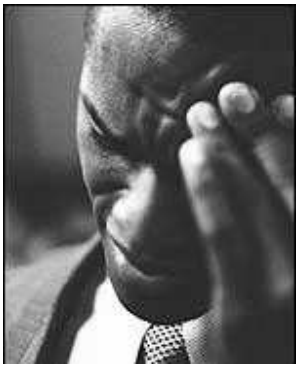
Environmental Stress



A variety of factors, including heat, cold, chemical pollution, noise, and the physical proximity of others can have a detrimental effect on health, social behaviour and performance. These are examples of **stressors**. This article examines in more detail what psychologists mean by stress.

Stress and Stressors

Many people these days complain about stress. Increasing workloads, longer working hours, financial constraints, increased number of exams for students and job insecurity are frequently cited as sources of stress. From an environmental view, temperature, noise and pollution act as stressors. But what exactly is stress? Psychologists have tended to adopt one of three models when conceptualising stress (see Table 1).

Type of model	View of stress	Explanation
Stimulus model	Focus on stress as something that happens to people.	Researchers in this tradition tend to examine the impact of different environmental stressors (as in chapters two and three) or different sorts of life event. Stimulus models of stress have been the impetus for a great deal of research into stress as a factor in illness.
Response models	Focus on the person's physical and psychological responses to stress.	Researchers in this tradition have been interested in the mechanisms by which stress may affect the cardio-vascular and immune systems and have been influential in promoting techniques to cope with stress on a physiological level, such as relaxation training.
Interactional models.	Focus on stress as a problem that occurs when there is an imbalance between the demands made on a person and their ability to meet those demands.	Researchers in this tradition are interested in how a person's perception of demands and coping resources affect stress responses. In addition, these has been an interest in how individuals differ in their ability to cope with stress that has led to the development of training programmes to help people deal more effectively with stress (e.g. stress inoculation training).

Environmental psychologists originally tended to focus on stress as a stimulus that can result in physical and psychological damage and that requires some sort of adaptation on the part of the individual. However, there has been increasing acknowledgement of the role of the individual's cognitive appraisal of the stressor in the stress process and so later research has tended towards an interactional approach. For example the effects of both noise and overcrowding are moderated if the person feels that they have some degree of control over the stressor.

Because there is such a variety of stressor in the environment, many researchers have attempted to categorise them into different types. One useful way of classifying stressors is according to whether they are acute or chronic (i.e. short or long term) and according to their severity. Such a taxonomy is provided by Halpern (1995; see Table 2).

	Minor	Major
Acute	Short-term hassles, such as crowding.	Cataclysmic events such as nuclear accidents or earthquakes.
Chronic	Long-term ambient stressors such as chronic noise.	Long-term problems such as poverty, famine or the aftermath of war.

Responses to Stress

The physiological response to stress in humans is known as the **fight or flight response**. This is an evolved response to threat that can be observed in all mammals, involving a set of structures known as the hypothalamic-pituitary-adrenal axis. In essence, the function of the fight or flight response is to reduce unnecessary energy expenditure and divert as many resources as possible towards physical activity, so that the organism can either engage directly with the threat (fight) or escape from it (flight). The fight or flight response is initiated by the **hypothalamus**. This brain structure activates the sympathetic branch of the **autonomic nervous system** (ANS). The effect of this is to increase heart and respiration rate, decrease digestive activity and divert energy resources towards the skeletal muscles, which are used for movement. At the same time, the sympathetic ANS stimulates the adrenal cortex to secrete **adrenaline**, which has the effect of maintaining the high level of activation in the sympathetic ANS. Simultaneously, the hypothalamus stimulates the **pituitary gland**, which

releases **adrenocorticotropic hormone** (ACTH). This hormone, in turn, stimulates the adrenal cortex to produce a variety of substances that act to increase metabolic rate, keep blood glucose levels high and control pain and swelling in the event of injury.

The General Adaptation Syndrome

The fight or flight response evolved to help organisms deal with stressors that operate in the short term, such as physical threats from other organisms. Problems may occur if the fight or flight response is required to operate for longer periods. One of the first researchers to appreciate this was Seyle (1956), who noted that people with severe physical injuries tend to suffer a range of health effects, such as stomach ulcers, besides those directly attributable to the injury. Selye proposed that an organism's response to long-term stress is characterised by a three-stage process he termed the **general adaptation syndrome** (GAS). The stages are:

- **Alarm.** As a reaction to the stressor, the fight or flight response occurs. The body is prepared for physical activity.
- **Resistance.** The body's energy reserves are depleted. Immune functioning starts to decline and adverse effects, such as stomach ulcers, begin to occur.
- **Exhaustion.** Unable to maintain the stress response, the body's systems begin to collapse. At this point, irreversible tissue damage can occur and the eventual outcome is death.

A variety of research supports the general idea that prolonged stress has an adverse effect on health. On a physiological level, there are a number of reasons why this might be so. The fight or flight response requires a considerable amount of energy to maintain. Since the body's energy resources are finite, this energy must be diverted from somewhere else. One possible source is the energy used to synthesise proteins required for proper immune functioning. In the long term, this diversion of resources may have a detrimental effect on the immune system, leaving the body open to infection. Additionally, the fight or flight response involves the release of **endorphins**. These brain chemicals reduce pain in the event of injury. However, inflated endorphin levels appear to reduce numbers of **natural killer cells**, whose function is to fight tumours and viruses. A range of research suggests that tumours grow faster in animals under stress Similar effects are observable in humans. Depressed levels of natural killer cells have been found in the recently bereaved, in students during exam periods and in people living near a nuclear accident (Kalat, 1998). Other research has shown that stressed individuals are more susceptible to colds and other respiratory infections (e.g. Jemmott et al, 1983).

It should be noted at this point that although the link between stress and ill health is widely accepted, it is far from proven that this is entirely due to physiological stress responses. The reason for this is that it has proven difficult to disentangle those health effects directly attributable to physiological factors from those that may arise because of behavioural responses to stress. In order to cope with stress, individuals may adopt a range of behaviours, such as smoking, that may adversely affect their health. This being the case, it could be that the increase in the incidence of respiratory infections in groups of stressed individuals is attributable to the fact that some of the group were smoking more.

Psychological Responses to Stress

The degree of psychological change that results from exposure to a stressor depends primarily on the stressor's intensity. One such response is an increase in arousal that may be experienced as anxiety. Emotional responses generally become more negative and more extreme, leading to deterioration in social behaviours characterised by increased aggressiveness and a decreased inclination to act altruistically. In addition, deficits in cognitive functioning may occur that can affect an individual's ability to perform on a variety of tasks. As cognitive functioning declines, there may be a concomitant decline in problem-solving ability and flexibility. As such, the individual may come to depend largely on well-established routines and may act in an inflexible, ritualistic way.

In the face of overwhelming stress, an individual may exhibit depressed symptoms. Once again, this may be for physiological reasons. One of the stress hormones released by the adrenal cortex is **cortisol**. The main function of cortisol is to control swelling when an injury occurs. However, it also appears to have the effect of reducing the density of **serotonin** receptors in some parts of the brain. Since abnormal serotonin activity is thought to be associated with mood disorders, this may be why high levels of stress can be associated with depression.

Alternately, depression as a response to stress may be due to a phenomenon called **learned helplessness**. Seligman (1975) suggests that, when an individual's experience suggests that they are powerless to alter the situation they cease trying to do so. In a series of animal experiments, Seligman showed that dogs subjected on a series of occasions to electric shocks from which they could not escape would later not attempt to escape from electric shocks even when this was possible. Seligman believes that learned helplessness is a central feature of depression and it is easy to see how this phenomenon could be linked to stress. If a person has learned throughout their life that they can not control stressful situations, then they may not mobilise coping resources to deal with new stressors that arise. As a result, they may be prone to the low mood, feelings of powerlessness and inactivity that characterise depression.

Although these may appear to be conflicting explanations, it is worth remembering that the relationship between physiological and psychological phenomena is an extremely complex one that psychologists and physiologists are far from disentangling. In many ways, the distinction between physiological and psychological processes is a misleading one, as each is simply a different level of explanation for the same phenomenon.

During exposure to a stressor, an individual will typically mobilise coping resources (see below). Whilst some of these may be adaptive in that they help to deal with the immediate effects of the stressor, there is the possibility that some coping responses may be maladaptive in the medium to long term. Adjusting behaviour so that the stressor is avoided may impact negatively on the person's overall ability to function normally, as in a phobia, where an individual may go to inordinate lengths to avoid the phobic stimulus. Other coping strategies, such as drinking alcohol, may help alleviate the negative emotions associated with the stressor but in themselves may ultimately detract from the person's ability to cope, besides having negative effects on their health and social relationships.