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STRESS, BIOPSYCHOSOCIAL FACTORS, AND ILLNESS

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Two cataclysmic events riveted the world’s attention within a year of each other: the enormous tsunami in the Indian Ocean in December 2004 and hurricane Katrina, which nearly destroyed New Orleans and surrounding areas in August 2005. These events killed over 200,000 people and left even more injured and homeless. In New Orleans, hundreds of thousands of people were relocated, sometimes splitting up families, at least temporarily. Let’s contrast Katrina’s aftermath for two high school friends, Will and Barb, who were relocated far apart.

The initial impact of the hurricane on them was similar, but the amounts of stress that followed were different—Will’s stress was not as severe as Barb’s. One thing that helped Will was that his whole family remained together when relocated to a nearby town where they had relatives. The relatives provided consolation for Will’s loss, places for him to socialize, help in getting jobs for his parents, and assistance in getting their new house set up. How was Will doing 2 years later? He missed Barb, whom he hadn’t seen in over a year. But he was making a good adjustment in his new community; had a good relationship with his family, had begun attending a nearby community college and dating a student he met there, and was in good health.

Barb was not so fortunate, and her situation differed from Will’s in several major ways. Her immediate family was split up for several months until they relocated to a distant state when one of her parents got a job there. Barb had no extended family to help her and her parents or to provide emotional support in their grief. Her family lived in a cramped apartment in their new location, and their financial situation was very difficult. And Barb
had never been as outgoing as Will—she felt awkward and insecure in making friends and meeting guys. Two years after Katrina, she was isolated and lonely. Although Barb graduated from high school, she then got a low-paying job with lots of overtime, which left her with little time or money to socialize. The stress in Barb’s life was taking its toll: she and her parents were arguing often, and her health was deteriorating. She had developed two illnesses—migraine headaches and a digestive system condition that causes abdominal pain—that worsened when she felt stress.

Continuing issues introduced in Chapter 3, this chapter examines in more detail the effects of stress on health. We begin by looking at psychosocial factors that can modify the stress people experience. Then we consider how stress affects health and the development of specific illnesses. And in this chapter we address many questions about stress and illness that are of great concern today. Why can some people experience one traumatic event after another without ill effects, but others cannot? Are angry and hard-driving people more likely to have a heart attack than people who are easygoing? Can stress delay people’s recovery from illness?

PSYCHOSOCIAL MODIFIERS OF STRESS

People’s reactions to stress vary from one person to the next and from time to time for the same person. These variations often result from psychological and social factors that seem to modify the impact of stressors on the individual. Let’s look at some of these modifiers, beginning with the role of social support.

SOCIAL SUPPORT

We saw in the experiences of Will and Barb how important social ties and relationships can be during troubled times. The social support Will got from his family tempered the impact of his stressful loss and probably helped him adjust. Social support refers to comfort, caring, esteem, or help available to a person from other people or groups (Uchino, 2004). Support can come from many sources—the person’s spouse or lover, family, friends, physician, or community organizations. People with social support believe they are loved, valued, and part of a social network, such as a family or community organization, that can help in times of need. So, social support refers to actions actually performed by others, or received support. But it also refers to one’s sense or perception that comfort, caring, and help are available if needed—that is, perceived support. As will we see later, received and perceived support can have different effects on health.

Types of Social Support

What specifically does social support provide to the person? It appears to provide four basic functions (Cutrona & Gardner, 2004; Uchino, 2004). Emotional or esteem support conveys empathy, caring, concern, positive regard, and encouragement toward the person. It provides comfort and reassurance with a sense of belongingness and of being loved in times of stress, as Will received from his immediate and extended family after Katrina. Tangible or instrumental support involves direct assistance, as when people give or lend the person money or help out with chores in times of stress. Will’s relatives helped his parents get jobs and set up the new house. Informational support includes giving advice, directions, suggestions, or feedback about how the person is doing.
For example, a person who is ill might get information from family or a physician on how to treat the illness. Companionship support refers to the availability of others to spend time with the person, thereby giving a feeling of membership in a group of people who share interests and social activities.

What type of support do people generally need and get? The answer depends on the stressful circumstances. For instance, Figure 4-1 shows that cancer patients find emotional and esteem support to be especially helpful, but patients with less serious chronic illnesses find the different types of support equally helpful (Martin et al., 1994). Another study had college students fill out a questionnaire, rating the degree to which their current relationships provided them with different types of support, and then keep a daily record of their stress and social experiences for 2 weeks (Cutrona, 1986). The daily records revealed that most of the stressors were relatively minor, such as having car trouble or an argument with a roommate, but one-fifth of the students reported a severe event, such as a parent’s diagnosis of cancer or the ending of a long-term romantic relationship. As you might expect, individuals received more social support following stressful events than at less stressful times. Tangible support occurred very infrequently, but informational and emotional/esteem support occurred often. Emotional/esteem support appeared to protect individuals from negative emotional consequences of stress.

Who Gets Social Support?

Not everyone gets the social support they need. Many factors determine whether people receive support (Antonucci, 1985; Broadhead et al., 1983; Wortman & Dunkel-Schetter, 1987). Some factors relate to the potential recipients of support. People are unlikely to receive support if they are unsociable, don’t help others, and don’t let others know that they need help. Some people are not assertive enough to ask for help, or feel that they should be independent or not burden others, or feel uncomfortable confiding in others, or don’t know whom to ask. Other factors relate to the potential providers of support. For instance, they may not have the resources needed, or may be under stress and in need of help themselves, or may be insensitive to the needs of others. Old age is a time when social support sometimes declines: the elderly may exchange less support because of the loss of a spouse or because they may feel reluctant to ask for help if they become unable to reciprocate. Whether people receive social support also depends on the size, intimacy, and frequency of contact of individuals in their social network—the people a person knows and contacts (Cutrona & Gardner, 2004; Wills & Fegan, 2001).

How can we assess people’s social support, given the different types of support and the complex relationships that are involved? One highly regarded instrument is the Social Support Questionnaire, which consists of items, such as, “Who helps you feel that you truly have something positive to contribute to others?” (Sarason et al., 1983). For each item, the respondents list the people they can rely on and then indicate their overall degree of satisfaction with the support available. Using this instrument, these researchers have found that some people report high levels of satisfaction with support from a small number of close friends and relatives, but others need a large social network. (Go to .)

Gender and Sociocultural Differences in Receiving Support

The amount of social support individuals receive appears to depend on their gender and sociocultural group membership. Some evidence suggests that women receive less support from their spouses than men do and seem to rely heavily on women friends for social support (Greenglass & Noguchi, 1996). These gender differences may result from the greater intimacy that seems to exist in the friendships of females than males and may reflect mainly differences in the emotional and esteem support
Social Support, Stress, and Health

A favorite fortune cookie read, “Friendship is to people what sunshine is to flowers.” Does the social support of friends, relatives, and other people affect our stress and health? Social support may reduce the stress people experience. For example, studies of job stress have shown that the greater the social support available to employees, the lower the psychological strain they report (Cottington & House, 1987; LaRocco, House, & French, 1980). Other research has found that blood pressure during work is lower for workers who have high social support than for those with less support (Karlin, Brondolo, & Schwartz, 2003), and positive interactions with spouses can reduce the effects of job stress on cortisol levels (Ditzen et al., 2008). People with better social support also have larger nighttime decreases in blood pressure, suggesting better restorative processes (Troxel et al., 2010). And social support has been associated with reduced stress from a variety of other sources, such as living near the damaged nuclear power plant at Three Mile Island (Fleming et al., 1982).

Experiments have assessed people’s physiological strain while they were engaged in a stressful activity (such as giving a speech or performing mental arithmetic) either alone or in the presence of one or more individuals. Strain in these experiments is often assessed as cardiovascular reactivity—that is, an increase in blood pressure and/or heart rate from a baseline level. However, other aspects of the physiological stress response, including stress hormones such as cortisol, have been examined, as well (Uchino, 2006). We’ll consider a few findings. First, while giving a speech, people often show less reactivity if a supportive person is present than if speaking alone (Lepore, Allen, & Evans, 1993; Uchino & Garvey, 1997). Second, reactivity is lower with a friend present than with a supportive stranger (Christenfeld et al., 1997). Third, sometimes the presence of supportive people can increase reactivity, especially if their presence functions as an audience that increases the support recipient’s worries about being evaluated negatively (Taylor et al., 1997). Third, sometimes the presence of supportive people can increase reactivity, especially if their presence functions as an audience that increases the support recipient’s worries about being evaluated negatively (Taylor et al., 2010). Fourth, reactivity is also lower in the presence of the person’s pet than alone (Allen, Blascovich, & Mendes, 2002). Fifth, other findings suggest that the benefits of social support on reactivity may depend on the person’s personality: people who are defensive—they avoid information or feelings that
threaten their self-concept—show higher reactivity under stress when social support is given (Westmaas & Jamner, 2006). Similarly, hostile individuals can also show increased reactivity during stressful activities when accompanied by friends, perhaps because they mistrust their friends or are concerned about being evaluated (Holt-Lunstad et al., 2008). Finally, simply thinking about supportive relationships before encountering a stressor can reduce cardiovascular stress responses (Smith et al., 2004). So, looking at the pictures of loved ones on your desk during a stressful day at work might be more than just a pleasant distraction.

Having social support also seems to benefit people’s health (Cutrona & Gardner, 2004; Uchino, 2004). For instance, a prospective study had more than 4,700 men and women between 30 and 69 years of age report on four aspects of social support: marital status, contacts with family and friends, church membership, and formal and informal group associations (Berkman & Syme, 1979). Mortality data collected over the next 9 years revealed that the greater the degree of social support the subjects had, the lower the likelihood of their dying during the period of the study. Figure 4-2 shows an example of these findings. In each age category, individuals who had few contacts with friends and relatives had higher mortality rates than those with many contacts. This relationship applied to deaths from all causes and deaths from several specific diseases, including cancer and heart disease. This association is also quite strong in the case of coronary heart disease, a leading cause of mortality in industrialized nations. Specifically, social support is associated with a lower risk of developing heart disease, and among people who have already developed heart disease social support is associated with lower risk of additional heart attacks and death from heart disease (Lett et al., 2005).

Because this research is quasi-experimental, the relationship found between social support and mortality is correlational. How do we know whether social support leads to better health or whether the influence is the other way around? That is, could the people who had less social support be less active socially because they were already sick at the start of the study? Berkman and Syme provided some evidence that this was not the case. For instance, the subjects had been asked about past illnesses at the initial interview, and those with high levels of social support did not differ from those with low levels of support. But better evidence comes from a similar study of more than 2,700 adults who were medically examined at the start of the research (House, Robbins, & Metzner, 1982). This research found that people with less social support had higher mortality rates and that the initial health of those with low social support was the same as that of those with high support. Many studies of social support and future health have made sure that initial differences in health do not explain the prospective association between support and health. However, the correlational design still means that we cannot be certain that good support causes good health. Unexamined third variables could still play a role. For example, twin studies demonstrate that social support and the quality of our personal relationships are at least partially influenced by genetic factors (Spotts, Prescott, & Kendler, 2006). So, it is possible that genetic factors influence both the development of social support and future health, without support playing a direct causal role in health.

Researchers have also studied the association between social support and the likelihood that people will recover quickly from serious illness. Early findings were inconsistent—probably because of variations in research methods, such as in the way support was defined and measured (Wallston et al., 1983; Wortman & Dunkel-Schetter, 1987). Newer research has found more consistently positive results, showing, for example, that heart disease and surgery patients with high levels of social support recover more quickly than comparable patients with less support (Cutrona & Gardner, 2004; Kulik & Mahler, 1989; Wills & Fegan, 2001). Although these findings suggest that social support reduces the likelihood of poor health outcomes, it is important to recognize that social support does not necessarily lead to better health outcomes without other factors such as individual characteristics and access to resources.
of illness and speeds recovery, the connection between social support and health is not always very strong, probably because support is only one of many factors involved (Kobasa et al., 1985; Smith et al., 1994). Social support appears to have a strong impact on the health of some individuals, and a weak influence on the health of others. For instance, some evidence indicates that the recovery of many patients who believe they can cope with the emotional demands of their illness does not benefit from social support (Wilcox, Kasl, & Berkman, 1994).

**How May Social Support Affect Health?**

We have seen that prolonged exposure to high levels of stress can lead to illness. To explain how social support may influence health, researchers have proposed two theories: the “buffering” and the “direct effects” (or “main effects”) hypotheses (Cutrona & Gardner, 2004; Wills & Fegan, 2001). According to the buffering hypothesis, social support affects health by protecting the person against the negative effects of high stress. A graphical illustration of the buffering hypothesis appears in Figure 4-3a. As the graph shows, this protective function is effective only or mainly when the person encounters a strong stressor. Under low-stress conditions, little or no buffering occurs. Research has shown that the buffering process does occur (Wills & Fegan, 2001). For example, a study of job stress found that social support had a much stronger association with lower blood pressure during stressful than nonstressful work times (Karlin, Brondolo, & Schwartz, 2003).

How may buffering work? Here are two ways. First, when people encounter a strong stressor, such as a major financial crisis, those who have high levels of social support may be less likely to appraise the situation as stressful than those with low levels of support. Individuals with high social support may expect that someone they know will help them, such as by lending money or giving advice on how to get it. Second, social support may modify people’s response to a stressor after the initial appraisal. For instance, people with high social support might have someone provide a solution to the problem, convince them that the problem is not very important, or cheer them on to “look on the bright side.” People with little social support are much less likely to have any of these advantages—so the negative impact of the stress is greater for them.

The direct effects hypothesis maintains that social support benefits health and well-being regardless of the amount of stress people experience—the beneficial effects are similar under high and low stressor intensities, as depicted in Figure 4-3b. How do direct effects work? One way is that people with high levels of social support may have strong feelings of belongingness and self-esteem. The positive outlook this produces may be beneficial to health independently of stress: studies have found lower blood pressures in daily life and in laboratory tests among middle-aged and younger adults with higher levels of social support regardless of stress levels (Carels, Blumenthal, & Sherwood, 1998; Uchino et al., 1999). Other evidence suggests that high levels of support may encourage people to lead healthful lifestyles (Broman, 1993; Peirce et al., 2000). People with social support may feel, for example, that because others care about them and need them, they should exercise, eat well, and not smoke or drink heavily.

**Figure 4-3** Illustration of two ways social support may benefit health and well-being. Graph (a) illustrates the buffering hypothesis, which proposes that social support modifies the negative health effects of high levels of stress. Graph (b) depicts the direct effects hypothesis, which proposes that the health benefits of social support occur regardless of stress.
Does Social Support Always Help?

Social support does not always reduce stress and benefit health. Why not? For one thing, although support may be offered or available to us, we may not perceive it as supportive (Dunkel-Schetter & Bennett, 1990; Wilcox, Kasl, & Berkman, 1994). This may happen because the help is insufficient or the wrong kind, or we may not want help. When we do not perceive help as supportive, it is less likely to reduce our stress. For example, when people feel the need for tangible help or instrumental support but receive emotional support, they find that support unhelpful and ineffective. Similarly, when people feel the need for emotional support but receive offers of instrumental support, they also find that support unhelpful (Horowitz et al., 2001).

Support that is responsive to the recipient’s needs is the most beneficial (Maisel & Gable, 2009). Further, receiving support can sometimes convey the message to the recipient that they are inadequate to handle their problems on their own, resulting in lower self-esteem (Lepore et al., 2008). These possible negative consequences of received support may be the reason that overall the health benefits of the general sense or perceptions that one has support is a better predictor of future good health than is actual received support (Uchino, 2009).

Despite the advantages of perceived support, some intriguing research suggests that “invisible support” is best. By studying couples and asking each partner separately whether they gave or received support on a given day, Niall Bolger and his colleagues (2000) found the most beneficial effects of support on reducing negative mood during high stress days when the partner reported giving support but the recipient was unaware of it. Experimental studies have shown similar advantages of receiving support without being aware of it (Bolger & Amarel, 2007).

Perhaps a “light touch” that is responsive to the recipients’ needs without making them feel less competent or as though they are a burden on the support providers can maximize the benefits of support in some instances.

Marriage is often thought to convey protective health benefits by providing social support. Consistent with this idea, studies have found that married people live longer than divorced and never-married individuals (Kaplan & Kronick, 2006; Murphy & Bennett, 2004). James Lynch (1990) has argued that being lonely or having a “broken heart” is a risk factor for heart disease because widowed, divorced, and never-married individuals have higher death rates from heart disease than married people do. Some evidence indeed suggests that loneliness can increase the risk of heart disease (Thurston & Kubzansky, 2009). But other findings suggest that marriage itself is not the crucial factor.

- Studies have found that a health protective role of marriage occurs mainly for men and women who think their marital quality is high (Gallo et al., 2003; Umberson et al., 2006).
- Research on middle-aged men and women with no symptoms of heart disease found similar low rates of atherosclerosis in people living with a spouse or a partner (unmarried), but much higher rates for people living alone, either single or widowed (Kop et al., 2005).
- Married people show lower blood pressure than do single people, but people in unhappy marriages show higher blood pressure than single individuals (Holt-Lunstad et al., 2009).
- Frequent contact with a spouse, presumably a source of social support, can protect against worsening atherosclerosis over time, unless the marriage is perceived as low in quality (Janicki et al., 2005).

These findings suggest that social support, and not specifically marriage, is the crucial factor. When it comes to marriage and health, simply being married is not everything; quality matters.

Last, sometimes social ties can harm a person’s health. For one thing, strain or conflict in relationships can increase chances of developing serious illness (De Vogli et al., 2007), probably because as discussed in Chapter 3 conflict in relationships evokes a strong physiological stress response. Further, people with high levels of stress and frequent social contacts are more likely than others to develop infectious illnesses, such as colds (Hamrick, Cohen, & Rodriguez, 2002). Also, social ties harm health when people encourage unhealthful behavior (Burg & Seeman, 1994; Kaplan & Toshima, 1990; Suls, 1982). We’ll look at three examples. First, people may set a bad example—for instance, children are more likely to start smoking and drinking if their friends and family engage in these behaviors and less likely to use seat belts and eat a balanced diet if friends and family don’t. Second, people may encourage individuals who are overweight or have high blood pressure to eat prohibited foods, saying, “A little more cheesecake can’t hurt” or “You can make up for it by dieting next week.” Third, families may be overprotective toward a person with a serious illness, such as heart disease, and discourage the patient’s need to become more active or to go back to work. This can interfere with rehabilitation and make the patient increasingly dependent and disabled.

In summary, people perceive and receive various types of support from friends, family, and others. Social support tends to reduce people’s stress and benefit their health, but some types of support or other aspects of relationships do not. (Go to [ ]
A SENSE OF PERSONAL CONTROL

Another psychosocial factor that modifies the stress people experience is the degree of control people feel they have in their lives. People generally like the feeling of having some measure of control over the things that happen to them, and they take action when they want to influence events directly. In doing these things, people strive for a sense of **personal control**—the feeling that they can make decisions and take effective action to produce desirable outcomes and avoid undesirable ones (Contrada & Goyal, 2004). Studies have found that people who have a strong sense of personal control report experiencing less strain from stressors (McFarlane et al., 1983; Suls & Mullen, 1981).

Types of Control

How can feelings of personal control reduce the stress people experience? People can use several types of control to influence events in their lives and reduce their stress (Cohen et al., 1986; Thompson, 1981). We’ll focus on two. **Behavioral control** involves the ability to take concrete action to reduce the impact of a stressor. This action might reduce the intensity of the event or shorten its duration. For example, a pregnant woman who has taken natural childbirth classes can use special breathing techniques during delivery that reduce the pain of labor. **Cognitive control** is the ability to use thought processes or strategies to modify the impact of a stressor, such as by thinking about the event differently or focusing on a pleasant or neutral thought. While giving birth, for instance, the mother might think about the positive meanings the baby will give to her life, or she could focus her mind on an image, such as a pleasant day she had at the beach. Cognitive control appears to be especially effective in reducing stress (Cohen et al., 1986). For example, cognitive reappraisal of stressful stimuli or events as less threatening can reduce negative emotions and physiological stress responses (John & Gross, 2004).

Beliefs About Oneself and Control

People differ in the degree to which they believe they have control over their lives. Most people believe they have at least some control, but others think they have almost none. The latter is shown in the case study of a chronically unemployed man named Karl, who was referred to therapy by the Veterans Administration and with some help applied for a job and got it. But this did not raise his expectations of being able to get another job should he have to do so. Indeed, he attributed his success entirely to good fortune. He believed that the employer probably was partial to veterans or just happened to be in a good mood that day… [and] that the occurrence of reinforcement was outside his own personal control. (Phares, 1984, pp. 505–506)

People who believe they have control over their successes and failures are described as possessing an **internal locus of control**. That is, the control for these events lies within themselves—they are responsible. Other people, like Karl, who believe that their lives are controlled by forces outside themselves, for example, by luck, have an **external** locus of control (Rotter, 1966).
questionnaire called the I-E Scale is used for measuring the degree of internality or externality of a person’s beliefs about personal control.

Another important aspect of personal control is our sense of self-efficacy—the belief that we can succeed at a specific activity we want to do (Bandura, 1986, 2004). People estimate their chances of success in an activity, such as quitting smoking or running a mile, on the basis of their prior observations of themselves and others. They decide whether to attempt the activity according to two expectations:

1. **Outcome expectancy**—that the behavior, if properly carried out, would lead to a favorable outcome.
2. **Self-efficacy expectancy**—that they can perform the behavior properly.

For example, you may know that by taking and doing well in a set of college honors courses you can graduate with a special diploma or certificate. But if you think the likelihood of achieving that feat as “zilch,” you’re not likely to try. For people engaged in a stressful activity, increases in heart rate and blood pressure generally correspond to their level of mental effort in dealing with the demands of the situation—the greater their effort, the greater the cardiovascular reactivity (Gendolla & Wright, 2005). People with strong self-efficacy for the activity may be less threatened and exert less mental effort because they know they can manage the demands of the situation more easily. Hence, they generally show less psychological and physiological strain than do those with a weaker self-efficacy (Bandura, Reese, & Adams, 1982; Bandura et al., 1985; Holahan, Holahan, & Belk, 1984).

### Determinants and Development of Personal Control

On what basis do people judge that they have control over things that happen in their lives? We make these assessments by using information we gain from our successes and failures throughout life (Bandura, 1986, 2004; DeVellis & DeVellis, 2001). Our sense of control also develops through social learning, in which we learn by observing the behavior of others (Bandura, 1969, 1986). During childhood, people in the family and at school are important others, serving as models of behavior, agents of reinforcement, and standards for comparison. At the other end of the life span, people tend to be relatively external in locus of control—that is, beliefs that chance and powerful others affect their lives are greater in the elderly than in younger adults (Lachman, 1986). So, among adults who develop serious illnesses, those who are elderly are more inclined to prefer having professionals make health-related decisions for them (Woodward & Wallston, 1987).

### Gender and Sociocultural Differences in Personal Control

Gender and sociocultural differences in personal control often develop, depending on the social experiences individuals have. Sometimes parents and teachers inadvertently lead girls more than boys toward beliefs in external control and in low self-efficacy for certain activities (Dweck & Elliott, 1983). This socialization may carry over to old age: among elderly cardiac patients, men report greater self-efficacy than women for being able to walk various distances, a common rehabilitation behavior (Jenkins & Gortner, 1998). Self-efficacy beliefs generally can play an important role in the process of rehabilitation for heart patients (Woodgate & Brawley, 2008). Because minority groups and poor people generally have limited access to power and economic advancement, they tend to have external locus of control beliefs (Lundin, 1987).

### When People Lack Personal Control

What happens to people who experience high levels of stress over a long period of time and feel that nothing they do matters? They feel helpless—trapped and unable to avoid negative outcomes. A worker who cannot seem to please her boss no matter what she does, a student who cannot perform well on exams, or a patient who is unable to relieve his severe low back pain—each of these situations can produce apathy. As a result, these people may stop striving for these goals, come to believe they have no control over these and other events in their lives, and fail to exert control even when they could succeed. This is the condition Martin Seligman (1975) has called learned helplessness—which he describes as a principal characteristic of depression. Research has shown that people can learn to be helpless by being in uncontrollable situations that lead to repeated failure, such as in trying to stop an unpleasant noise (Hiroto & Seligman, 1975).

Seligman and his colleagues have extended the theory of learned helplessness to explain two important observations (Abramson, Seligman, & Teasdale, 1978). First, being exposed to uncontrollable negative events does not always lead to learned helplessness. Second, depressed people often report feeling a loss in self-esteem. The revised theory proposes that people who experience uncontrollable negative events apply a cognitive process called attribution, in which they make judgments about three dimensions of the situation.
This homeless woman probably sees little personal control in her life and feels very helpless.

1. **Internal-external.** People consider whether the situation results from their own personal inability to control outcomes or from external causes that are beyond anyone’s control. For example, suppose a boy receives physical therapy for a serious injury but cannot seem to meet the goals each week, which he might attribute either to his own lack of fortitude or to the rehabilitation program design. Either judgment may make him stop trying. He is likely to suffer a loss of self-esteem if he attributes the difficulty to a lack of personal strength, but not if he attributes the difficulty to external causes.

2. **Stable-unstable.** People assess whether the situation results from a cause that is long-lasting (stable) or temporary (unstable). If they judge that it is long-lasting, as when people develop a chronic and disabling disease, they are more likely to feel helpless and depressed than if they think their condition is temporary.

3. **Global-specific.** People consider whether the situation results from factors that have global and wide-ranging effects or specific and narrow effects. Individuals who fail at stopping smoking cigarettes and make a global judgment—for example, “I’m totally no good and weak-willed”—may feel helpless and depressed. But others who fail and make a specific judgment, such as “I’m not good at controlling this part of my life,” are less likely to feel helpless.

Thus, people who tend to attribute negative events in their lives to stable and global causes are at high risk for feeling helpless and depressed. If their judgments are also internal, their depressive thinking is likely to include a loss of self-esteem as well. People who believe bad events result from internal, stable, and global factors while good events result from external, unstable, and specific factors have a *pessimistic explanatory style* (Kamen & Seligman, 1989). Attributing negative events to external, unstable, and specific causes, in contrast, reflects an optimistic explanatory or attributional style.

How does lacking personal control affect people in real-life stressful conditions? Studies have examined this question with college students and children. For instance, of college students in dormitories, those who lived on crowded floors reported more stress and less ability to control unwanted social interaction and showed more evidence of helplessness, such as giving up in competitive games, than those on uncrowded floors (Baum, Aiello, & Calesnick, 1978; Rodin & Baum, 1978). In a study of fifth-graders, students were given an impossible task to arrange blocks to match a pictured design (Dweck & Repucci, 1973). Children who attributed their failure to stable, uncontrollable factors, such as their own lack of ability, showed poorer performance on subsequent problems than those who attributed failure to unstable, modifiable factors, such as a lack of effort. Thus, the children’s attributions were linked to their feelings of helplessness.

**Personal Control and Health**

There are two ways in which personal control and health may be related. First, people who have a strong sense of personal control may be more likely or able to maintain their health and prevent illness than those who have a weak sense of control. Second, once people become seriously ill, those who have a strong sense of control may adjust to the illness and promote their own rehabilitation better than those who have a weak sense of control. Both types of relationships have been examined.

To study these relationships, researchers have used several approaches to measure people’s personal control. One of the best-developed health-related measures of personal control is the *Multidimensional Health Locus of Control Scales* (Wallston, Wallston, & DeVellis, 1978). This
instrument contains 18 items divided into three scales that assess:

1. **Internal health locus of control**, the belief that control for one’s health lies within the person.
2. **Powerful-others’ health locus of control**, the belief that one’s health is controlled by other people, such as physicians.
3. **Chance locus of control**, the belief that luck or fate controls health.

As you can see, the powerful-others and chance scales are directed toward assessing the degree to which people believe important external sources have control over their health.

Does a sense of personal control influence people’s health? Studies have shown that pessimistic and hopeless people—those who believe they have little control—have poorer health habits, have more illnesses, and are less likely to take active steps to treat their illness than are people with a greater sense of control (Kamen & Seligman, 1989; Lin & Peterson, 1990; Rasmussen, Scheier, & Greenhouse, 2009; Whipple et al., 2009). Personal control can also help people adjust to becoming seriously ill (Thompson & Kyle, 2000). Patients with illnesses such as kidney failure or cancer who score high on internal or powerful-others’ health locus of control suffer less depression than those with strong beliefs in the role of chance (Devins et al., 1981; Marks et al., 1986). The belief that either they or someone else can influence the course of their illness allows patients to be hopeful about their future. Moreover, patients with strong internal locus of control beliefs probably realize they have effective ways for controlling their stress.

Personal control also affects the efforts patients make toward rehabilitation—in particular, feelings of self-efficacy enhance their efforts. A study demonstrated this with older adult patients who had serious respiratory diseases, such as chronic bronchitis and emphysema (Kaplan, Atkins, & Reinsch, 1984). The patients were examined at a clinic and given individualized prescriptions for exercise. And they rated on a survey their self-efficacy—that is, their belief in their ability to perform specific physical activities, such as walking different distances, lifting objects of various weights, and climbing stairs. Correlational analyses revealed that the greater the patients’ self-efficacy for doing physical activity, the more they adhered to the exercise prescription.

**Health and Personal Control in Old Age**

Here are two things we know about elderly people who live in nursing homes: First, they often show declines in their activity and health after they begin living in nursing homes. Second, residents of nursing homes frequently have few responsibilities or opportunities to influence their everyday lives. Could it be that the declines in activity and health among nursing-home residents result in part from their dependency and loss of personal control that the nursing home procedures seem to encourage?

Ellen Langer and Judith Rodin (1976) studied this issue by manipulating the amount of responsibility allowed residents of two floors of a modern, high-quality nursing home. The residents on the two floors were similar in physical and psychological health and prior socioeconomic status. On one floor, residents were given responsibilities for exercising. For example, they could select small plants to care for and were encouraged to make decisions about participating in activities and rearranging furniture. In comparison, residents of the other floor continued to have little personal control. For example, they were assigned to various activities without choice, and when they were given plants, they were told that the staff would take care of them. Assessments revealed that the residents who were given more responsibility became happier and more active and alert than the residents who had little control. A year and a half later the residents who were given responsibility were still happier and more active than those who had little control (Rodin & Langer, 1977). Moreover, comparisons of health data during these 18 months showed that the residents with responsibility were healthier and had half the rate of mortality than the residents with little control.

Other research with residents of a retirement home also demonstrated the importance of personal control for physical and psychological well-being and showed that withdrawing opportunities for personal control may impair people’s health (Schulz, 1976; Schulz & Hanusa, 1978). The results of these studies suggest two important conclusions. First, personal control—even over relatively simple or minor events—can have a powerful effect on people’s health and psychological condition. Second, health care workers and researchers need to consider the nature of the personal control they introduce and what the impact will be if it is removed.

To summarize the material on personal control, people differ in the degree to which they believe they have control over the things that happen in their lives. People who experience prolonged, high levels of stress and lack a sense of personal control tend to feel helpless. Having a strong sense of control seems to benefit people’s health and help them adjust to becoming seriously ill. A sense of personal control contributes to people’s hardness, which is the next psychosocial modifier of stress we will examine.
PERSONALITY AS RESILIENCE AND VULNERABILITY

Researchers have long been interested in the ways in which some personality traits can make individuals more resilient in the face of stressful life circumstances, whereas other personality characteristics are sources of vulnerability. That is, some personality factors make the individual more able to withstand high levels of stressful experience without becoming emotionally distressed or physically ill, and other aspects of personality make them more susceptible to those problems.

Early in the development of the field of health psychology, researchers Suzanne Kobasa and Salvatore Maddi suggested that individual differences in personal control provide only part of the reason why some people who are under stress get sick whereas others do not. They proposed that a broader array of personality traits—called hardiness—differentiates people who do and do not get sick under stress (Kobasa & Maddi, 1977). Hardiness includes three characteristics: (1) Control refers to people's belief that they can influence events in their lives—that is, a sense of personal control. (2) Commitment is people's sense of purpose or involvement in the events, activities, and people in their lives. For instance, people with a strong sense of commitment tend to look forward to starting each day's projects and enjoy getting close to people. (3) Challenge refers to the tendency to view changes as incentives or opportunities for growth rather than threats to security. The concept of hardiness has been highly influential, although more recent studies have found conflicting results, and some evidence indicates that tests used to measure hardiness may simply be measuring the tendency to experience negative affect, such as the tendency to be anxious, depressed, or hostile (Funk, 1992). Nonetheless, the basic idea that some personality traits make the individual resilient has continued to be a major focus in the field, and research supports this general hypothesis.

Sense of Coherence, Mastery, Optimism, and Resilience

One example of a personality concept similar to hardiness is sense of coherence, developed by Aaron Antonovsky (1979, 1987). This trait involves the tendency of people to see their worlds as comprehensible, manageable, and meaningful. People's sense of coherence has been linked to reduced levels of stress and illness symptoms (Jorgensen, Frankowski, & Carey, 1999). A related personality characteristic is sense of mastery (Pearlin & Schooler, 1978), which refers to people's general belief that they are able to deal effectively with the events of life, rather than being subjected to forces beyond their control. This trait is obviously quite similar to the belief in personal control or a general sense of self-efficacy as described previously. Optimism is the point of view that good things are likely to happen, and has similarities to the optimistic versus pessimistic explanatory style described previously. Optimists tend to experience life's difficulties with less distress than do pessimists (Scheier, Carver, & Bridges, 2001). They also tend to have better health habits, better mental and physical health, and faster recovery when they become ill than pessimists (Ouellette & DiPlacido, 2001).

Finally, resilience refers to high levels of three interrelated positive components of personality: self-esteem, personal control, and optimism (Major et al., 1998). Resilient people appraise negative events as less stressful, they bounce back from adversities and recover their strength and spirit. For example, resilient children develop into competent, well-adjusted individuals even when growing up under extremely difficult conditions (Garmezy, 1983; Werner & Smith, 1982). The following case shows what this means:

In the slums of Minneapolis... is a 10-year-old boy who lives in a dilapidated apartment with his father, an ex-convict now dying of cancer, his illiterate mother, and seven brothers and sisters, two of whom are mentally retarded. Yet his teachers describe him as unusually competent child who does well in his studies and is loved by almost everyone in the school. (Pines, 1979, p. 53)

Even when facing adversity, resilient people seem to make use of positive emotions and find meaning in the experience (Ong et al., 2006; Tugade & Fredrickson, 2004). Although such resilience was once considered rare, it now appears that probably most adults move on with their lives and do not suffer serious depression after a trauma, such as the loss of a close relative or friend (Bonanno, 2004).

Why are some individuals resilient and others not? Part of the answer may lie in their genetic endowments. Resilient people may have inherited traits, such as relatively easy temperaments, that enable them to cope better with stress and turmoil. Another part lies in their experiences. Resilient people who overcome a history of stressful events often have compensating experiences and circumstances in their lives, such as special talents or interests that absorb them and give them confidence, and close relationships with friends or relatives. The concepts of hardiness, resilience, optimism, mastery, and coherence have a great deal in common, and research scales used to measure these traits may be tapping overlapping personality strengths.
Personality Strengths and Health

In theory, the personality strengths we’ve discussed make people better able to deal with stressors and less likely to become emotionally distressed and physiologically aroused by stressful events, leading them to remain healthier. Given the personality assets or strengths reflected in a sense of coherence, mastery, and optimism, the spiraling process that can lead from stress to illness should not take hold. Studies have generally supported the prediction that these traits should be associated with lower risks of physical illness. For example, a meta-analysis of several studies of a variety of health conditions found that, as expected, optimism is associated with a reduced risk of developing physical illnesses and with a more positive outcome of illness among individuals who are already suffering from disease (Rasmussen, Scheier, & Greenhouse, 2009). Prospective studies have shown that optimistic people are at lower risk of life-threatening medical conditions, such as heart disease (Tindle et al., 2009). And a prospective study found that people who have a strong sense of coherence had far lower mortality rates from cardiovascular disease and cancer over a 6-year period than people low on this trait (Surtees et al., 2003), and sense of mastery has similar beneficial effects over time (Surtees et al., 2006). Taken together, positive personality traits like optimism, mastery, and sense of coherence apparently protect health. Although the status of the concept and measurement of hardiness is uncertain at this time, research on related aspects of personality has provided clearer evidence of health benefits. Future research will need to clarify what these personality variables are and how they operate.

Personality Strengths and Health in Old Age

Old age is a time when very difficult life events often occur, particularly those that involve reduced income, failing health and disability, and the loss of one’s spouse and close friends. Personality strengths like those described above can be important in meeting these difficulties. For example, older people with a strong sense of purpose in life seem to live longer, even when the possibly overlapping effects of negative emotions like depression are taken into account (Boyle et al., 2009). What other personality characteristics reflect resilience in old age?

Elizabeth Colerick (1985) studied 70- to 80-year-old men and women for the quality she called stamina, which is similar to hardness. This research was undertaken to determine how people who do and do not have stamina in later life deal with setbacks, such as the loss of a loved one. She identified with questionnaires and interviews two groups: one with high stamina and one with low stamina. She found that stamina in old age is characterized by “a triumphant, positive outlook during periods of adversity,” as illustrated by the following interview excerpts from two different high-stamina people:

The key to dealing with loss is not obvious. One must take the problem, the void, the loneliness, the sorrow and put it on the back of your neck and use it as a driving force. Don’t let such problems sit out there in front of you, blocking your vision … Use hardships in a positive way. (p. 999)

I realize that setbacks are a part of the game. I’ve had ‘em, I have them now, and I’ve got plenty more ahead of me. Seeing this—the big picture—puts it all into perspective, no matter how bad things get. (p. 999)

In contrast, low-stamina people described a negative outlook and feelings of helplessness and hopelessness in facing life events in old age. One woman who had undergone surgery for colon cancer said:

I was certain that I would die on the table … never wake up … I felt sure it was the end. Then I woke up with a colostomy and figured I have to stay inside the house the rest of my life. Now I’m afraid to go back to the doctor’s and keep putting off my checkups. (p. 999)

In summary, people with a high degree of optimism, mastery, coherence, or resilience—or some related personality traits—may have some protection against the harmful effects of stress on health. The fact that several different labels have been given to what seem to be very similar personality strengths with possibly overlapping associations with future health suggests that an organizing framework would be useful in understanding personality as a modifier of stress. A widely accepted framework from personality science has been useful in this way, especially because it helps to organize personality factors that are sources of resilience or sources of vulnerability.

The Five-Factor Model of Personality

A general consensus has emerged among personality researchers that five broad traits provide a reasonably thorough description of normal variations in human
personality (Costa & McCrae, 1992; Digman, 1990). These traits, listed in Table 4.1, are useful in research on personality (Smith & Williams, 1992, Smith & MacKenzie, 2006). Researchers can examine correlations of personality concepts and measures proposed as influences on health with these basic dimensions and their more specific components. By doing this, researchers can create an organized and systematic catalogue of these modifiers of stress responses. The traits of the five-factor model also can be measured with well-established personality scales, and these scientifically validated instruments can be used directly in studies of stress and health outcomes. In this way, some of the best ways of conceptualizing and measuring personality available to researchers can be used to answer questions about which general dimensions of personality modify stress and influence health. By thinking about the traits in Table 4.1, readers can get a general sense of how they might be described in the five-factor system.

The personality strengths discussed above seem to correlate consistently with emotional stability—the opposite of neuroticism (Smith & MacKenzie, 2006). Neuroticism and its components, such as anxiety, sadness or depressive symptoms, and irritability, predict earlier death and several other negative health outcomes (Grossardt et al., 2009, Kubzansky et al., 2006, Suls & Bunde, 2005). However, positive aspects of personality generally predict good future health even when the possibly overlapping effects of emotional stability versus neuroticism are taken into account (Chida & Steptoe, 2008). Measures of personality strengths like optimism, mastery, and sense of coherence also correlate with other five-factor traits, especially extraversion, conscientiousness, and openness. These five-factor model traits also predict longevity and other health outcomes (Kern & Friedman, 2008, Taylor et al., 2009, Terracciano et al., 2008).

How does the five-factor model of personality relate to health? The answer involves the stress responses described in Chapter 3. Personality traits associated with better health are generally associated with less exposure to stressors at work and in relationships, less physiological reactivity, better recovery, and better restoration (Williams et al., 2010). In contrast, personality traits linked to poor health are consistently related to greater exposure to stressors, greater reactivity, less recovery, and less restoration, as reflected in better sleep and lower levels of physiological stress responses during sleep. What’s more, traits included in the five-factor model are also linked to one of the best known psychosocial modifiers of stress, the Type A or B behavioral and emotional style.

## TYPE A BEHAVIOR AND BEYOND

The history of science has many stories about researchers accidently coming upon an idea that changed their focus and led to major discoveries. Such was the case for bacteriologist Alexander Fleming, for instance: when bacteria cultures he was studying developed unwanted molds, he happened to notice some properties of the molds that led to the discovery of penicillin. Serendipity also led to the discovery of the “Type A” behavior pattern. Cardiologists Meyer Friedman and Ray Rosenman were

<table>
<thead>
<tr>
<th>Trait</th>
<th>Specific Characteristics</th>
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<tbody>
<tr>
<td>Neuroticism vs. Emotional Stability</td>
<td>Tendency to experience negative emotions, such as anxiety, tension, sadness, and irritability, feeling vulnerable and unable to cope well with stress vs. calm, even-tempered, relaxed, able to deal with stressful situations without undue distress.</td>
</tr>
<tr>
<td>Extraversion vs. Introversion</td>
<td>Outgoing, gregarious, cheerful, and talkative interpersonal style; excitement seeking, assertiveness; a tendency to experience positive emotions vs. reserved, enjoyment of and even preference for solitude and quiet, subdued.</td>
</tr>
<tr>
<td>Openness vs. Closed Mindedness</td>
<td>Drawn to new experience, intellectual curiosity, flexibility, readiness to examine and re-consider values and beliefs, and to try new things; “in touch” with feelings and aesthetic experiences vs. dislike of change, rigid, dogmatic, narrow.</td>
</tr>
<tr>
<td>Agreeableness vs. Antagonism</td>
<td>Altruistic, high empathy and concern for others; warm, forgiving helpful; trusting, cooperative; straightforward, modest vs. cold-hearted, cynical, guarded, disingenuous, mistrusting, argumentative; competitive, arrogant, critical.</td>
</tr>
<tr>
<td>Conscientiousness vs. Unreliability</td>
<td>High self-control, organized, purposeful, self-image of being capable, prepared, competent; preference for order, dependable, deliberate, self-disciplined; achievement striving vs. unorganized, low ambition; lackadaisical, procrastinating.</td>
</tr>
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studying the diets of male heart disease victims and their wives when one of the wives exclaimed: “If you really want to know what is giving our husbands heart attacks, I’ll tell you. It’s stress, the stress they receive in their work, that’s what’s doing it” (Friedman & Rosenman, 1974, p. 56). These researchers began to study this possibility and noticed that heart patients were more likely than nonpatients to display a pattern of behavior we now refer to as Type A.

Defining and Measuring Behavior Patterns

The Type A behavior pattern consists of four characteristics (Chesney, Frautschi, & Rosenman, 1985; Friedman & Rosenman, 1974):

1. Competitive achievement orientation. Type A individuals strive toward goals with a sense of being in competition—or even opposition—with others, and not feeling a sense of joy in their efforts or accomplishments.

2. Time urgency. Type A people seem to be in a constant struggle against the clock. Often, they quickly become impatient with delays and unproductive time, schedule commitments too tightly, and try to do more than one thing at a time, such as reading while eating or watching TV.

3. Anger/hostility. Type A individuals tend to be easily aroused to anger or hostility, which they may or may not express overtly.

4. Vigorous Vocal Style. Type A people speak loudly, rapidly, and emphatically, often “taking over” and generally controlling the conversation.

In contrast, the Type B behavior pattern consists of low levels of competitiveness, time urgency, and hostility. People with the Type B pattern tend to be more easygoing and “philosophical” about life—they are more likely to “stop and smell the roses.” In conversations, their speech is slower, softer, and reflects a more relaxed “give and take.”

Type A behavior is measured in several ways. The Structured Interview has been considered the “gold standard” of Type A assessments. It consists of a series of questions that require about 15 to 20 minutes, and it is intended to obtain not only self-reports of competitiveness, time urgency, and anger/hostility, but also to obtain an actual sample of Type A versus B behavior. The questions are asked in such a way that Type As will reveal their competitive, impatient, hostile, and vigorous style not simply in what they say, but in how they say it. In contrast, Type Bs display their more relaxed and easy-going style. The interview is time-consuming and expensive to use, but it measures all four Type A characteristics (competitiveness, time urgency, anger/hostility, vocal style) better than self-report, paper and pencil survey measures of Type A do, and its scores are more consistently associated with health, especially heart disease (Miller et al., 1991).

Behavior Patterns and Stress

Individuals who exhibit the Type A behavior pattern react differently to stressors from those with the Type B pattern. Type A individuals respond more quickly and strongly to stressors, often interpreting them as threats to their personal control (Glass, 1977). Type A individuals also often choose more demanding or pressured activities at work and in their leisure times, and they often evoke angry and competitive behavior from others (Smith & Anderson, 1986). Hence, they have greater exposure to stressors, too.

We saw in Chapter 3 that the response to a stressor—or strain—includes a physiological component called reactivity, such as increased blood pressure, catecholamine, or cortisol levels compared to baseline levels. Type As often show greater reactivity to stressors than Type Bs, especially during situations involving competition, debates and arguments, or other stressful social interactions (Contrada & Krantz, 1988; Glass et al., 1980).

Age and Developmental Differences in Type A Behavior

Longitudinal studies suggest that adult Type A behavior may have its roots in the person’s early temperament, and although behavior patterns often change over time, many individuals exhibit the same pattern across many years (Bergman & Magnusson, 1986; Carmelli et al., 1991; Carmelli, Rosenman, & Chesney, 1987). Still, cross-sectional studies have found that the Type A behavior pattern among Americans becomes more prevalent with age from childhood through middle age or so and then declines (Amos et al., 1987; Moss et al., 1986). But some of the decline in prevalence in old age could be result of Type A individuals dying at earlier ages than Type Bs.

Heredity also affects the development of Type A and B behavior. Research with identical (monozygotic) and fraternal ( dizygotic) twins has found a genetic role in the development of both temperament (Buss & Plomin, 1975, 1986) and Type A behavior (Carmelli, Rosenman, & Chesney, 1987; Reboollo & Boomsma, 2006). That is, identical twins are more similar than fraternal twins in their reactivity to stressors, too (Ditto, 1993; Turner & Hewitt, 1992). Demographic and genetic variations in Type A behavior are important because of the relationships researchers have found between reactivity and health, such as in the development of heart disease.
Type A Behavior and Health

How are people’s health and behavior patterns related? Researchers have studied this issue in two ways. First, studies have examined whether Type A individuals are at greater risk than Type Bs for becoming sick with any of a variety of illnesses, such as asthma and indigestion, but the associations appear to be weak and inconsistent (Orfutt & Lacroix, 1988; Suls & Sanders, 1988).

Second, studies have focused on the Type A pattern as a risk factor for coronary heart disease (CHD)—illnesses involving the narrowing of the coronary arteries, which supply blood to the heart muscle. This narrowing is called atherosclerosis, and causes several manifestations of CHD. Angina is chest pain that occurs when the supply of oxygen carried by blood to the heart muscle is not sufficient to meet the muscle’s demand. When the demand exceeds the supply available through the narrowed coronary arteries and the heart is not getting enough oxygen, the heart muscle becomes ischemic. If the blood supply is blocked severely enough and for a long enough period of time, the ischemic portion of the heart muscle dies. This is called a myocardial infarction, or what is commonly called a “heart attack.” A severely ischemic heart sometimes develops a lethal disturbance in rhythm, causing it stop pumping blood through the body. This is the usual cause of sudden cardiac death, where the victim dies within a few minutes or hours of first noticing symptoms.

Dozens of studies have been done to assess the link between Type A behavior and CHD. An example of research on this link comes from the Western Collaborative Group Study, a large-scale prospective study of 3,000 39- to 59-year-old initially healthy men who were tested for behavior patterns using the Structured Interview (Rosenman et al., 1976). A follow-up 8 1/2 years later showed that the Type A individuals were twice as likely as Type Bs to have developed CHD and to have died of CHD. Have other studies found similar results? Yes, but the answer depends on the way Type A behavior was measured: the link between Type A behavior and CHD is clearest in studies using the Structured Interview (Miller et al., 1991).

Type A’s “Deadly Emotion”

Why would the link between Type A behavior and CHD depend on the way behavior patterns are measured? It could be that people are not completely honest and accurate in describing their own behavior on self-report surveys, whereas observational measures are less “filtered” in this way. However, it also could be the content of the measures. We saw earlier that the Structured Interview assesses all four components of Type A behavior well. This isn’t so for available surveys, which assess competitive achievement and time urgency well but measure anger/hostility much less well and do not measure the vocal style at all. These discrepancies prompted researchers to examine the role of individual Type A components, which revealed that anger/hostility is the main aspect of Type A behavior in the link with CHD (Everson-Rose & Lewis, 2005; Smith & Gallo, 2001). Anger/hostility seems to be Type A’s deadly emotion: people who are chronically hostile have an increased risk of developing CHD.

A study that supports this idea examined the records of 255 physicians who had taken a psychological test that included a scale for hostility while they were in medical school 25 years earlier (Barefoot, Dahlstrom, & Williams, 1983). For the physicians with high scores on the hostility scale, the rates of both CHD and overall mortality during the intervening years were several times higher than for those with low hostility scores. The researchers measured hostility with a widely used test, the Cook-Medley Hostility Scale, which has 50 true/false items, such as “It is safer to trust nobody” and “Some of my family have habits that bother and annoy me very much” (Cook & Medley, 1954). This scale measures anger, as well as cynicism, suspiciousness, and other negative traits (Friedman, Tucker, & Reise, 1995). In pursuing anger and hostility as the toxic element within the Type A pattern, a wide variety of self-report and behavioral measures of these traits have been used (Smith, 1992). A meta-analysis of the many studies of the topic found that anger and hostility are associated with an increased risk of CHD in initially healthy individuals (Chida & Steptoe, 2009). Further, among people who already have CHD, anger and hostility are associated with increased risk of poor medical outcomes, such as additional heart attacks or death from CHD.

What links anger and hostility to the development of CHD? Here again, the four stress processes of exposure, reactivity, recovery, and restoration seem important. Angry and hostile people experience more conflict with others at home and work (Smith et al., 2004), indicating greater stress exposure. The suspicious and mistrusting style of hostile persons is likely to make them cold and argumentative during interactions with others,
sometimes even with friends and family members. The resulting conflict and reduced social support may, in turn, contribute to the maintenance or even worsening of their hostile behavior toward others in a vicious cycle or self-fulfilling prophecy (Smith et al., 2004). Further, in difficult interpersonal situations in general, and at work and with family members in particular, they show greater physiological reactivity or strain (Brondolo et al., 2009; Chida & Hamer, 2008; Smith & Gallo, 1999).

Further, unlike non-hostile people, hostile people do not respond to social support with reduced physiological reactivity during stressful situations (Holt-Lunstad et al., 2008; Vella et al., 2008), perhaps because they are too distrusting or worry that support providers will evaluate them negatively. After a stressful situation, hostile people show delayed or incomplete recovery of their physiological stress responses, perhaps because they are more likely to brood or ruminate about upsetting events (Neuman et al., 2004). Also, their sleep quality is more likely to suffer during stressful periods (Brissette & Cohen, 2002). Combined, these stress processes can produce a lot of wear and tear on the cardiovascular system. As we discuss further in a later section of this chapter, cardiovascular reactivity and other physiological stress responses can contribute to coronary atherosclerosis and the development of other indications of CHD.

However, these stress processes might not be the only link between anger/hostility and CHD. Anger and hostility are related to several unhealthy conditions and behaviors, such as heavier drinking, obesity, and cigarette smoking, that put people at risk for CHD (Bunde & Suls, 2006; Nabi et al., 2009; Patterson et al., 2008). Although anger and hostility generally are associated with CHD even when these health behaviors and conditions are taken into account, some evidence suggests that they are at least part of the link between these personality traits and health (Boyle et al., 2007; Everson et al., 1997).

Are There Other Dangerous Aspects of the Type A Pattern?

Anger might not be the only unhealthy Type A behavior (Houston et al., 1992, 1997). Social dominance—the tendency or motive to exert power, control, or influence over other people—is also associated with coronary atherosclerosis and CHD (Siegel et al., 2000; Smith et al., 2008). Further, this personality trait is associated with greater physiological reactivity or strain during challenging interpersonal tasks and situations, like arguments or debates, and efforts to influence other people also evoke larger increases in blood pressure and stress hormones (Newton, 2009; Smith et al., 2000).

As a summary of the role of psychosocial modifiers of stress, we have seen that social support, personal control, various personality strengths, and aspects of the Type A and B behavior patterns are factors that can modify the impact of stress on health. High levels of social support, personal control, and related personality traits, are generally associated with reduced stress and resulting illnesses; Type A behavior, especially the anger/hostility component, is associated with increased stress and cardiovascular illness. The remainder of this chapter examines health problems that are affected by people's experience of stress. We begin by considering how stress leads to illness.

HOW STRESS AFFECTS HEALTH

Why does stress lead to illnesses in some individuals, but not others? One answer: other factors influence the effects of stress. This idea forms the basis of the diathesis-stress model, the view that people's vulnerability to a physical or psychological disorder depends on the interplay of their predisposition to the disorder (the diathesis) and the amount of stress they experience (Steptoe & Ayers, 2004). The predisposition can result from organic structure and functioning, often genetically determined, or from prior environmental conditions, such as living in a community that promotes tobacco use. For example, chronically high levels of stress are especially likely to lead to CHD if the person's body produces high levels of cholesterol. Or students are likely to catch cold around final exams week if their immune system functioning is impaired. This concept may explain why not all individuals in the following experiment caught cold.

Researchers conducted an interesting experiment: they gave people nasal drops that contained a "common cold" virus or a placebo solution and then quarantined them to check for infection and cold symptoms (Cohen, Tyrrell, & Smith, 1991). Before the nasal drops were administered, the subjects filled out questionnaires to assess their recent stress. Of these people, 47% of those with high stress and 27% of those with low stress developed colds. Other studies have produced three related findings. First, people under chronic, severe stress are more vulnerable to catching cold when exposed to the virus than people under less stress (Cohen et al., 1998). Second, people who experience a lot of positive emotions, such as feeling energetic or happy, are less likely to catch a cold or the flu when exposed to the viruses than people who have less of these emotions (Cohen et al., 2006). Third, people who have sleep problems prior to their exposure to the virus are more likely to develop colds (Cohen et al., 2009).
Figure 4-4 Summary of behavioral and physiological avenues by which stress leads to illness. See text for additional information about these avenues.

What is it about stress that leads to illness? The causal sequence can involve two routes: (1) a direct route, resulting from changes stress produces in the body's physiology, or (2) an indirect route, affecting health through the person's behavior. Figure 4-4 gives a summary of these routes. Let's look first at the behavioral route.

STRESS, BEHAVIOR, AND ILLNESS

Stress can affect behavior, which, in turn, can lead to illness or worsen an existing condition. We can see the behavioral links between stress and illness in many stressful situations, such as when a family undergoes a divorce. In many cases during the first year following the separation, the parent who has the children is less available and responsive to them than she or he was before, resulting in haphazard meals, less regular bedtimes, and delays in getting medical attention, for instance.

People who experience high levels of stress tend to behave in ways that increase their chances of becoming ill or injured (Weidner et al., 1996; Wiebe & McCallum, 1986). For instance, compared with people with low stress, those with high stress are more likely to eat higher fat diets with less fruit and vegetables, engage in less exercise, smoke cigarettes, and consume more alcohol (Baer et al., 1987; Cartwright et al., 2003; Ng & Jeffery, 2003). These behaviors are associated with the development of various illnesses. In addition, stress impairs sleep (Hall et al., 2004). And the resulting inattention and carelessness probably play a role in the relatively high accident rates of people under stress. Studies have found that children and adults who experience high levels of stress are more likely to suffer accidental injuries at home, in sports activities, on the job, and while driving a car than individuals under less stress (Johnson, 1986, Quick et al., 1997). Further, disrupted sleep can itself be stressful, and as described previously poor sleep interferes with a key way that the body is restored physiologically.

STRESS, PHYSIOLOGY, AND ILLNESS

Stress produces many physiological changes in the body that can affect health, especially when stress is chronic and severe. In Chapter 3, we discussed the concept of allostatic load in which the strain involved in reacting repeatedly to intense stressors produces wear and tear on body systems that accumulate over time and lead to illness (McEwen & Stellar, 1993). A study found that for elderly individuals whose allostatic load increased or decreased across a 3-year period, those with increased loads had higher mortality rates during the next 4 years (Karlamangla, Singer, & Seeman, 2006). Connections have been found between illness and the degree of reactivity people show in their cardiovascular, endocrine, and immune systems when stressed.

Cardiovascular System Reactivity and Illness

Cardiovascular reactivity refers to physiological changes that occur in the heart, blood vessels, and blood in response to stressors. Before middle age, people's degree of cardiovascular reactivity is generally stable, showing little change when retested with the same stressors years later (Sherwood et al., 1997; Veit, Brody, & Rau, 1997). In later years, cardiovascular reactivity increases with age, which corresponds to increases in risk of cardiovascular illness (Uchino et al., 2005, 2006).

Research has discovered links between high cardiovascular reactivity and the development of CHD, hypertension, and stroke (Eversion et al., 2001; Henderson & Baum, 2004, Manuck, 1994). For example, high levels of
job stress are associated with high blood pressure and abnormally enlarged hearts (Schnall et al., 1990), and people’s laboratory reactivity to stress in early adulthood is associated with their later development of high blood pressure (Menkes et al., 1989) and atherosclerosis (Matthews et al., 2006). The blood pressure reactivity that people display in laboratory tests appears to reflect their reactivity in daily life (Turner et al., 1994). A meta-analysis found that greater cardiovascular reactivity and poor cardiovascular recovery after stressors were associated with greater risk of cardiovascular disease, including higher blood pressure, diagnosed hypertension, and atherosclerosis (Chida & Steptoe, 2010).

Stress produces several cardiovascular changes that relate to the development of CHD. For instance, the blood of people who are under stress contains high concentrations of activated platelets (Everson-Rose & Lewis, 2005; Patterson et al., 1994) and clotting factors that thicken the blood, which can contribute to a heart attack (Wirtz et al., 2006). Stress also produces unfavorable levels of cholesterol (Patterson et al., 1995; Steptoe & Brydon, 2005) and inflammatory substances circulating in the blood (Steptoe et al., 2007). These changes in blood composition promote atherosclerosis—the growth of plaques (inflamed, fatty patches) within artery walls. These changes narrow and stiffen the arteries, thereby increasing blood pressure and the risk of a heart attack or stroke.

Stephen Manuck and his colleagues (1995) have demonstrated this link between stress and atherosclerosis in research with monkeys. In one study, over many months some of the subjects were relocated periodically to different living groups. This required stressful adjustments among the animals as they sought to re-establish the social hierarchies these animals naturally form, especially for higher-ranking or dominant animals to retain their status. The remaining subjects stayed in stable living groups. The stressed monkeys who tended to hold dominant status in their living groups developed greater atherosclerosis than the dominant animals in the low stress condition, and greater than the lower ranking or subordinate monkeys in either living condition. These effects were prevented when the animals were given a drug that blocked sympathetic nervous system excitation of the heart muscle, strongly implicating the role of chronic or recurring activation of the “fight or flight” response in development of atherosclerosis. Similar effects of experimentally manipulated stressful living conditions on atherosclerosis have been demonstrated in rabbits (McCabe et al., 2002). Although human stress and cardiovascular disease probably differs somewhat from what occurs in these animals, the ability to perform true experiments in which chronic stress is manipulated over long periods of time provides important converging evidence to the findings of observational studies of human stress and cardiovascular disease.

Recent research suggests that it is not just the excitatory effects of the sympathetic nervous system on the cardiovascular system that contribute to cardiovascular disease. If this activating system functions like the “gas pedal” in activating stress responses, the parasympathetic nervous system “brake” on such reactivity is also important. The functioning of this stress-dampening system can be measured though increases and decreases in heart rate that are due to respiration, changes in the activity of the parasympathetic nervous system cause heart rate to slow down when we breathe out and speed up when we breathe in. The magnitude of this change in heart rate—sometimes called “vagal tone” because it is caused by activity of the vagus nerve—is a good indicator of the strength of an individual’s parasympathetic stress-dampening system. Importantly, higher vagal tone is associated with lower risk of cardiovascular disease (Thayer & Lane, 2007). That is, good parasympathetic “brakes” on stress are protective.

Endocrine System Reactivity and Illness

Part of reactivity involves activation of the adrenal glands, both directly by sympathetic nervous system stimulation of these glands and by the hypothalamus-pituitary-adrenal axis as described previously. In this process, the adrenal glands release hormones—particularly catecholamines and corticosteroids—during stress (Henderson & Baum, 2004, Lundberg, 1999). The increased endocrine reactivity that people display in these tests appears to reflect their reactivity in daily life (Williams et al., 1991). One way in which high levels of these hormones can lead to illness involves their effects on the cardiovascular system. For example, an intense episode of stress with high levels of these hormones can cause the heart to beat erratically and may even lead to sudden cardiac death (Williams, 2008). In addition, chronically high levels of catecholamines and corticosteroids, such as cortisol, can contribute the development and progression of atherosclerosis (Lundberg, 1999, Matthews et al., 2006). But social support may help: people with high levels of social support tend to exhibit lower endocrine reactivity than those with lower levels (Seeman & McEwen, 1996).

Stress also seems to contribute to health through endocrine system pathways that involve fat stored in the abdominal cavity. The metabolic syndrome (Kyrou & Tsigos, 2009) is a set of risk factors including high levels of cholesterol and other blood fats, elevated
blood pressure; high levels of insulin in the blood or impairments in the ability of insulin to facilitate transportation of glucose out of the blood stream; and larger fat deposits in the abdomen. The metabolic syndrome seems to be made worse by exposure to stressors and the related physiological stress responses, especially heightened neuroendocrine activity. The metabolic syndrome also promotes chronic inflammation in the blood stream and elsewhere, increasing the risk of cardiovascular disease and other serious conditions, such as diabetes (Goldbacher & Matthews, 2007; Rizvi, 2009).

If you have not read Chapter 2, The Body's Physical Systems, and your course has you read the modules from that chapter distributed to later chapters, read Module 6 (The Immune System) now.

Immune System Reactivity and Illness

The release of catecholamines and corticosteroids during arousal affects health in another way: these stress responses alter the functioning of the immune system (Kemeny, 2007; Segerstrom & Miller, 2004). Brief stressors typically activate some components of the immune system, especially non-specific immunity, while suppressing specific immunity. Chronic stressors, in contrast, more generally suppress both non-specific and specific immune functions. Chronic stressors also increase inflammation, an important process that disrupts immune function when it occurs on a long-term basis (Kemeny, 2007; Segerstrom & Miller, 2004). So, rather than a simple “up or down” effect of stress on this vital system, stress dysregulates or disrupts it.

The effects of acute and chronic stress on the immune system can be measured in many ways, such as the extent to which immune system cells multiply or proliferate in response to antigens, or the ability of such cells to destroy foreign microorganisms or viruses. Immune system functioning can also be measured in others ways, such as whether or not an individual has a successful immune response to a flu vaccination. For example, increases in cortisol and epinephrine are associated with decreased activity of T cells and B cells against antigens. This decrease in lymphocyte activity appears to be important in the development and progression of a variety of infectious diseases and cancer (Kiecolt-Glaser & Glaser, 1995; Vedhara et al., 1999). Among people with cancer, those with high levels of killer-T-cell activity have a better prognosis than those with low levels of activity (Kemeny, 2007; Uchino et al., 2007).

Immune processes also protect the body against cancers that result from excessive exposure to harmful chemical or physical agents called carcinogens, which include radiation (nuclear, X-ray, and ultraviolet types), tobacco smoke, and asbestos (AMA, 2003). Carcinogens can damage the DNA in body cells, which may then develop into mutant cells and spread. Fortunately, people’s exposure to carcinogens is generally at low levels and for short periods of time, and most DNA changes probably do not lead to cancer (Glaser et al., 1985). When mutant cells develop, the immune system attacks them with killer T cells. Actually, the body begins to defend itself against cancer even before a cell mutates by using enzymes to destroy chemical carcinogens or to repair damaged DNA.

But research has shown that high levels of stress reduce the production of these enzymes and the repair of damaged DNA (Glaser et al., 1985; Kiecolt-Glaser & Glaser, 1986). Given that the immune system has far-reaching protective effects, if stress disrupts the immune system it can affect a great variety of health conditions from the common cold to herpes virus infections (Chida & Mao, 2009) to cancer.

PSYCHONEUROIMMUNOLOGY

We have seen in this and earlier chapters that psychological and biological systems are interrelated—as one system changes, the others are often affected. The recognition of this interdependence and its connection to health and illness led researchers to form a new field of study called psychoneuroimmunology. This field focuses on the relationships between psychosocial processes and the activities of the nervous, endocrine, and immune systems (Ader & Cohen, 1985; Byrne-Davis & Vedhara, 2004; Kemeny, 2007; Marsland et al., 2001). These systems form a feedback loop: the nervous and endocrine systems send chemical messages in the form of neurotransmitters and hormones that increase or decrease immune function, and cells of the immune system produce chemicals, such as cytokines and ACTH, that feed information back to the brain. The brain appears to serve as a control center to maintain a balance in immune function, since too little immune activity leaves the individual open to infection and too much activity may produce autoimmune diseases.
Emotions and Immune Function

People’s emotions—both positive and negative—play a critical role in the balance of immune functions. Research has shown that pessimism, depression, and stress from major and minor events are related to impaired immune function (Byrne-Davis & Vedhara, 2004, Leonard, 1995, Marsland et al., 2001). For example, research compared immune variables of caregiver spouses of Alzheimer’s disease patients with matched control subjects and found that the caregivers had lower immune function and reported more days of illness over the course of about a year (Kiecolt-Glaser et al., 1991). Another study compared individuals who received a flu vaccination and found that those who developed and maintained a high level of flu antibodies over 5 months had experienced less stress in the interim than those with fewer antibodies (Burns, Carroll, et al., 2003).

Positive emotions can also affect immune function, giving it a boost (Futterman et al., 1994, Stone et al., 1994). In the study by Arthur Stone and his coworkers, adult men kept daily logs of positive and negative events and gave saliva samples for analyses of antibody content. Negative events were associated with reduced antibodies only for the day the events occurred, but positive events enhanced antibody content for the day of occurrence and the next two.

Some stressful situations start with a crisis, and the ensuing emotional states tend to continue and suppress immune processes over an extended period of time. This was demonstrated with healthy elderly individuals who were taking part in a longitudinal study of the aging process (Willis et al., 1987). These people were asked to contact the researchers as soon as they were able if they experienced any major crisis, such as the diagnosis of a serious illness in or the death of a spouse or child, 15 of them did so. A month after the crisis, and again months later, the researchers assessed the people’s cortisol and lymphocyte blood concentrations, recent diets, weights, and psychological distress. Because the subjects were already participating in the longitudinal study, comparable data were available from a time prior to the crisis. Analysis of these data revealed that lymphocyte concentrations, caloric intake, and body weight decreased, and cortisol concentrations and psychological distress increased, soon after the crisis. By the time of the last assessment several months later, however, all of these measures had returned almost to the precrisis levels. Similarly, a study found that people who become unemployed show impaired immune function that recovers after they get a new job (Cohen et al., 2007).

When people react to short-term, minor events, such as doing difficult math problems under time pressure, changes in the number and activity of immune cells occur for fairly short periods of time—minutes or hours (Delahanty et al., 1996). The degree of change depends on which immune system component is measured and the event’s characteristics—long-lasting and intense interpersonal events seem to produce especially large immune reductions (Herbert & Cohen, 1993). Of course, immune system reactivity varies from one person to the next, but a person’s degree of response to a type of event seems to be much the same when tested weeks apart (Marsland et al., 1995). This suggests that an individual’s reaction to specific stressors is fairly stable over time.

One key process of the immune system— inflammation—is receiving increased attention because it is implicated in a wide variety of serious medical conditions (Gouin et al., 2008, Libby et al., 2009, Steptoe et al., 2007). Stress can evoke increases in inflammatory substances in the blood, as can chronic levels of negative affect (Howren et al., 2009, Steptoe et al., 2007). Inflammation, in turn, can contribute to atherosclerosis, rheumatoid arthritis and other chronic conditions, and seems to generally accelerate age-related diseases. One puzzling question in this area is the fact that one stress response, the release of cortisol, generally decreases inflammation. But emerging perspectives suggest that under conditions of chronic stress the immune system becomes less sensitive to the normal anti-inflammatory effects of cortisol, so that inflammatory responses remain activated and can eventually damage health (Segerstrom & Miller, 2004).

Psychosocial Modifiers of Immune System Reactivity

As we’ve seen, psychosocial factors in people’s lives may modify the stress they experience. Such factors seem to affect immune system responses, too. For instance, social support affects the immune function of people under long-term, intense stress. People who have strong social support have stronger immune systems and smaller immune impairments in response to stress than others with less support (Kennedy, Kiecolt-Glaser, & Glaser, 1990, Levy et al., 1990).

A related psychosocial modifier is disclosure—describing one’s feelings about stressful events. An experiment with college students examined the effect of expressing such feelings on blood levels of antibodies against the Epstein-Barr virus, a widespread virus that causes mononucleosis in many of those who are infected (Esterling et al., 1994). The students were randomly assigned to three conditions that met in three weekly 20-minute sessions when they either described verbally or in writing a highly stressful event they had experienced.
or wrote about a trivial (non-stress-related) topic, such as the contents of their bedrooms. The students in each condition had the same level of immune control against the virus before the study. But blood samples taken a week after the last session revealed that immune control improved substantially in the verbal condition, moderately in the written condition, and declined slightly in the control (trivial topic) condition, as Figure 4-5 depicts. Other research has found that describing feelings about stressful events is more effective in enhancing immune function in cynically hostile people than in nonhostile individuals (Christensen et al., 1996).

The influence of optimism on immune function appears to depend on whether the stress is short-term or chronic (Segerstrom, 2005). Optimism is often associated with better immune functioning, but sometimes worse, perhaps because optimists persist in physiologically taxing efforts to influence or control stressful circumstances. Optimism has also been associated with lower levels of inflammation (Roy et al., 2010). (Go to [link].)

**Lifestyles and Immune Function**

Do people's lifestyles affect the functioning of their immune systems? Some evidence suggests that they do. People with generally healthful lifestyles—including exercising, getting enough sleep, eating balanced meals, and not smoking—show stronger immune functioning than those with less healthful lifestyles (Kusaka, Kondou, & Morimoto, 1992). Other studies have found that sleeping poorly can impair immune function the next day (Irwin et al., 1994), and people who smoke are more susceptible than those who don’t to catching colds (Cohen et al., 1993).

**Conditioning Immune Function**

Research on psychoneuroimmunology with animals has revealed that the influence of psychological processes on immune function is not limited to the effects of stress. The impact may be far more broad and pervasive. Robert Ader and Nicholas Cohen (1975, 1985) have shown that immune suppression can be conditioned. In their original research, they were actually studying how animals learn to dislike certain tastes. The procedure used a single conditioning trial: the subjects (rats) received saccharin-flavored water to drink (which they seemed to like) and then got an injection of a drug that induces nausea. To see whether the rats’ subsequent dislike of the taste depended on its strength, some subjects received more saccharin flavoring than others in this conditioning trial. Over the next several weeks, the drug was not used, but the animals continued to receive saccharin-flavored water. During this time, the researchers noticed a curious thing: a number of rats had fallen ill and died—and these animals tended to be the ones that had consumed the greatest amount of saccharin in the conditioning trial.
Stress and Wound Healing

We usually think of the central task of the immune systems as the detection and destruction of foreign invaders or antigens and the destruction of abnormal cells. But an equally important function of the immune system is wound healing. Whether wounds result from accidental injuries or are intentional as in surgery, the immune system plays the key role in repairing the injured tissue, as well as keeping the site from becoming infected. If stress can impair the immune system, can it also interfere with wound healing? A study by Janice Kiecolt-Glaser and her colleagues (2005) suggests it can. Married couples came to the hospital on two occasions. Both times, small blisters were created on participants’ arm with a precise suction device. During one of the hospital admissions the couples engaged in a supportive marital interaction task, and during the other they discussed a marital disagreement or conflict. Blister healing was measured over about two weeks after both admissions to the hospital. The blister wounds healed more slowly after marital conflicts than after more supportive marital interactions, and they healed more slowly for couples whose interactions included high level of hostile behavior toward each other. In other studies, tape is applied to the skin and then stripped off, creating an abrasion. A variety of stressors, including examinations and stressful interviews, and negative affect appear to delay healing of these experimental wounds (Bosch et al., 2007; Robles, 2007). Interventions that reduce stress, such as exercise or written disclosure about past traumas, can facilitate wound healing after such procedures (Emery et al., 2005; Weinman et al., 2008). These results may have important implications for patients undergoing surgery.

How did these deaths relate to immune suppression? Since the nausea-inducing drug used in the conditioning trial was also known to suppress immune function temporarily, Ader and Cohen hypothesized that the continued intake of saccharin water served as a conditioned stimulus, suppressing the ability of the rats to fight infection. Subsequent experiments by these researchers and others confirmed this hypothesis and demonstrated that conditioning can raise or lower immune function and can influence both antibody-mediated and cell-mediated immune processes (Kusnecov, 2001). Similar conditioning effects have been demonstrated in humans, such as cancer patients who receive medications that impair immune function.

DIGESTIVE SYSTEM DISEASES

Several psychophysiological disorders can afflict the digestive system. Ulcers and inflammatory bowel disease are two illnesses that involve wounds in the digestive tract that may cause pain and bleeding (AMA, 2003). Ulcers are found in the stomach and the duodenum, or upper section of the small intestine. Inflammatory bowel disease, which includes ulcerative colitis and Crohn disease, can occur in the colon (large intestine) and the small intestine. Another illness, irritable bowel syndrome, produces abdominal pain, diarrhea, and constipation (AMA, 2003). Although these diseases afflict mainly adults, similar symptoms occur in childhood (Blanchard et al., 2008).

Most ulcers are produced by a combination of gastric juices eroding the lining of the stomach and duodenum that has been weakened by bacterial infection (AMA, 2003). But stress plays a role, too (Levenstein, 2002). In a classic study, a patient (called Tom) agreed to cooperate in a lengthy and detailed examination of gastric function (Wolf & Wolff, 1947). Tom was unique in that many years earlier, at the age of 9, he had had a stomach operation that left an opening to the outside of the body. This opening, which provided the only way he could feed himself, was literally a window through
which the inside of his stomach could be observed. When Tom was subjected to stressful situations, his stomach-acid production greatly increased. When he was under emotional tension for several weeks, there was a pronounced reddening of the stomach lining. Another study reported similar effects with a 15-month-old girl who had a temporary stomach opening. Her highest levels of acid secretion occurred when she was angry (Engel, Reichsman, & Segal, 1956). The physical causes of inflammatory bowel disease and irritable bowel syndrome are not well known (AMA, 2003). Stress is related to flare-ups of these illnesses, but its specific role is currently unclear (Blanchard, 2008; Kiank et al., 2010).

Asthma

Asthma is a respiratory disorder in which inflammation, spasms, and mucus obstruct the bronchial tubes and lead to difficulty in breathing, with wheezing or coughing. This ailment is prevalent around the world—in the United States it afflicts about 6% of the population and is more common in children than in adults (AAFA, 2010). Asthma attacks appear to result from some combination of three factors: allergies, respiratory infections, and biopsychosocial arousal, such as from stress or exercise (AAFA, 2010; Lehrer et al., 2002). In most cases, the cause of an attack is largely physical, but sometimes it may be largely psychosocial.

Professionals working with hospitalized children have noticed that the asthma symptoms of many children decrease shortly after admission to the hospital, but reappear when they return home (Purcell, Weiss, & Hahn, 1972). Are these children allergic to something in their own houses, such as dust, that isn’t in the hospital? This question was tested with asthmatic children who were allergic to house dust (Long et al., 1958). Without the children knowing, the researchers vacuumed the children’s homes and then sprayed the collected dust from each house into their individual hospital rooms. The result: none of the children had respiratory difficulty when exposed to their home dust, which suggests that psychosocial factors may be involved. Findings of other research indicate that stress can trigger asthma attacks (Lehrer et al., 2002; Miller & Wood, 1994; Sarafino, 1997). Several psychosocial factors have been implicated in the development of asthma, the occurrence of asthma attacks, and the inflammatory processes that worsen asthma, including adversity during childhood and family patterns that involve stress or low social support (Chen et al., 2010; Marin et al., 2009; Miller et al., 2009; Scott et al., 2008). A meta-analysis of this research indicated that the association between stress-related psychosocial factors and asthma is bidirectional; stress and negative emotions can contribute to the development and worsening of asthma, and having asthma can contribute to future stress and negative emotion (Chida, Hamer, & Steptoe, 2008).

Recurrent Headache

Many people suffer chronically from intense headaches. Although there are many types of recurrent headache, two of the most common are called tension-type and migraine headache. Tension-type (or muscle contraction) headache seems to be caused by a combination of a central nervous system dysfunction and persistent contractions of the head and neck muscles (AMA, 2003; Holroyd, 2002). The pain it produces is a dull and steady ache that often feels like a tight band of pressure around the head. Recurrent tension-type headaches occur twice a week or more, and may last for hours, days, or weeks (Dalessio, 1994).

Migraine headache seems to result from dilation of blood vessels surrounding the brain and a dysfunction in the brainstem and trigeminal nerve that extends throughout the front half of the head (AMA, 2003; Goadsby, 1994; Holroyd, 2002). The pain often begins on one side of the head near the temple, is sharp and throbbing, and lasts for hours or, sometimes, days (Dalessio, 1994). Sometimes migraines begin with an aura, a set of symptoms that signal an impending headache episode. These symptoms usually include sensory phenomena, such as seeing lines or shimmering in the visual field. This may be accompanied by dizziness, nausea, and vomiting. Recurrent migraine is marked by periodic debilitating symptoms, which occur about once a month, with headache-free periods in between (Dalessio, 1994).

Most adults and children have headaches at least occasionally, and tension-type headaches are common (AMA, 2003). The prevalence of migraine varies widely across cultures, but is about 10% overall, is far greater in females than males, and increases with age from childhood to middle age, and then declines (Stewart, Shechter, & Rasmussen, 1994). Many children experience their first headaches in the preschool years, and chronic headaches have been reported in boys and girls as young as 6 years of age (Andrasik, Blake, & McCarran, 1986). Figure 4-6 presents a drawing by an 11-year-old girl named Meghan to describe her experience of migraine headache pain.

What triggers headaches? They often are brought on by hormonal changes, missing a meal, sunlight, sleeping poorly, and consuming certain substances, such as alcohol or chocolate. Research has also shown...
that stressors—particularly the hassles of everyday living—are common triggers of migraine and tension-type headaches (Köhler & Haimerl, 1990; Nash & Thebarge, 2006; Robbins, 1994). Yet some patients with chronic headache have attacks when they are not under great stress, and others fail to have headaches when they are under stress. Stress appears to be one of many factors that produce headaches, but the full nature of these causes is not yet known.

OTHER DISORDERS
There are several other psychophysiological disorders for which stress appears to be involved in triggering or aggravating episodes. One of these illnesses is rheumatoid arthritis—a chronic and very painful disease that produces inflammation and stiffness of the small joints, such as in the hands. It afflicts about 1% of the American population, and its victims are primarily women (AF, 2006), and stress seems to play a role in arthritis inflammation, pain, and limitations in physical activity (Parrish et al., 2008). Another disorder, called dysmenorrhea, affects millions of women. It is characterized by painful menstruation, which may be accompanied by nausea, headache, and dizziness (AMA, 2003; Calhoun & Burnette, 1983). A third stress-related problem involves skin disorders, such as hives, eczema, and psoriasis, in which the skin develops rashes or becomes dry and flakes or cracks (AMA, 2003). In many cases, specific allergies are identified as contributing to episodes of these skin problems.

Although current evidence implicates both biological and psychosocial causes for each of the psychophysiological disorders we have considered, the evidence is sketchy and the nature of the interplay of these factors is unclear. The remainder of this chapter focuses on the role of stress in the development of cardiovascular disorders and cancer.

STRESS AND CARDIOVASCULAR DISORDERS
Earlier in this chapter, we saw that psychosocial modifiers of stress can affect health—for instance, the risk of developing CHD is greater for chronically angry and hostile people. Such findings suggest that stress may be a factor in the development of cardiovascular disorders, the number-one cause of death in the United States and many other countries. We’ll look more closely at the role of stress in hypertension and CHD.

HYPERTENSION
Hypertension—the condition of having high blood pressure consistently over several weeks or more—is a major risk factor for CHD, stroke, and kidney disease.
(AHA, 2010; NKF, 2006). In the United States, nearly 30% of adults are classified as hypertensive, having blood pressures at or above 140 (systolic) over 90 (diastolic). By comparison, the hypertension rates elsewhere are (Hajjar, Kotchen, & Kotchen, 2006):

- Australia, 21%–32%
- Canada, 20%
- Europe, 44% (across several nations)
- Worldwide, 26%.

Because lesser elevations in blood pressure are now known to increase risk substantially, current guidelines designate less than 120/80 as “normal,” or conveying little risk, as shown in Table 4.2. Prevalence rates for hypertension increase in adulthood, particularly after about 40 years of age (NCHS, 2009a). Some cases of hypertension are caused by, or are secondary to, disorders of other body systems or organs, such as the kidneys or endocrine system. Secondary hypertension can usually be cured by medical procedures. But the vast majority—over 90%—of hypertensive cases are classified as primary or essential hypertension, in which the causes of the high blood pressure are unknown.

To say that the causes for essential hypertension are unknown is somewhat misleading. In cases of essential hypertension, physicians are unable to identify any biomedical causes, such as infectious agents or organ damage. But many risk factors are associated with the development of hypertension—and there is evidence implicating the following as some of the risk factors for hypertension (AHA, 2010; Hajjar, Kotchen, & Kotchen, 2006):

- Obesity
- Dietary elements, such as high salt, fats, and cholesterol
- Excessive alcohol use
- Physical inactivity
- Family history of hypertension
- Psychosocial factors, such as chronic stress, anger, and anxiety

### Table 4.2  Blood Pressure Categories
(values in mm Hg units)

<table>
<thead>
<tr>
<th>Category</th>
<th>Systolic</th>
<th>Diastolic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal (recommended)</td>
<td>Less than 120 and Less than 80</td>
<td></td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120–139</td>
<td>80–89</td>
</tr>
<tr>
<td>Hypertension: Stage 1</td>
<td>140–159</td>
<td>90–99</td>
</tr>
<tr>
<td>Hypertension: Stage 2</td>
<td>160 or higher or 100 or higher</td>
<td></td>
</tr>
</tbody>
</table>

Source: AHA, 2010

### Stress, Emotions, and Hypertension

People’s occupations provide sources of stress that can have an impact on their blood pressure. Traffic controllers at airports provide an example. Sidney Cobb and Robert Rose (1973) compared the medical records of thousands of men employed as air traffic controllers or as second-class airmen, separating the data for different age groups, since blood pressure increases with age. Comparisons for each age group revealed prevalence rates of hypertension among traffic controllers that were several times higher than for airmen. The researchers also compared the records of traffic controllers who experienced high and low levels of stress, as measured by the traffic density at the air stations where they worked. Figure 4-7 depicts the results: for each age group, prevalence rates of hypertension were higher for traffic controllers working at high-stress locations than for those at low-stress sites.

Aspects of social environments, such as crowding and aggression, are also linked to stress and hypertension. Experiments with animals have shown that living in crowded, aggressive conditions induces chronic hypertension (Henry et al., 1993). Research with humans compared people living in crowded and uncrowded neighborhoods to see if these living conditions influence blood pressure (Fleming et al., 1987). The people from the two types of neighborhoods were similar in...
important characteristics, such as age, gender, and family income. While working on a stressful cognitive task, the subjects showed greater increases in heart rate and systolic and diastolic pressure if they lived in crowded neighborhoods. Other research has found that psychological stress and high cardiovascular reactivity to stress may be a risk factor for, or even a cause of, hypertension (Chida & Steptoe, 2010; Sparrenberger et al., 2009; Tuomisto et al., 2005). Taken together, the evidence suggests that chronic stress plays a role in the development of hypertension.

Studies on pessimism, anger, and hostility have revealed important links to the development of hypertension. We'll consider three. First, blood pressure is higher in pessimistic than optimistic individuals (Räikkönen et al., 1999). Second, people who are hypertensive are more likely to be chronically hostile and resentful than are normotensive people, those with normal blood pressure (Diamond, 1982). Anger is also associated with higher nighttime blood pressure (Beatty & Matthews, 2009). Third, resting blood pressure is higher among individuals who ruminate or dwell on events that provoke anger than among people who don’t ruminate (Hogan & Linden, 2004).

Interestingly, the effects of stress on blood pressure can complicate the medical diagnosis of hypertension. Some people become anxious when medical professionals measure their blood pressure, producing an elevated reading that actually is not representative of their usual blood pressure levels, leading to a false diagnosis of hypertension. If undetected, this “white coat hypertension” can lead to unnecessary medical treatment (McGrady & Higgins, 1990; Ogedegbe et al., 2008).

**Stress and Sociocultural Differences in Hypertension**

The impact of stress on hypertension may be particularly relevant for Black people in the United States, who have a much higher prevalence rate of high blood pressure than Whites do (NCHS, 2009a). In a study of Black and White people in Detroit, the highest blood pressure readings found were those of Blacks living in high-stress areas of the city—neighborhoods that were crowded and had high crime rates and low incomes (Harburg et al., 1973). But Blacks and Whites who lived in low-stress areas had similar blood pressures. Two other findings suggest that perceived racism is a stressor that plays a major role in the high rates of hypertension among African Americans. First, Black women’s blood pressure reactivity to stressors is higher among those who feel that racial discrimination underlies the mistreatment they’ve experienced than those who do not (Guyll, Matthews, & Bromberger, 2001). Second, blood pressure in waking daily life is higher among Black men and women who perceive frequent racism in their lives than those who do not (Steffen et al., 2003).

Few cases of essential hypertension are likely to be caused by emotional factors alone (Schneiderman & Hammer, 1985). Most cases of high blood pressure probably involve several of the determinants listed earlier in this section. (Go to [Go to](#) )

**CORONARY HEART DISEASE**

Epidemiologists have studied the distribution and frequency of CHD over many decades in many different cultures. The data they have collected suggest that...
CHD is, to some extent, a disease of modernized societies—that is, the incidence rate of heart disease is higher in technologically advanced countries than in other nations (Susser, Hopper, & Richman, 1983). In advanced societies, people live long enough to become victims of CHD, which afflicts mainly older individuals, and are more likely than those in less developed countries to have certain risk factors for CHD, such as obesity and low levels of physical activity. Last, the psychosocial stressors of advanced societies are different from those in other societies and may be more conducive to the development of heart disease. For instance, people in less advanced societies may have more social support to protect them from the effects of stress and perceive less reason for anger and hostility, which we’ve already seen can increase the risk of CHD.

The link between stress and CHD has considerable support (Williams, 2008). For example, job stress, conflict in close relationships, post-traumatic stress disorder, and stress-related personality factors such as anger and optimism predict the development of CHD, as indicated by myocardial infarctions or death from CHD (Chida & Steptoe, 2009, Dedert et al., 2010, De Vogli et al., 2007, Eller et al., 2009, Kubzansky et al., 2009, Tindle et al., 2009). Associations between stress and myocardial infarctions or death from CHD could occur across various phases of the disease. Stress could contribute to the initiation and progression of atherosclerosis, even years before the first symptoms and other outward indications of CHD occur. Later, in the presence of advanced atherosclerosis, stress could contribute to the occurrence of ischemia, myocardial infarction, or disturbances in the rhythm of the heart that reveal clinically apparent CHD. Still later, stress could contribute to worrisome health outcomes for people with established CHD, such as additional heart attacks or coronary death.

Research has supported each of these possibilities. For example, anger is associated with stiffness in arteries that indicate very early signs of atherosclerosis (Shimbo et al., 2007). Also, research has found higher levels of atherosclerosis in the arteries of African American women who perceived high levels of stress, unfair treatment, and racial discrimination in their lives than those who did not (Troxel et al., 2003). Also, experiences of high demand and low control in dealing with daily stressors is associated with greater progression of atherosclerosis over time (Kamarck et al., 2007). Later in the development of CHD, a variety of stressful events and negative emotions such as episodes of anger can precipitate heart attacks in people with advanced atherosclerosis (Bhattacharyya & Steptoe, 2007). Finally, anger, depression, and stressful aspects of neighborhoods have all been found to predict poor medical outcomes, including recurring heart attacks and death, in CHD patients (Chida & Steptoe, 2009; Nicholson, Kuper, & Hemingway, 2006; Scheffler et al., 2008).

What processes link stress and CHD? We’ve discussed three processes already (Kop, 2003; Williams, 2008). First, stress evokes increases in lipids and inflammatory substances in the blood, cardiovascular reactivity, and increases in catecholamine and corticosteroid release by the endocrine glands. These physiological responses, especially if they become chronic, can damage the arteries and heart, promote atherosclerosis, and lead to the development of hypertension. These same physiological processes can cause advanced and unstable coronary artery plaques to rupture, causing a blood clot that can close off an artery that otherwise brings blood and oxygen to the heart muscle. This is the most common cause of a myocardial infarction or heart attack. Second, stress can cause cardiac arrhythmia, especially if the heart is susceptible to ischemia. When severe, arrhythmias can cause a cardiac episode and sudden death. Third, stress is associated with cigarette smoking and high levels of alcohol use, for example, which are behavioral risk factors for CHD. In later chapters we will examine in greater detail various risk factors and issues relating to CHD and the next stress-related illness, cancer.

STRESS AND CANCER

The idea that stress and other psychosocial factors contribute to the development of cancer has a long history. The physician Galen, who practiced in Rome during the second century A.D., believed that individuals who were sad and depressed, or “melancholy,” were more likely to develop cancer than those who were happy, confident, and vigorous (Sklar & Anisman, 1981). Similar ideas have appeared in the writings of physicians in later eras. Cancer is a term that refers to a broad class of disease in which cells multiply and grow in an unrestrained manner. As such, cancer does not refer to a single illness, but to dozens of disease forms that share this characteristic (ACS, 2009). It includes, for instance, leukemias, in which the bone marrow produces excessive numbers of white blood cells, and carcinomas, in which tumors form in the tissue of the skin and internal organ linings. Some cancers take longer to develop or follow more irregular courses in their development than others do.

Does stress play a role in cancer? Early evidence linking stress and cancer came from research using retrospective methods (Sklar & Anisman, 1981). This research
generally had cancer patients fill out life events questionnaires to assess the stress they experienced during the year or so preceding the diagnosis. Although some studies found that the appearance of cancer was associated with self-reported high levels of prior stress, others did not (Steptoe & Ayers, 2004). And problems with retrospective methods cloud the interpretation of the results of these studies. Because the cancer diagnoses were typically made years after the disease process started, the patients’ cancers were probably present prior to and during the year for which they reported high levels of stress. Also, the patients’ perceptions or recollections of prior stress may have been distorted by their knowledge that they have cancer. More recent, better designed research using prospective or longitudinal approaches has also produced inconsistent results, but a meta-analysis of the large number of available studies indicated that stress-related psychosocial factors predicted the initial occurrence of cancer, as well as the medical course of the disease, including survival and death from cancer (Chida et al., 2008).

One other psychosocial modifier of stress is people’s tendency toward either the Type A or the Type B behavior pattern. The Type A behavior pattern consists of four characteristics: competitive achievement orientation, time urgency, anger or hostility, and a vigorous or controlling vocal style. Compared with Type Bs, Type A individuals respond more quickly and strongly to stressors both in their overt behaviors and in their physiological reactivity. Anger/hostility is the component of this pattern that is most closely associated with the development of coronary heart disease (CHD) and hypertension.

Chronic stress may affect health in two ways. First, it may increase health-compromising behaviors, such as alcohol and cigarette use. Second, it produces changes in the body’s physical systems, as when the endocrine system releases catecholamines and corticosteroids, which can cause damage to the heart and blood vessels and impair immune system functioning. The physical effects of stress can even impair healing of wounds. Psychoneuroimmunology is the field of study that focuses on how psychosocial processes and the nervous, endocrine, and immune systems are interrelated. Stress also plays a role in many psychophysiological disorders, such as ulcers, inflammatory bowel disease, irritable bowel syndrome, asthma, and tension-type and migraine headache. In addition, stress is strongly implicated in the development of hypertension and CHD, and may also affect cancer.
## KEY TERMS

| social support | self-efficacy | psychoneuroimmunology | irritable bowel syndrome |
| buffer hypothesis | learned helplessness | psychophysiological disorders | asthma |
| direct effects hypothesis | hardness | ulcers | tension-type headache |
| personal control | Type A behavior pattern | inflammatory bowel disease | migraine headache |
| behavioral control | Type B behavior pattern | disease | hypertension |
| cognitive control | coronary heart disease | (CHD) | |
| locus of control | | | |

**Note:** If you read Modules 5 and 6 (from Chapter 2) with the current chapter, you should include the terms for those modules.