reifman, & McIntosh, 1998; Tamres, Janicki, & Helgeson, 2002). Mothers' responses to offspring during times of stress also appear to be different from those of fathers in ways encompassed by the tend-and-befriend theory. Nonetheless, men, too, show social responses to stress, and so elements of the theory apply to men as well.

How Does Stress Contribute to Illness?

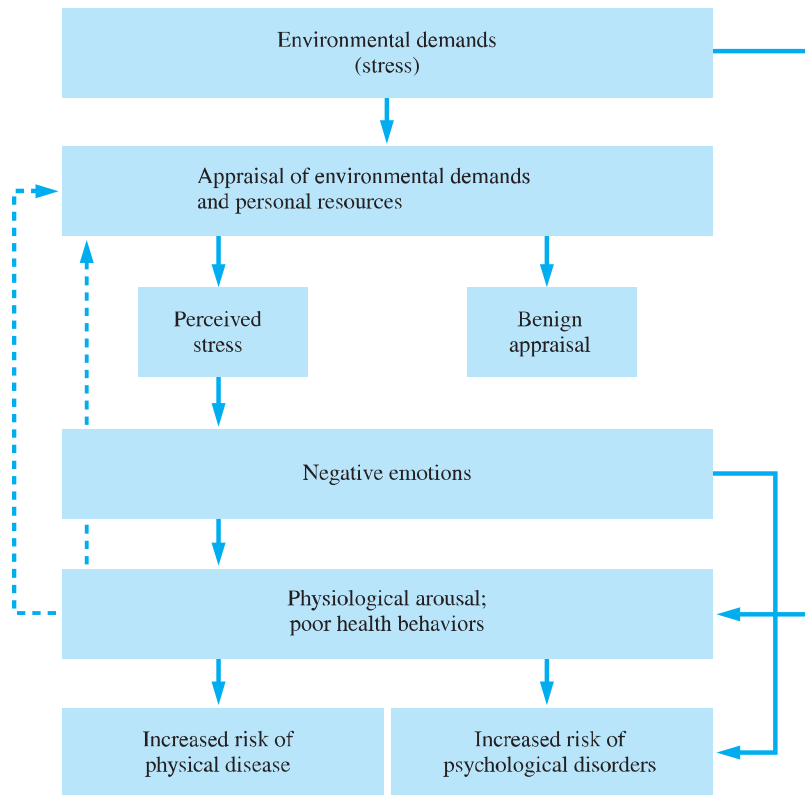
These early contributions to the study of stress have helped researchers identify the pathways by which stress leads to poor health. The first set of pathways involves direct effects on physiology. As both Cannon and Selye showed, stress alters biological functioning. The ways in which it does so and how it interacts with existing risks or genetic predispositions to illness determine what illnesses a person will develop. Direct physiological effects include such processes as elevated blood pressure, a decreased ability of the immune system to fight off infection, and changes in lipid levels and cholesterol, among other changes. We explore these more fully in the next sections.

A second set of pathways concern health behaviors (Chapters 3–5). People who live with chronic stress have poorer health habits than people who do not, and acute stress, even when it is short-term, often compromises health habits. These poor health habits can include smoking, poor nutrition, little sleep, little exercise, and use of substances such as drugs and alcohol. Over the long-term, each of these poor health habits contributes to specific illnesses. For example, smoking can cause lung disease. Even in the short-term, changes in these health habits may increase the risk for illness and set the stage for longer term adverse health outcomes.

Third, stress affects psychosocial resources in ways that can adversely affect health (Chapter 7). Supportive social contacts are protective of health, but stress can make a person avoid these social contacts or, worse, behave in ways that drive others away. Optimism, self-esteem, and a sense of personal control

FIGURE 6.2 | Stress and Mental and Physical Health

Stress contributes to mental and physical health disorders. This figure shows some of the routes by which these effects may occur. (Source: Cohen, Kessler, & Gordon, 1995)



also contribute to good health, yet many stressors undermine these beneficial beliefs. To the extent that time, money, and energy must be put into combating the stressor, these external resources are compromised as well, falling especially hard on people who have very little of those resources.

A fourth set of pathways by which stress adversely affects health involves the use of health services and adherence to treatment recommendations. People are less likely to adhere to a treatment regimen when they are under stress, and they are more likely to delay seeking care for disorders that should be treated. Alternatively, they may not seek care at all. These pathways are addressed primarily in Chapters 8 and 9.

These four routes—physiology, health behaviors, psychosocial resources, and use of health services—represent the most important pathways by which stress affects health (see Figure 6.2).

■ THE PHYSIOLOGY OF STRESS

Stress engages psychological distress and leads to changes in the body that may have short- and long-term consequences for health. Two interrelated systems are heavily involved in the stress response. They are the sympathetic-adrenomedullary (SAM) system and the hypothalamic-pituitary-adrenocortical (HPA) axis.

Sympathetic Activation When events are perceived as harmful or threatening, they are identified as such by the cerebral cortex in the brain, which, in turn, sets off a chain of reactions mediated by these appraisals. Information from the cortex is transmitted to the hypothalamus, which initiates one of the earliest responses to stress—namely, sympathetic nervous system arousal. Sympathetic arousal stimulates the

medulla of the adrenal glands, which, in turn, secrete the catecholamines epinephrine (EP) and norepinephrine (NE). These effects result in the cranked-up feeling we usually experience in response to stress: increased blood pressure, increased heart rate, increased sweating, and constriction of peripheral blood vessels, among other changes. The catecholamines modulate the immune system as well.

Parasympathetic functioning may also become dysregulated in response to stress. For example, stress can affect heart rate variability. Parasympathetic modulation is an important restorative aspect of sleep, and so, changes in heart rate variability may both represent a pathway to disturbed sleep and help to explain the relation of stress to illness and increased risk for mortality.

HPA Activation The hypothalamic-pituitary adrenal (HPA) axis is also activated in response to stress. The hypothalamus releases corticotrophin-releasing hormone (CRH), which stimulates the pituitary gland to secrete adrenocorticotrophic hormone (ACTH), which, in turn, stimulates the adrenal cortex to release glucocorticoids. Of these, cortisol is especially significant. It acts to conserve stores of carbohydrates and helps reduce inflammation in the case of an injury. It also helps the body return to its steady state following stress.

Repeated activation of the HPA axis in response to chronic or recurring stress can ultimately compromise its functioning. Daily cortisol patterns may be altered. Normally, cortisol levels are high upon waking in the morning, but decrease during the day (although peaking following lunch) until they flatten out at low levels in the afternoon. People under chronic stress, however, can show any of several deviant patterns: elevated cortisol levels long into the afternoon or evening, a general flattening of the daily rhythm, an exaggerated cortisol response to a challenge, a protracted cortisol response following a stressor, or, alternatively, no response at all (McEwen, 1998). Any of these patterns is suggestive of compromised ability of the HPA axis to respond to and recover from stress (McEwen, 1998; Pruessner, Hellhammer, Pruessner, & Lupien, 2003) (Figure 6.3).

Effects of Long-Term Stress

Although physiological mobilization prepared humans to fight or flee in prehistoric times, only rarely

do our current stressful events require these kinds of adjustments. That is, job strain, commuting, family quarrels, and money worries are not the sorts of stressors that demand this dramatic mobilization of physical resources. Nonetheless, people still experience sudden elevations of circulating stress hormones in response to current-day stressors, and this process, in certain respects, does not serve the purpose for which it originally developed.

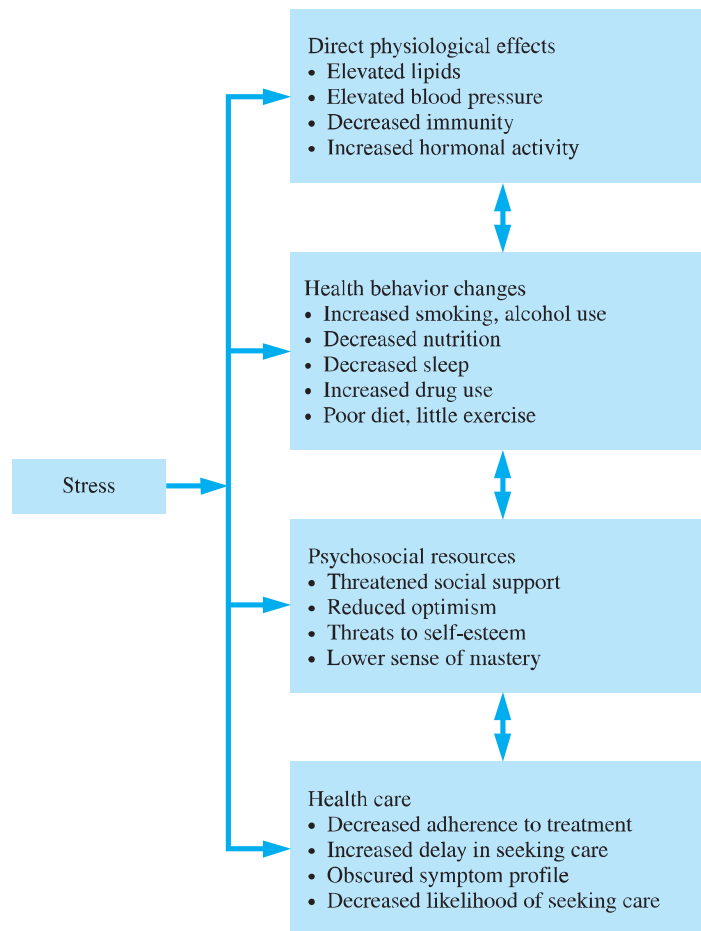
Over the long term, excessive discharge of epinephrine and norepinephrine can lead to suppression of immune function; produce adverse changes such as increased blood pressure and heart rate; provoke variations in normal heart rhythms, such as ventricular arrhythmias, which can be a precursor to sudden death; and produce neurochemical imbalances that may contribute to the development of psychiatric disorders. The catecholamines may also have effects on lipid levels and free fatty acids, which contribute to the development of atherosclerosis, as was seen in Chapter 2.

Corticosteroids have immunosuppressive effects, which can compromise the functioning of the immune system. Prolonged cortisol secretion has also been related to the destruction of neurons in the hippocampus, which can lead to problems with verbal functioning, memory, and concentration (Starkman, Giordani, Brenent, Schork, & Scheingart, 2001) and may be one of the mechanisms leading to senility. Pronounced HPA activation is common in depression, with episodes of cortisol secretion being more frequent and longer among depressed than nondepressed people. Storage of fat in central visceral areas (i.e., belly fat), rather than in the hips, is another consequence of prolonged HPA activation. This accumulation leads to a high waist-to-hip ratio, which is used by some researchers as a marker for chronic stress (Bjorntorp, 1996).

Which of these responses to stress have implications for disease? The health consequences of HPA axis activation may be more significant than those of sympathetic activation (Blascovich, 1992; Dientsbier, 1989; Jamieson, Mendes, & Nock, 2013). Sympathetic arousal in response to stress by itself may not be a pathway for disease; HPA activation may be required as well. This reasoning may explain why exercise, which produces sympathetic arousal but not HPA activation, is protective for health rather than health compromising. However, unlike exercise, stressors can be experienced long after a stressful event has terminated, and cardiovascular activation may persist

FIGURE 6.3 | How Does Stress Cause Illness?

Direct physiological effects result from sympathetic nervous system and/or HPA activation. In addition, as this figure shows, stress may affect health via behaviors, first, by influencing health behavior, second, by affecting the use of psychosocial resources and, third, by interfering with treatment and the use of health services.



for hours, days, weeks, or even years after an initial stressful event has occurred, even without awareness (Pieper, Brosschot, van der Leeden, & Thayer, 2010). Such wear and tear on the cardiovascular system may foster illness.

Stress may also compromise immune functioning (Chapter 14). Among these changes is impairment of the immune system's ability to terminate inflammation, which is an early response to stress. Chronic inflammation, even low-level chronic inflammation, is implicated in many diseases including coronary artery disease (Rohleder, 2014) (See Chapter 2), and so the impaired ability to terminate inflammation may be an important pathway by which stress affects illness outcomes.

Poor sleep can be a consequence of chronic stress. Because sleep represents a vital restorative activity, this mechanism, too, represents a pathway to disease (Edwards, Hucklebridge, Clow, & Evans, 2003).

Individual Differences in Stress Reactivity

People vary in their reactivity to stress. **Reactivity** is the degree of change that occurs in autonomic, neuroendocrine, and/or immune responses as a result of stress. Some people are predisposed by their genetic makeup, prenatal experiences, and/or early life experiences to be more biologically reactive to stress than others and, consequently, they may be especially vulnerable to adverse



Stressful events such as being stuck in traffic produce agitation and physiological arousal.

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health consequences due to stress (Boyce et al., 1995; Jacobs et al., 2006).

For example, S. Cohen and colleagues (2002) found that people who reacted to laboratory stressors with high cortisol responses and who also had a high level of negative life events were especially vulnerable to upper respiratory infections when exposed to a virus. People who reacted to laboratory stressors with low immune responses were especially vulnerable to upper respiratory infection only if they were also under high stress. High immune reactors, in contrast, did not show differences in upper respiratory illness as a function of the stress they experienced, perhaps because their immune systems were quick to respond to the threat that a potential infection posed (see also Cohen, Janicki-Deverts, & Miller, 2007).

Studies like these suggest that psychobiological reactivity to stress is an important factor that influences the stress-illness relationship. As will be seen in Chapter 13, differences in reactivity are believed to contribute to the development of hypertension and coronary artery disease.

Physiological Recovery

Recovery following stress is also important in the physiology of the stress response. The inability to recover quickly from a stressful event may be a marker for the cumulative damage that stress has caused. Researchers have paid special attention to the cortisol response, particularly, prolonged cortisol responses that occur under conditions of high stress.

TABLE 6.1 | Indicators of Allostatic Load

- Decreases in cell-mediated immunity
- The inability to shut off cortisol in response to stress
- Lowered heart rate variability
- Elevated epinephrine levels
- A high waist-to-hip ratio (reflecting abdominal fat)
- Hippocampal volume (which can decrease with repeated stimulation of the HPA)
- Problems with memory (an indirect measure of hippocampal functioning)
- Elevated blood pressure

Source: Seeman, Singer, Horwitz, & McEwen, 1997.

In one intriguing study (Perna & McDowell, 1995), elite athletes were divided into those who were experiencing a high versus a low amount of stress in their lives, and their cortisol response was measured following vigorous training. Those athletes under more stress had a protracted cortisol response. Stress may, accordingly, widen the window of susceptibility for illness and injury among competitive athletes by virtue of its impact on cortisol recovery.

Allostatic Load

Multiple physiological systems within the body fluctuate to meet demands from stress, as we have seen. The concept of **allostatic load** has been developed to refer to the physiological costs of chronic exposure to the physiological changes that result from repeated or chronic stress (McEwen, 1998). Allostatic load can begin to accumulate in childhood, affecting multiple disease risks across the lifespan (Doan, Dich, & Evans, 2014). The buildup of allostatic load can be assessed by a number of indicators, including increasing weight and higher blood pressure (Seeman, Singer, Horwitz, & McEwen, 1997). More of these indicators are listed in Table 6.1.

Many of these changes occur normally with age, so to the extent that they occur early, accumulating allostatic load may be thought of as accelerated aging in response to stress. Over time, this kind of wear and tear can lead to illness and increased risk of death (Gallo, Fortmann, & Mattei, 2014). The damage due to chronic stress is made worse if people also cope with stress via a high-fat diet, infrequent exercise, alcohol abuse, and

Common wisdom has long held that pregnant women should be treated especially well and avoid major stressors in their lives. Research now supports that wisdom by showing that stress can actually endanger the course of pregnancy and childbirth.

Stress affects the immune and endocrine systems in ways that directly affect the growing fetus. These changes are potentially dangerous because they can lead to spontaneous abortion (Wainstock, Lerner-Geva, Glasser, Shoham-Vardi, & Anteby, 2013), and preterm birth and low birth weight, among other adverse outcomes (Glynn, Dunkel-Schetter, Hobel, & Sandman, 2008; Tegethoff, Greene, Olsen, Meyer, & Meinlschmidt, 2010). African American women and acculturated Mexican American women appear to be especially vulnerable, due in large part to the stress they experience (D'Anna-Hernandez et al., 2012; Hilmert et al., 2008). The mother's elevated cortisol levels in response to stress act as a signal to the fetus that it is time to be born, leading to preterm birth (Mancuso, Dunkel-Schetter, Rini, Roesch, & Hobel, 2004).

Are there any factors that can protect against adverse birth outcomes due to stress? Social support, especially from a partner, protects against adverse birth outcomes (Feldman, Dunkel-Schetter, Sandman, & Wadhwa, 2000). Psychosocial resources such as mastery, self-esteem, and optimism may also help guard against



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adverse birth outcomes (Rini, Dunkel-Schetter, Wadhwa, & Sandman, 1999). Pregnancy-specific stress can elevate birth risks as well (Cole-Lewis et al., 2014). The anxiety that can accompany stress and the prenatal period exacerbates cortisol levels and increases the likelihood of an adverse birth outcome, and so interventions to reduce anxiety may be helpful as well (Mancuso et al., 2004).

But the old adage about taking it easy during pregnancy and the more dire warnings about the high risks for adverse birth outcomes in disadvantaged groups make it clear that pregnancy is an especially important time to avoid stress and to draw on one's psychological and social resources.

smoking, all of which stress can encourage (Doan et al., 2014).

The relationship of stress to both acute disorders, such as infection, and chronic disorders, such as heart disease, is now well known. We explore these processes more fully with heart disease and hypertension in Chapter 13 and cancer and arthritis in Chapter 14. Stress can even affect the course of pregnancy, as Box 6.1 shows.

■ WHAT MAKES EVENTS STRESSFUL?

Dimensions of Stressful Events

Although events are not necessarily inherently stressful, some characteristics of events make them more likely to be appraised as stressful.

Negative Events Negative events produce more stress than do positive events. Shopping for the holidays, coping with an unexpected job promotion, and getting married are all positive events that draw off time and energy. Nonetheless, these positive experiences are less stressful than negative or undesirable events, such as getting a traffic ticket, trying to find a job, coping with a death in the family, getting divorced or experiencing daily conflict (Tobin et al., 2015). Rejection targeted at you specifically by another person or group is particularly toxic (Murphy, Slavich, Chen, & Miller, 2015). Negative events produce more psychological distress and physical symptoms than positive ones do (Sarason, Johnson, & Siegel, 1978).

Uncontrollable Events Uncontrollable or unpredictable events are more stressful than controllable or predictable ones especially if they are also unexpected (Cankaya, Chapman, Talbot, Moynihan, & Duberstein, 2009). When people feel that they can predict, modify, or terminate an aversive event or feel they have access to someone who can influence it, they experience less stress, even if they actually can do nothing about it (Thompson, 1981). Feelings of control not only mute the subjective experience of stress but also influence biochemical reactions to it, including catecholamine levels and immune responses (Brosschot et al., 1998).

Ambiguous Events Ambiguous events are more stressful than clear-cut events. When a potential stressor is ambiguous, a person cannot take action, but must instead devote energy to trying to understand the stressor, which can be a time-consuming, resource-sapping task. Clear-cut stressors, on the other hand, let the person get on with finding solutions and do not leave him or her stuck at the problem definition stage. The ability to take confrontative action is usually associated with less distress and better coping (Billings & Moos, 1984).

Overload Overloaded people experience more stress than people with fewer tasks to perform (Cohen & Williamson, 1988). For example, one of the main sources of work-related stress is job overload, the

perception that one is responsible for doing too much in too short a time.

Which Stressors? People are more vulnerable to stress in central life domains than in peripheral ones, because important aspects of the self are heavily invested in central life domains (Swindle & Moos, 1992). For example, one study of working women for whom parental identity was very important found that strains associated with the parent role, such as feeling that their children did not get the attention they needed, took a toll (Simon, 1992).

To summarize, then, events that are negative, uncontrollable, ambiguous, or overwhelming or that involve central life goals are experienced as more stressful than events that are positive, controllable, clear-cut, or manageable or that involve peripheral life tasks.

Must Stress Be Perceived as Such to Be Stressful?

The discussion of stress thus far has emphasized the importance of perception, that is, the subjective experience of stress. However, objective stressors can have effects independent of the perceived stress they cause. For example, in a study of air traffic controllers, Repetti (1993b) assessed their subjective perceptions of stress on various days and also gathered objective measures of daily stress, including the weather conditions and the amount of air traffic. She



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Events such as crowding are experienced as stressful to the extent that they are appraised that way. Some situations of crowding make people feel happy, whereas other crowding situations are experienced as aversive.

found that both subjective and objective measures of stress independently predicted psychological distress and health complaints. Even when the air traffic controllers reported that they were not under stress, if air traffic was heavy and weather conditions poor, they were more likely to show evidence of stress, both physiologically and behaviorally.

Can People Adapt to Stress?

If a stressful event becomes a permanent or chronic part of the environment, will people eventually habituate to it, or will they develop **chronic strain**? The answer to this question depends on the type of stressor, the subjective experience of stress, and the indicator of stress.

Most people are able to adapt psychologically to moderate or predictable stressors. At first, any novel or threatening situation can produce stress, but such reactions subside over time. For example, research on the effects of environmental noise (Nivison & Endresen, 1993) and crowding (Cohen, Glass, & Phillip, 1978) indicates few or no long-term adverse physiological or psychological effects, suggesting that most people simply adapt to this chronic stressor.

However, vulnerable populations, such as children, the elderly, and the poor, show little adaptation to chronic stressors (Cohen et al., 1978). One reason is that these groups already experience little control over their environments and, accordingly, may already be at high levels of stress; the addition of an environmental stressor may push their resources to the limits.

Most people, then, can adapt to mildly stressful events; however, it may be difficult or impossible to adapt to highly stressful events, and already-stressed people may be unable to adapt to even moderate stressors. Moreover, even when psychological adaptation may have occurred, physiological changes in response to stress may persist. Chronic stress can impair cardiovascular, neuroendocrine, and immune system recovery from stressors and, through such effects, contribute to an increased risk for diseases such as cardiovascular disorders (Matthews, Gump, & Owens, 2001).

Must a Stressor Be Ongoing to Be Stressful?

One of the wonders and curses of human beings' symbolic capacities is the ability to anticipate things

before they materialize. We owe our abilities to plan, invent, and reason abstractly to this skill, but we also get from it our ability to worry. We do not have to be exposed to a stressor to suffer stress.

Anticipating Stress The anticipation of a stressor can be as stressful as its actual occurrence, and sometimes more so (Wirtz et al., 2006). Consider the strain of anticipating a confrontation with one's partner or worrying about an upcoming test. Sleepless nights and days of distracting anxiety attest to the human being's capacity for anticipatory distress.

In one study that illustrates this point, medical students' blood pressure was assessed on an unstressful lecture day, on the day before an important examination, and during the examination itself. Although the students had stable blood pressure on the lecture day, blood pressure on the preexamination day, when the students were worrying about the exam, was as high as that seen during the examination (Sausen, Lovallo, Pincomb, & Wilson, 1992).

Aftereffects of Stress Adverse **aftereffects of stress** often persist long after the stressful event itself is no longer present. These aftereffects include a shortened attention span and poor performance on intellectual tasks as well as ongoing psychological distress and physiological arousal. Cognitive disruptions such as difficulty concentrating are common, and social behavior is affected as well; people seem to be less willing to help others when they are suffering from the aftereffects of stress. Worry or rumination, even when one is not aware that one is doing it, can keep heart rate, blood pressure, and immune markers at high levels (Zoccola, Figueroa, Rabideau, Woody, & Benencia, 2014). Box 6.2 profiles a particular kind of aftereffect of stress, post-traumatic stress disorder.

■ HOW HAS STRESS BEEN STUDIED?

Health psychologists have used several different methods for studying stress and assessing its effects on psychological and physical health.

Studying Stress in the Laboratory

A common way to study stress is to bring people into the laboratory, expose them to short-term stressful

events, and observe the impact of that stress on their physiological, neuroendocrine, and psychological responses. This **acute stress paradigm** consistently finds that when people perform stressful tasks (such as counting backward quickly by 7s or delivering an impromptu speech to an unresponsive audience), they become psychologically distressed and show physiological arousal (Kirschbaum, Klauer, Filipp, & Hellhammer, 1995; Ritz & Steptoe, 2000).

The acute stress paradigm has been helpful for identifying who is most vulnerable to stress (Pike et al., 1997). For example, people who are chronically stressed react more during these laboratory stressors as do people who are high in hostility (Davis, Matthews, & McGrath, 2000). Box 6.3 provides an example of how an acutely stressful event can lead to dramatic health consequences. These methods have also shown that when people experience stress in the presence of a supportive partner or even a stranger, their stress responses can be reduced (Ditzen et al., 2007).

Inducing Disease

Another way of studying the effects of stress has involved intentionally exposing people to viruses and then assessing whether they get ill and how ill

they get. For example, S. Cohen and colleagues (1999) measured levels of stress in a group of adults, infected them with an influenza virus by swabbing their nose with cotton soaked in a viral culture, and measured their respiratory symptoms, the amount of mucus they produced, and immune responses to stress. They found that people experiencing more stress are more likely to get sick and mount a stronger immune response than people exposed to the virus whose lives were less stressful. This approach has also been used to study factors that protect against stress, such as social support (e.g., Cohen et al., 2008).

Stressful Life Events

Another line of stress research assesses **stressful life events**. Two pioneers in stress research, T. H. Holmes and R. H. Rahe (1967), maintained that when a person must adjust to a changing environment, the likelihood of stress increases. They created an inventory of stressful life events (Table 6.2) by developing ratings of stressful events based on the amount of change those events cause. Thus, for example, if one's spouse dies, virtually every aspect of life is disrupted. On the other hand, getting a traffic ticket may be annoying but is unlikely to produce much change in one's life.

TABLE 6.2 | The Social Readjustment Rating Scale

Here are some examples of items from the Social Readjustment Rating Scale, including some that are viewed as very taxing and others, much less so.		
Rank	Life Event	Mean Value
1	Death of a spouse	100
2	Divorce	73
4	Detention in jail or other institution	63
5	Death of a close family member	63
6	Major personal injury or illness	53
8	Being fired at work	47
Here are some of the smaller stressful events that nonetheless can aggravate accumulating stress as well.		
Rank	Life Event	Mean Value
41	Vacation	13
42	Christmas	12
43	Minor violations of the law (e.g., traffic tickets, jaywalking, disturbing the peace)	11

Source: T. H. Holmes & Rahe, 1967.

An Iraq War veteran and his wife headed out to the movies one summer night. As they took their seats, the veteran scanned the rows for moviegoers who might be wired with explosives. A man who appeared to be Middle Eastern, wearing a long coat with bulging pockets, sat down in the same row. The Iraq War veteran instructed his wife to get low to the ground. Moments later, he heard a metal jangling as the man reached into his pocket, and he lunged at the man, sure that he was a suicide bomber about to strike. As he jerked away, the man dropped the deadly weapon—a can of Coke (Streisand, 2006, October 9).

When a person has experienced intense stress, symptoms of the stress experience may persist long after the event is over and affect health long afterwards as well (Litcher-Kelly et al., 2014; Lowe, Willis, & Rhodes, 2014). In the case of major traumas, these stressful aftereffects may go on intermittently for months or years. Such long-term reactions are especially likely following combat exposure, as occurred in Iraq and Afghanistan (McNally, 2012). But they may also occur in response to assault, rape, domestic abuse, a violent encounter with nature (such as an earthquake or flood), a disaster (such as 9/11) (Fagan, Galea, Ahern, Bonner, & Vlahov, 2003), being a hostage (Vila, Porche, & Mouren-Simeoni, 1999), or having a child with a life-threatening disease (Cabizuca, Marques-Portella, Mendlowicz, Coutinho, & Figueria, 2009). Particular occupations such as being a police officer in a high-crime city (D. Mohr et al., 2003) or having re-



National Archives and Records Administration (NWDNS-111-SC-347803)

sponsibility for clearing up remains following war, disaster, or mass death (McCarroll, Ursano, Fullerton, Liu, & Lundy, 2002) increase the risk of trauma. Post-traumatic stress disorder (PTSD) can be the result. Symptoms of PTSD include psychic numbing, reduced interest in once-enjoyable activities, detachment from friends, or constriction in emotions. The person may relive aspects of the trauma, as the Iraq War veteran did. Other symptoms include excessive vigilance, sleep disturbances, feelings of guilt, impaired memory and concentration, an exaggerated startle response to loud noise (Lewis, Troxel, Kravitz, Bromberger, Matthews, & Hall, 2013), and even suicidal behavior. Sometimes the onset of symptoms is delayed, necessitating following people at risk over time (O'Donnell et al., 2013). PTSD can lead to greater and more severe conflict in couples and with other family members and friends (Caska et al., 2014).

PTSD can produce temporary and permanent changes in stress regulatory systems (Minassian et al., 2014). People with PTSD show cortisol dysregulation (Mason et al., 2002), alterations in immune functioning (Boscarino & Chang, 1999), and chronically higher levels of norepinephrine, epinephrine, and testosterone (Lindauer et al., 2006; O'Donnell, Creamer, Elliott, & Bryant, 2007).

PTSD leads to poor health, especially cardiovascular and lung disorders (Kubzansky, Koenen, Jones, & Eaton, 2009; Pietrzak, Goldstein, Southwick, & Grant, 2011), and early mortality, especially from heart disease (Dedert, Calhoun, Watkins, Sherwood, & Beckham, 2010). It also is tied to life-threatening health habits such as problem drinking and smoking, which contribute to poor health (Dennis et al., 2014), and to worsening symptoms of already existing disorders such as asthma (Fagan et al., 2003).

Nearly half of adults in the United States experience at least one traumatic event in their lifetime, but only 10 percent of women and 5 percent of men develop PTSD (Ozer & Weiss, 2004). Who is most likely to develop PTSD? People who have poor cognitive skills (Gilbertson et al., 2006) or catastrophic thinking about stress (Bryant & Guthrie, 2005), and people who have a preexisting emotional disorder such as anxiety (Dohrenwend, Yager, Wall, & Adams, 2013) are vulnerable. People who use avoidant coping, have low levels of social support, have a history of chronic

stress, have preexisting heightened reactivity to trauma-related stimuli (Suendermann, Ehlers, Boellinghaus, Gamer, & Glucksman, 2010), and are generally negative all have increased risk of developing PTSD in the wake of a traumatic stressor (Gil & Caspi, 2006; Widows, Jacobsen, & Fields, 2000).

Characteristics of the trauma matters, too. Soldiers who had combat experience, who observed atrocities, and who participated in atrocities are most likely to experience PTSD (Dohrenwend et al., 2013). The more traumas one is exposed to, the greater the risk of PTSD, and the greater the health risk that may result (Sledjeski, Speisman, & Dierker, 2008).

Can PTSD be alleviated? Cognitive-behavioral therapies are used to treat PTSD (Harvey, Bryant, & Tarrier, 2003; Nemeroff et al., 2006). Perhaps counterintuitively, repeated exposure to the trauma through imagined exposure and discussion of thoughts and feelings related to the trauma can reduce symptoms of PTSD and enhance

emotional processing of the traumatic event (Reger et al., 2011). Exposure therapy early after the trauma may be best (Rothbaum et al., 2012). Virtual reality exposure therapy after or even before exposure to wartime trauma has been used as well (Rizzo et al., 2009). The goals of repeated exposure involve isolating the trauma as a discrete event, habituating to it and reducing overwhelming distress. In turn, this repeated exposure can foster new interpretations of the event and its implications, reduce anxiety, and build a sense of mastery (Harvey et al., 2003). Once habituation is achieved, cognitive restructuring is added to integrate the trauma into the client's self-view and worldview. Anxiety management training is often included so that the patient can recognize and deal with intrusive traumatic memories (Harvey et al., 2003). Interventions such as these have been successfully used with military veterans (Monson et al., 2006) and women who were sexually abused as children (McDonagh et al., 2005) among other groups.

Although all people experience at least some stressful events, some people will experience a lot, and it is this group, according to Holmes and Rahe, that is most vulnerable to illness.

Although scores on life event inventories predict illness, the relation is quite modest. Why is this the case? First, some of the items on the list are vague; for example, "personal injury or illness" could mean anything from the flu to a heart attack. Second, because events have preassigned point values, individual differences in how events are experienced are not taken into account. For example, a divorce may mean welcome freedom to one partner but a collapse in living standard or self-esteem to the other.

Third, inventories include both positive and negative events, as well as events that people choose, such as getting married, and events that simply happen, such as the death of a close friend. As noted, sudden, negative, unexpected, and uncontrollable events are reliably more stressful. Fourth, researchers typically do not assess whether stressful events have been successfully resolved, which mutes adverse effects (Thoits, 1994; Turner & Avison, 1992).

Life event inventories may pick up chronic strains and also personality factors that influence

how intensely a person experiences an event. Many people believe that stress causes illness, and so if they have been ill, they may remember more events in their lives as having been stressful.

A final difficulty concerns the time between stress and illness. Usually, in these studies, stress over a 1-year period is related to the most recent 6 months of illness bouts. Yet, January's crisis is unlikely to have caused June's cold and April's financial problems are unlikely to have produced a malignancy detected in May. Obviously, these cases are extreme, but they illustrate some of the problems in studying the stress-illness relationship over time. For all these reasons, life event inventories are no longer used as much and some researchers have turned instead to perceived stress (Box 6.4).

Daily Stress

In addition to major stressful life events, researchers have studied minor stressful events, or **daily hassles**, and their cumulative impact on health and illness. Such hassles include being stuck in traffic, waiting in a line, doing household chores, having difficulty making small decisions, and daily conflict (Tobin et al., 2015). Daily minor problems produce psychological

Everyone knows that fans get worked up during exciting sports matches. Near misses by one's own team, questionable calls by referees, and dirty plays can all rouse fans to fever pitch. But do these events actually have health effects? To examine this question, Wilbert-Lampen and colleagues (2008) studied acute cardiovascular events in 4,279 Germans when the German national team played in World Cup soccer events. On days with matches involving the German team, cardiac emergencies were nearly three times as likely as on days when they did not play. Nearly half of these people, mostly men, had previously been diagnosed with coronary heart disease.

The study concluded that viewing a stressful soccer match, or indeed any other exciting sports event, may more than double the risk of a heart attack or stroke. This increased risk falls especially hard on people who have already been diagnosed with heart



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disease. So if someone you care about has a cardiovascular disorder and is a sports fan, that person may want to rethink whether exciting matches are worth the risk.

distress, adverse physiological changes, physical symptoms, and use of health care services (Gouin, Glaser, Malarkey, Beversdorf, & Kiecolt-Glaser, 2012; Sin, Graham-Engeland, Ong, & Almeida, 2015). An example of how daily hassles can be measured is shown in Box 6.5.

Minor hassles affect physical and psychological health in several ways. First, the cumulative impact of small stressors may wear a person down, leading to



New York City traffic enforcement agents who have social support from coworkers are better able to deal with these stressful working conditions (Karlan, Brondolo, & Schwartz, 2003).

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illness. Second, such events may aggravate reactions to major life events or chronic stress to produce distress or illness (Marin, Martin, Blackwell, Stetler, & Miller, 2007; Serido, Almeida, & Wethington, 2004).

Although useful for identifying the smaller hassles of life, measure of daily strain have some of the same problems as the measurement of major stressful life events. For example, people who report a lot of hassles may be anxious or neurotic.

■ SOURCES OF CHRONIC STRESS

Earlier, we posed the question of whether people can adapt to chronically stressful events. The answer is that people can adapt to a degree but continue to show signs of stress in response to severe chronic strains in their lives. Indeed, chronic stress may be more important than major life events for developing illness.

Effects of Early Stressful Life Experiences

Early life adversity in childhood can affect not only health in childhood (e.g., Marin, Chen, Munch, & Miller, 2009), but also health across the lifespan into adulthood and old age (McCrary, Dooley, Layte, & Kenny, 2015; Miller, Chen, & Parker, 2011). Some of

Because people vary so much in what they consider to be stressful, many researchers measure perceived stress instead. S. Cohen and his colleagues (1983) developed a measure of perceived stress, some items of which follow. Perceived stress predicts a broad array of health outcomes (Kojima et al., 2005; Young, He, Genkinger, Sapun, Mabry, & Jehn, 2004).

ITEMS ON THE PERCEIVED STRESS SCALE

For each question, choose from the following alternatives:

- 0 Never
- 1 Almost never
- 2 Sometimes
- 3 Fairly often
- 4 Very often

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you felt nervous and stressed?
3. In the last month, how often have you found that you could not cope with all the things that you had to do?
4. In the last month, how often have you been angered because of things that happened that were outside your control?
5. In the last month, how often have you found yourself thinking about things that you had to accomplish?
6. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

If your score is high, you may want to try to reduce the stress in your life.

this work grew out of the allostatic load view of stress, which argues that major, chronic, or recurrent stress dysregulates stress systems, which, over time, produce accumulating risk for disease (Slatcher & Robles, 2012). These early risks include low socioeconomic status, exposure to violence, living in poverty-stricken neighborhoods, and other community level stressors (Blair & Raver, 2012).

Physical or sexual abuse in childhood increases health risks (Midei, Matthews, Chang, & Bromberger,



Work strains, like the argument between these coworkers, are common sources of stress that compromise well-being and physical health.

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2013) because abuse can result in intense, chronic stress that taxes physiological systems (Wegman & Stetler, 2009) and difficulties regulating emotions (Broody et al., 2014). Even more modest family stress can increase risk for disease. Repetti and colleagues (2002) found that “risky families”—that is, families that are high in conflict or abuse and low in warmth and nurturance—produce offspring whose stress responses are compromised. These difficulties include problems with emotion regulation, social skills, and health habits (Schrepf, Markon, & Lutgendorf, 2014). Children who grow up in harsh families do not learn how to recognize other people’s emotions and respond to them appropriately or regulate their own emotional responses to situations. As a result, they may overreact to mild stressors (Hanson & Chen, 2010). These adverse reactions can be compounded by low socioeconomic status (Appleton et al., 2012) and by exposure to trauma (Schrepf et al., 2014).

Children who grow up in risky families also have difficulty forming good social relationships. These deficits in emotion regulation and social skills can persist across the lifespan long into adulthood, compromising the ways in which people from risky families cope with stress (Raposa, Hammen, Brennan, O’Callaghan, & Najman, 2014; Taylor, Eisenberger, Saxbe, Lehman, & Lieberman, 2006). Physiological systems are affected

INSTRUCTIONS

Each day, we experience minor annoyances as well as major problems or difficulties. Indicate how much of a strain each of these annoyances has been for you in the past month.

Severity

- 0 Did not occur
- 1 Mild strain
- 2 Somewhat of a strain
- 3 Moderate strain
- 4 Extreme strain

Hassles

- | | | | | | |
|--|---|---|---|---|---|
| 1. A quarrel or problems with a neighbor | 0 | 1 | 2 | 3 | 4 |
| 2. Traffic congestion | 0 | 1 | 2 | 3 | 4 |
| 3. Thoughts of poor health | 0 | 1 | 2 | 3 | 4 |
| 4. An argument with a romantic partner | 0 | 1 | 2 | 3 | 4 |
| 5. Concerns about money | 0 | 1 | 2 | 3 | 4 |
| 6. A parking ticket | 0 | 1 | 2 | 3 | 4 |
| 7. Preparation of meals | 0 | 1 | 2 | 3 | 4 |

as well (Miller, Chen, & Parker, 2011). Children from risky families can develop heightened sympathetic reactivity to stress, exaggerated cortisol responses leading to health risks, and/or an immune profile marked by chronic inflammation (Miller & Chen, 2010; Schreier & Chen, 2012).

For example, in a retrospective study, V. J. Felitti and colleagues (1998) asked adults to complete a questionnaire regarding their early family environment that inquired, among other things, how warm and supportive the environment was versus how cold, critical, hostile, or conflict-ridden it was. The more negative characteristics these adults reported from their childhood, the more vulnerable they were in adulthood to many disorders, including depression, lung disease, cancer, heart disease, and diabetes (Loucks, Almeida, Taylor, & Matthews, 2011). Because children from risky families often have poor health habits, some enhanced risk for disease may come from smoking, poor diet, and lack of exercise. Stress in adolescence also affects health both during adolescence (Schreier, Roy, Frimer, & Chen, 2014), and into adulthood (Quon & McGrath, 2014). For example, social disadvantage in adolescence is linked to increased body weight, to inflammation (Pietras & Goodman, 2013), and to high-blood pressure and poor blood pressure recovery from stress (Evans, Exner-Cortens, Kim & Bartholomew, 2013). Perceived financial stress is especially strongly related to multiple health markers and outcomes, attesting again to the adverse health effects of low SES (Quon & McGrath, 2014). Good parenting can mitigate these effects (Brody, Yu, Chen, & Miller, 2014).

Are these effects reversible? At present it is unknown whether early life stress permanently programs stress systems or whether some of these effects are reversible. However, some factors, such as maternal nurturance in a high poverty environment, can be protective against the health risks usually found in high-stress areas (Miller et al., 2011). Interventions undertaken early in childhood may have health payoffs across the lifespan (Puig, Englund, Simpson, & Collins, 2012).

Chronic Stressful Conditions

Sometimes, chronic stress is long-term and grinding, such as living in poverty, being in a bad relationship, or remaining in a high-stress job. Chronic stress is also an important contributor to psychological distress and physical illness (Kahn & Pearlin, 2006). In an early community study of 2,300 people, L. I. Pearlin and C. Schooler (1978) found that people who reported chronic stress in marriage, parenting, household functioning, or their jobs were more likely to be psychologically distressed. Uncontrollable stressors may be particularly virulent (McGonagle & Kessler, 1990). Even something as mundane as commuting can affect daily cortisol levels and perceived stress, affecting the over 100 million Americans who commute to work every weekday (Evans & Wener, 2006).

Research relating chronic stress to health outcomes is difficult to conduct, though, because it is hard to show that a particular chronic stressor is the factor that caused illness. Second, unlike life events, which can often be assessed objectively, chronic stress

can be more difficult to measure objectively. Third, as in the measurement of life events, inventories that assess chronic strain may also tap psychological distress and neuroticism. Nonetheless, the evidence indicates that chronic stress is related to illness (Matthews, Gallo, & Taylor, 2010). Box 6.6 focuses on a particular type of chronic stress, namely, prejudice, and its relation to poor health.

Research showing social class differences in death from all causes, including cancers and cardiovascular disease, also attests to the relationship between chronic stress and health (Grzywacz, Almeida, Neupert, & Ettner, 2004). Poverty, exposure to crime, neighborhood stress, and other chronic stressors vary with SES and are all tied to poor health outcomes (Adler, Boyce, Chesney, Folkman, & Syme, 1993). People who are low in SES typically have low-prestige occupations, which may expose them to greater interpersonal conflict and stress at work. Chronic SES-related stress has also been related to alterations in cortisol patterns, catecholamines, and inflammation (Friedman & Herd, 2010; Kumari et al., 2010). Even children in low SES circumstances suffer health risks, including sleep problems (El-Sheikh et al., 2013), weight gain (Puterman et al., 2016), and increases in allostatic load (Doan, Dich, & Evans, 2014). At least some of the health risks tied to low SES may be reversible if circumstances improve (Kiviruusu, Huurre, Haukkala, & Aro, 2013).

Stress in the Workplace

Workplace stress is estimated to cost \$300 billion a year (American Institute of Stress, n.d.). Studies of stress in the workplace are important for several additional reasons:

- They help identify some of the most common stressors of everyday life.
- They provide evidence for the stress-illness relationship.
- Work stress may be one of our preventable stressors and so provide possibilities for intervention.
- Stress-related physical and mental health disorders account for a growing percentage of disability and social security payments to workers.

Work and Sedentary Lifestyle The most common work that people undertook before the Industrial

Revolution was agricultural production, which involves physical labor. As people have moved into sedentary office jobs, the amount of exercise they get in their work lives has declined substantially. Even jobs that require high levels of physical exertion, such as construction work and firefighting, may include so much stress that the benefits of exercise are eliminated. Because activity level is related to health, this change in the nature of work increases vulnerability to illness.

Overload Work overload is a chief factor producing high levels of occupational stress. Workers required to work too long and too hard at too many tasks feel more stressed, have poorer health habits, and have more health risks than do workers not suffering from overload (Lumley et al., 2014). The chronic neuroendocrine activation and cardiovascular activation associated with overcommitment can contribute to cardiovascular disease (Steptoe, Siegrist, Kirschbaum, & Marmot, 2004; Von Känel, Bellingrath, & Kudielka, 2009).

An old rock song states, “Monday, Monday, can’t trust that day.” Monday may indeed be one of the most stressful days of the week. Weekdays more generally are associated with more worry and chronic work overload than weekends, resulting in altered cortisol levels (Schlotz, Hellhammer, Schulz, & Stone, 2004). Unfortunately, many people, particularly in the United States, don’t use their weekends to recover and instead work through the weekend. Then they dump the work they did over the weekend onto their coworkers on Monday. Incomplete recovery from work contributes to death from cardiovascular disease (Kivimäki et al., 2006).

So well established is the relation between work overload and poor health that Japan, a country notorious for its long working hours, long work weeks, little sleep, and lack of vacations, has a term, *karoshi*, that refers to death from overwork. One study found that men who worked more than 61 hours a week experienced twice the risk of a heart attack as those working 40 hours or less; sleeping 5 hours or less at least 2 days a week increased this risk by two to three times (Liu & Tanaka, 2002). Under Japanese law, families are entitled to compensation if they can prove that the breadwinner died of *karoshi* (*Los Angeles Times*, March 1993). As a result, work hours have declined in Japan over the past 20 years.

Ambiguity and Role Conflict Role conflict and role ambiguity are associated with stress. Role

A young African American father pulled up in front of a house in a largely white neighborhood to pick up his daughter from a birthday party. Because he was early and the party had not ended, he sat waiting in the car. Within 8 minutes, a security car had pulled up behind him; two officers approached him and asked him to exit his vehicle. Neighbors had reported seeing a suspicious-looking African American man casing their neighborhood.

Prejudice and racism adversely affect health (Klonoff, 2014). It has long been known that African Americans experience greater health risks than the rest of the population. Life expectancy for African American men is about 5 years less than for white men, and life expectancy for African American women is 3 years less than for white women (National Vital Statistics Reports, 2016). For example, African American men and women die of cardiovascular disease at nearly one and a half times the rate for white men and women.

Many of these differences can be traced to differences in SES and social status (Major, Mendes, & Dovidio, 2013; Myers, 2009). Poverty, lower educational attainment, imprisonment, and unemployment are more prevalent among blacks than whites (Browning & Cagney, 2003). The day-in, day-out grinding strain associated with poor housing, little available employment, poor schools, and poor neighborhoods also contributes to stress through chronic exposure to violence and an enduring sense of danger (Ross & Mirowsky, 2011). Discrimination can erode personal resources, such as social support and the ability to regulate emotions effectively (Gibbons et al., 2014). Medical services in minority areas are often inadequate. African Americans are less likely to receive preventive services and more likely to experience delayed medical attention (Institute of Medicine, 2002).

Racism and racial discrimination also contribute to disease risk, especially risk of cardiovascular disease (Brondolo, ver Halen, Pencille, Beatty, & Contrada, 2009; Williams & Mohammed, 2009). One may be treated badly by a store clerk or stopped by the police for no reason (driving while black). The adverse effects of prejudice and discrimination on health are explained in part by the higher anxiety, depression, and hostility that people develop in response to their experiences of prejudice and discrimination (Brondolo et al., 2011).

There are physiological effects of racism as well. Perceived racism coupled with inhibited angry responses to it are related to high blood pressure, contributing to the high incidence of hypertension among African Americans (Smart Richman, Pek, Pascoe, & Bauer, 2010). Blood pressure usually falls when a person goes to sleep, but African Americans are less likely to experience a dip in blood pressure at night (Tomfohr, Cooper, Mills, Nelesen, & Dimsdale, 2010). Racism may also help to explain the high levels of depression (Turner & Avison, 2003) and back pain (Edwards, 2008) in the African American population. Chronic exposure to racism has been tied to problem drinking and to poor sleep quality (Lewis, Troxel, Kravitz, Bromberger, Matthews, & Hall, 2013).

Racism is not the only form of prejudice that contributes to poor health. Sexism predicts poor physical and mental health for women (Ryff, Keyes, & Hughes, 2003). Women have the best health in states in which their earnings, employment, and political participation are highest and the worst health in those states in which they score lowest on these indices (Jun, Subramanian, Gortmaker, & Kawachi, 2004). Discrimination against mothers is particularly rampant and difficult to combat (Biernat, Crosby, & Williams, 2004).

Negative stereotypes about aging may compromise health among older adults. In one study, simply exposing older adults to negative aging stereotypes increased cardiovascular responses to stress (Levy, Hausdorff, Hencke, & Wei, 2000). Suicide rates among ethnic immigrant groups have been tied to the amount of hate speech directed toward those groups (Mullen & Smyth, 2004) and the strain of trying to adjust to a new culture can produce adverse changes in stress-related biomarkers (Fang, Ross, Pathak, Godwin, & Tseng, 2014). Perceived discrimination is linked to substance abuse among Native American children (Whitbeck, Hoyt, McMorris, Chen, & Stubben, 2001) and to depression among Native American adults (Whitbeck, McMorris, Hoyt, Stubben, & LaFromboise, 2002). Exposure to stress and prejudice can adversely affect LGBT young adults (Hatzenbuehler, Slopen, & McLaughlin, 2014), and exposure to weight stigma can affect biomarkers of stress (Schvey, Pulh, & Bronwell, 2014). Converging evidence like this indicates clearly that the stressors associated with discrimination, racism, and prejudice can adversely affect health.



Research shows that workers with high levels of job strain and low levels of control over their work are under great stress and may be at risk for coronary heart disease.

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ambiguity occurs when a person has no clear idea of what to do and no idea of the standards used for evaluating work. **Role conflict** occurs when a person receives conflicting information about work tasks or standards from different individuals. For example, if a college professor is told by one colleague to publish more articles, is advised by another colleague to publish fewer papers but of higher quality, and is told by a third to improve teaching ratings, the professor may experience role ambiguity and conflict. Chronically high blood pressure and elevated heart rate have been tied to role conflict and role ambiguity (French & Caplan, 1973). When people receive clear feedback about the nature of their performance, they report lower levels of stress (Cohen & Williamson, 1988).

Social Relationships The inability to develop satisfying social relationships at work has been tied to job stress (House, 1981), to psychological distress at work (Buunk, Doosje, Jans, & Hopstaken, 1993), and to poor physical and mental health (Repetti, 1993a; Shirom, Toker, Alkaly, Jacobson, & Balicer, 2011). Having a poor relationship with one's supervisor predicts job distress and may increase a worker's risk for coronary heart disease (Davis, Matthews, Meilahn, & Kiss, 1995; Repetti, 1993a).

To a degree, having an amicable social environment at work depends on being an amicable coworker. A study of air traffic controllers found that people who were not particularly well liked by their coworkers and

who consequently did not have much social contact were more likely to become ill and to experience an accidental injury than were people who enjoyed and contributed to a more satisfying social climate (Niemcryk, Jenkins, Rose, & Hurst, 1987).

Social relationships not only combat stress in their own right, they also buffer other job stressors, such as low control over one's work.

Control Lack of control over one's work life is a major stressor. It predicts dissatisfaction at work and absenteeism as well as physiological arousal that predicts disease. Lack of control at work has been tied to greater risk of coronary artery disease (Bosma et al., 1997) and to all-cause mortality. Job control, by contrast, can improve health (Smith, Frank, Bondy, & Mustard, 2008).

R. Karasek and his associates (1981) developed a model of job strain that helps to explain its adverse effects on health. They maintain that high psychological demands on the job with little decision latitude (such as low job control) causes job strain, which, in turn, can lead to the development of coronary artery disease. Research generally supports this idea (Emeny et al., 2013). The chronic anger that can result from high strain jobs may further contribute to coronary artery disease risk (Fitzgerald, Haythornthwaite, Suchday, & Ewart, 2003). When high demands and low control are combined with little social support at work, in what has been termed the **demand-control-support model**, risk for coronary artery disease is greater (Hintsanen et al., 2007; Muhonen & Torkelson, 2003). The perception that one's effort at work is insufficiently rewarded (effort-reward imbalance) is also associated with health risks, especially coronary heart disease (Abo-Éboulé et al., 2011).

Unemployment Unemployment is a major life stressor. It increases psychological distress (Burgard, Brand, & House, 2007), physical symptoms, physical illness (Hamilton, Broman, Hoffman, & Renner, 1990), alcohol abuse (Catalano et al., 1993), difficulty achieving sexual arousal, low birth weight of offspring (Catalano, Hansen, & Hartig, 1999), elevated inflammation (Janicki-Deverts, Cohen, Matthews, & Cullen, 2008), and compromised immune functioning (Cohen et al., 2007; Segerstrom & Miller, 2004).

For example, in a study of SES-related decline in the wake of Hurricane Katrina, those who suffered trauma or who lost their jobs and experienced other

deprivations showed enduring health effects (Joseph, Matthews, & Meyers, 2014).

Uncertainty over employment and unstable employment have also been tied to physical illness (Heaney, Israel, & House, 1994). For example, a study found that men who had held a series of unrelated jobs were at greater risk of dying than were men who remained in the same job or in the same type of job (Pavalko, Elder, & Clipp, 1993). Being stably employed is protective of health (Rushing, Ritter, & Burton, 1992).

Other Occupational Outcomes Stress shows up in ways other than illness that may be extremely costly to an organization. Workers who cannot participate actively in decisions about their jobs show higher rates of absenteeism, job turnover, tardiness, job dissatisfaction, sabotage, and poor performance on the job. Workers may take matters into their own hands and reduce stress by not working as long, as hard, or as well as their employers expect (Kivimäki, Vahtera, Ellovainio, Lillrank, & Kevin, 2002).

Some Solutions to Workplace Stressors

A blueprint for change has been offered by several organizational stress researchers (for example, Kahn, 1981) (Table 6.3).

Combining Work and Family Roles

Much of the stress that people experience results not from one role in their lives but from the combination of several roles. As adults, most of us will be workers, partners, and parents. Each of these roles entails heavy obligations, and stress can result when one is attempting to combine multiple roles.

Women and Multiple Roles These problems are particularly acute for women. More than half of married women with young children are currently employed (U.S. Bureau of Labor Statistics, 2014). Managing multiple roles is most difficult when both work and family responsibilities are heavy (Emmons, Biernat, Teidje, Lang, & Wortman, 1990), and having many responsibilities at home has health risks of its own (Thurston, Sherwood, Matthews, & Blumenthal, 2011). Because concessions to working parents are rarely made at work

TABLE 6.3 | Reducing Stress at Work

Because work is such an important and time-consuming part of life, it can contribute to the joy but also to the stress that people experience each day. How can stress on the job be reduced?

1. Minimize physical work stressors, such as noise, harsh lighting, crowding, or temperature extremes.
2. Minimize unpredictability and ambiguity in expected tasks and standards of performance. When workers know what they are expected to do, they are less distressed.
3. Involve workers as much as possible in the decisions that affect their work.
4. Make jobs as interesting as possible.
5. Provide workers with opportunities to develop or promote meaningful social relationships.
6. Reward workers for good work, rather than focusing on punishment for poor work.
7. Look for signs of stress before stress has an opportunity to do significant damage. Supervisors can watch for negative affect, such as boredom, apathy, and hostility, because these affective reactions often precede more severe reactions to stress, such as poor health or absenteeism.
8. Add workplace perks that enhance quality of life. Some organizations, such as Google, go so far as to permit pets at work and provide high-quality food continuously throughout the day (Cosser, 2008).

and because mothers take on more household tasks and child care than fathers (Emmons et al., 1990), home and work responsibilities may conflict with each other, increasing stress. Working women who have children at home have higher levels of cortisol, higher cardiovascular reactivity, and more home strain than those without children at home (Frankenhaeuser et al., 1989; Luecken et al., 1997). Single women raising children on their own are most at risk for health problems (Hughes & Waite, 2002), whereas women who are happily married are less likely to show these negative effects (Saxbe, Repetti, & Nishina, 2008).

Protective Effects of Multiple Roles Despite the potential for working mothers to suffer role conflict and overload, there can be positive effects of combining home and work responsibilities (e.g., Janssen et al., 2012). Combining motherhood with employment can be beneficial for women's health and well-being,



Many women hold multiple roles, such as worker, homemaker, and parent. Although these multiple roles can provide much satisfaction, they also make women vulnerable to role conflict and role overload.

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improving self-esteem, feelings of self-efficacy, and life satisfaction (Verbrugge, 1983; Weidner, Boughal, Connor, Pieper, & Mendell, 1997). Being a parent also confers resistance to colds (Sneed, Cohen, Turner, & Doyle, 2012).

Having control and flexibility over one's work environment (Lennon & Rosenfield, 1992), having a good income (Rosenfield, 1992), having someone to help with the housework (Krause & Markides, 1985), having adequate child care (Ross & Mirowsky, 1988), having a partner (Ali & Avison, 1997), and having a supportive, helpful partner (Klumb, Hoppmann, & Staats, 2006) all reduce the likelihood that multiple role demands will lead to

stress and its psychological and physical costs (Ten Brummelhuis & Bakker, 2012).

Men and Multiple Roles Men experience stress as they attempt to combine multiple roles as well. Studies show that men are more distressed by financial strain and work stress, whereas women are more distressed by adverse changes in the home (Barnett, Raudenbush, Brennan, Pleck, & Marshall, 1995).

Combining employment and marriage is protective for men's health and mental health (Burton, 1998), just as it is for women who have enough help. But multiple roles can take their toll on men, too. R. L. Repetti (1989) studied workload and interpersonal strain and how they affected fathers' interactions with the family at the end of the day. She found that after a demanding day at work (high workload strain) fathers were more withdrawn in their interactions with their children. After stressful interpersonal events at work (high interpersonal strain), conflict with children increased. Employed, unmarried fathers may be especially vulnerable to psychological distress (Simon, 1998).

For both men and women, the research on multiple roles is converging on the idea that stress is lower when one finds meaning in one's life. The protective effects of employment, marriage, and parenting on psychological distress and the beneficial effects of social support on health attest to the beneficial effects of social roles (Burton, 1998). When these sources of meaning and pleasure in life are challenged, as through role conflict and role overload, health may suffer (Stansfeld, Bosma, Hemingway, & Marmot, 1998).

Children Children and adolescents also experience stress that can make home life stressful (Repetti, Wang, & Saxbe, 2011). One study found that social and academic failure experiences at school, such as being rejected by a peer or having difficulty with schoolwork, significantly increased a child's demanding and aversive behavior at home—specifically, acting out and making demands for attention (Repetti & Pollina, 1994). Children are also affected by their parents' work and family stressors, with consequences for the children's academic achievement and acting out in adolescence (Menaghan, Kowaleski-Jones, & Mott, 1997). Stress in children leads to adoption of an unhealthy lifestyle (Michels et al., 2015). ●

SUMMARY

1. Events are perceived as stressful when people believe that their resources (such as time, money, and energy) may not be sufficient to meet the harm, threat, or challenge posed by the stressor.
2. Whether an event is stressful depends on how it is appraised. Events that are negative, uncontrollable or unpredictable, ambiguous, overwhelming, and threatening to central life tasks are especially likely to be perceived as stressful.
3. Early research on stress examined how a person mobilizes resources to fight or flee from threatening stimuli (the fight-or-flight response). Selye proposed the General Adaptation Syndrome, maintaining that reactions to stress go through three phases: alarm, resistance, and exhaustion. Recent efforts have focused on social responses to stress, that is, the ways in which people tend-and-befriend others in times of stress.
4. The physiology of stress implicates the sympathetic adrenomedullary (SAM) system and the hypothalamic-pituitary-adrenocortical (HPA) axis. Over the long term, repeated activation of these and other physiological systems can lead to cumulative damage, termed allostatic load, which represents the premature physiological aging that chronic or recurrent stress can produce.
5. Usually, people can adapt to mild stressors, but severe stressors may cause chronic health problems. Stress can have disruptive aftereffects, including persistent physiological arousal, psychological distress, poor task performance, and, over time, declines in cognitive capabilities. Vulnerable populations—such as children, the elderly, and the poor—may be particularly adversely affected by stress.
6. Researchers study stress in the laboratory and through experimental research that manipulates exposure to pathogens. Research on stressful life events indicates that any event that forces a person to make a change increases stress and the likelihood of illness. Chronic stress, as well as the daily hassles of life, also affect health adversely.
7. Studies of occupational stress suggest that work hazards, work overload, work pressure, role conflict and ambiguity, inability to develop satisfying job relationships, inability to exert control in one's job, and unemployment can lead to increased illness, job dissatisfaction, absenteeism, tardiness, and turnover. Some of these job stresses can be prevented or offset through intervention.
8. Combining multiple roles, such as those related to work and home life, can create role conflict and role overload, producing psychological distress and poor health. On the other hand, such role combinations may confer meaning and enhance well-being. Which of these effects depend, in large part, on available resources, such as time, money, and social support?

KEY TERMS

acute stress paradigm	fight-or-flight response	secondary appraisal
aftereffects of stress	general adaptation syndrome	stress
allostatic load	person–environment fit	stressful life events
chronic strain	primary appraisal	stressors
daily hassles	reactivity	tend-and-befriend
demand-control-support model	role conflict	