

A Stress as a bodily response

1 How the body responds to stress

While stress is a condition with which everyone is familiar, it is necessary before proceeding to be clear about what the term refers to. **Stress** is succinctly defined as ‘the effect on a person of being subjected to noxious stimulation, or the threat of such stimulation, particularly when they are unable to avoid or terminate the condition’ (Stratton and Hayes 1993). Such definitions refer to ‘effects’, ‘reactions’ or ‘responses’, and many of the more pronounced responses associated with the condition are physiological ones (although there are cognitive and behavioural components). In other words, stress manifests itself as a bodily response — the nature of this bodily response will be discussed below.

Stressors are simply the sources of stress — anything that causes stress is a stressor. If you are in a state over a lack of money, stress is what you feel, while the stressor is the lack of money.

1.1 The human nervous system

Stress manifests itself physically through the actions of the nervous system. Figure 4.1 shows the structure of the human nervous system. Note that for convenience and understanding (and primarily by function) it is divided and subdivided into individual components. While these divisions are justified on their different specific functions or locations, they are not truly separate in the way that your hands and your eyes are.

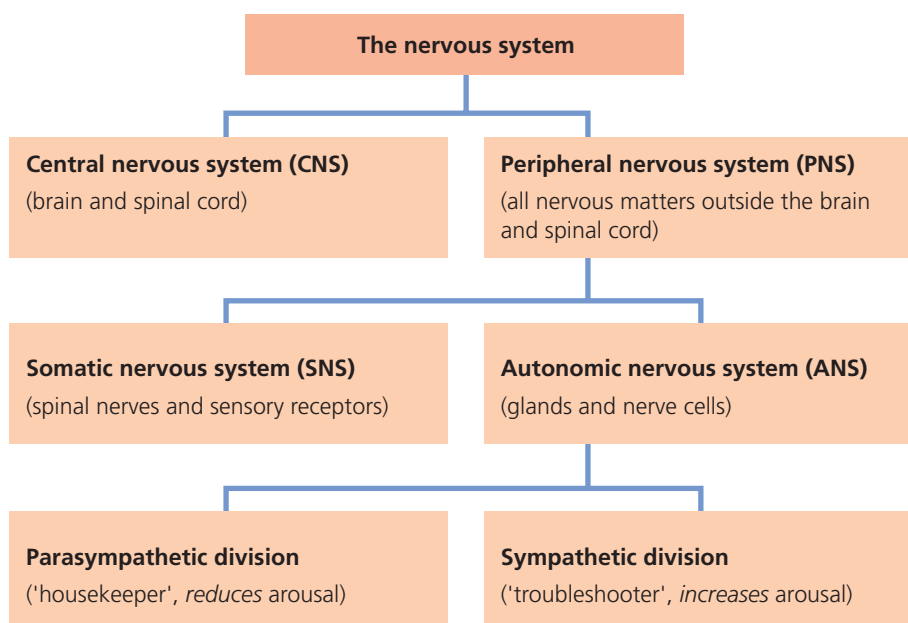


Figure 4.1 The structure of the human nervous system

Changes in the body’s physiological state in response to stressors are generally explained in terms of the activity of the **autonomic nervous system**, which comprises two

divisions, the **sympathetic** and the **parasympathetic**. The sympathetic division can be thought of as the ‘troubleshooter’ — highly responsive to stimuli and, through its activation, responsible for emotional states and elevated arousal. The parasympathetic division can be thought of as the ‘housekeeper’, stabilising and responsible for maintaining a degree of equilibrium and calming bodily processes. They are essentially opposing forces that interact to produce the bodily state at any given time. The sympathetic division of the autonomic nervous system is the component that is primarily activated by stressors.

Stress can be measured in terms of consequent changes to various physiological measures, some of which are discussed in the next section.

1.2 Physiological effects of stress (short term)

The short-term bodily response to a stressor is often termed the ‘fight or flight response’ or the ‘alarm reaction’ (Cannon). The sympathetic division of the autonomic nervous system instigates the response through neural impulses, and the endocrine system maintains arousal through release of hormones. The hypothalamus stimulates the pituitary gland (known as the ‘master’ or ‘control’ gland, since it regulates the activities of all other glands) to secrete quantities of adrenocorticotrophic hormone (ACTH). ACTH causes the adrenal gland to release the stress hormone adrenaline, which increases the rate at which energy is converted and released to muscle groups.

Short-term physiological symptoms associated with stressful states include: increased heart rate and blood pressure; a faster rate of digestion for sugars (though the digestion rate of foods that normally demand longer digestion times is slowed further), deeper breathing, increased sweating, pupil dilation, and release of endorphins (‘endogenous morphines’, the body’s naturally produced analgesic or painkiller). Such changes make the body better equipped to deal with physical danger or threat in the short term (though not in the long term) by maximising energy production and its distribution to muscle groups.

Q Explain the features of stress.

(6 marks)

1.3 The body’s response to stressors

There are two key ways in which the body responds to stressors.

The SAM system

- Immediate or acute stressors arouse the autonomic nervous system (ANS), which controls automatic functions such as breathing.
- The sympathetic branch of the ANS stimulates the release of the hormone adrenaline from the adrenal glands in the adrenal medulla.
- This activation of automatic body functions prepares the body for the flight or fight response.
- Together the sympathetic nervous system (SNS) and the sympathetic adrenal medullary system (SAM system) make up the **sympathomedullary pathway**.

The HPA axis

- Prolonged chronic stress activates the **hypothalamic-pituitary-adrenal** axis (HPA).
- The hypothalamus stimulates the pituitary gland to release the hormone ACTH. This in turn stimulates the adrenal glands to produce hormones such as cortisol.



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- The production of cortisol maintains a steady supply of blood sugar, which provides a person with a constant source of energy, allowing the body to deal with the stressor.

1.4 Evaluation

- There are individual differences with response levels. Mason (1975) found different individuals produce different levels of stress hormones when exposed to the same stressors.
- People respond in a more active way to stressors involving cognitive and emotional factors. Symington et al. (1955) found that conscious terminal cancer patients experienced more stress than those in a coma, as they indulged in a more stressful appraisal of their condition.
- This biological explanation of stress allows accurate, objective measures of stress.

Q Outline the pituitary-adrenal system.

(3 marks)

2

Stress-related illness and the immune system

2.1 Relationship between stress and cardiovascular disorders

The two most common cardiovascular disorders (CVDs) are **coronary heart disease** (CHD) and **hypertension** (high blood pressure).

Stress may lead to CVDs directly (e.g. via the GAS model) or indirectly (e.g. via stressed people's lifestyles).

Research on stress and CVDs

Krantz et al. (1991) looked at 39 people with myocardial ischemia (a condition where the heart receives a reduced blood flow) and their reactions to low-level stress. It was found that those who had the highest myocardial ischemia readings when stressed had the highest increases in blood pressure. This suggests that there is a direct link between low-level cognitive stress and physiological reactions that lead to cardiovascular damage. It could be seen as unethical to cause distress to patients with CVD, but the justification for stressing people who have a history of CVDs is that the cognitive stressors were no more than those found in everyday life.

It might be that the patients with CVDs would show heightened myocardial ischemia and blood pressure when relaxed as well as when moderately stressed. As no control was used to compare their behaviour when stressed and not stressed, it is not possible to know.

Other research studies into the relationship between stress and CVDs

- Cobb and Rose (1973) compared the medical records of air traffic controllers with other air traffic personnel and found that the air traffic controllers had higher levels of blood pressure (hypertension), which increases the risk of heart disease.
- Williams (2000) measured the anger levels of 13,000 healthy participants as an indicator of acute stress. Those who scored highly for anger were subsequently more likely to suffer heart attacks.
- Rozanski et al. (1999) found that some people are hyperresponsive to stressors: that is, the sympathetic branch of their ANS reacts more than in other people, leading to more damage of the cardiovascular systems. This shows that there are individual differences in people's reactions to stress.

2.2 The effects of stress on the immune system

The **immune system** is an interconnected system of cells and biochemicals that attack and destroy harmful invading particles, such as bacteria and toxins, and thus protect the body from infection. If a long-term stressor persists, the immune system, which is the body's device for fighting disease, will begin to fail.

Research on stress and the immune system

Kiecolt-Glaser et al. (1994) investigated the link between negative life events and suppression of the immune system. Blood samples and other stress measures were taken from students during low-stress and high-stress periods. It was found that natural killer (NK) cell activity was lower during the high-stress condition, suggesting that such stress reduces the functioning of the immune system and thus may leave people at risk of infection and illness.

However, the sample of volunteer medical students was potentially not representative of the general population. In addition, the stressors used were naturally occurring, in contrast to other studies that artificially induced stressors.

Other research studies into the relationship between stress and the immune system

- Kiecolt-Glaser et al. (1995) gave small wounds to participants and measured how long they took to heal. The healing process took longer in women who cared for senile relatives. This finding was backed up by other measurements of immune system functioning, which indicated that prolonged chronic stress lessens immune system functioning.
- Evans et al. (1994) found evidence that short-term stress is beneficial. Students who gave mildly stressing talks to others increased their levels of sIgA, an antibody that improves the ability of the immune system to resist infection.
- Cohen et al. (1993) undertook a research study centred on the cold virus. Of people who had been given the cold virus, it was found that they were more likely to catch a cold if they had displayed high stress scores. This suggests that stress depresses the efficiency of the immune system.
- Vaernes et al. (1991) reported a study of Norwegian air force personnel that showed a strong relationship between perceived work stress and complaints related to immune system activity. This shows a link between work stress and immunosuppression, but the direction of this relationship is not yet clear, as the data are only correlational.

Q What has psychological research told us about the relationship between stress and physical illness? (12 marks)

Q A psychologist wanted to investigate how stressful situations affect people's health. He decided to interview people and ask them questions about stress levels in their everyday lives.

(a) Explain one advantage of using an interview to collect these data.

(2 marks)

- (b) Write one question that the psychologist could ask that would generate quantitative data. (2 marks)
- (c) Explain one disadvantage of quantitative data. (2 marks)

B Stress in everyday life

1 Types of stressor

Research studies suggest some common sources of stress. Major stressors can essentially be broken down into the following categories: environmental conditions, occupational stressors and significant life events.

- **Environmental conditions** that induce stress include temperature and noise. Baron and Ransberger (1978) correlated weather conditions and the incidence of riot and civil disturbance; they found that the latter were more common when the temperature was moderately hot than when it was cooler or extremely hot (presumably if it is too hot, people are more lethargic and less active). Exposure to noise has been found to cause stress and impair cognitive functioning (Glass et al. 1969), but only when the noise is unpredictable (humans become habituated to constant forms of noise and can ‘tune out’ such predictable distraction).
- **Occupational stressors** encompass deadlines that are unattainable (or perceived as such), prolonged conflict with other employees, a change in employment or responsibilities, work overload and role ambiguity.
- **Life changes** are events in our lives that incur major adjustments to our lifestyle (e.g. getting married, moving house). We will examine these further in the next section.

2 Life changes and daily hassles as a source of stress

One way of studying stress is to examine potential stressors that can lead to stress, such as life changes and workplace stressors, and factors that modify it, such as personality and gender.

Scales such as the **Social Readjustment Rating Scale** (SRRS) have been developed that try to measure the stressful effects of life events in order that possible links between life changes and stress-related disorders can be investigated.

2.1 Stressful life events scale

In terms of life events and elevated stress, some stress-related illnesses have been found to be more prevalent in participants during examinations and after bereavement. Holmes and Rahe (1967) investigated medical histories of people and interviewed them about their experiences; from this they compiled a list of common life stressors. The list was arranged in a hierarchical order from most stressful to least stressful and loosely assigned a score out of 100. An adapted version of the scale is displayed in Table 4.1.

Death of spouse	100	Divorce	73
Marital separation	65	Prison sentence	63
Death of parent or close family	63	Personal injury or illness	53
Marriage	50	Being sacked from work	47
Marital reconciliation	45	Retirement	45
Change in health of family	44	Pregnancy	40
Sexual difficulties	39	Gain of new family member	39
Business readjustment	39	Change in financial state	38
Death of close friend	37	Change to different work	36
Foreclosure of mortgage	30	Change in work responsibilities	29
Son or daughter leaving home	29	Trouble with in-laws	29
Outstanding personal achievement	28	Spouse begins or stops work	26
Beginning or ending school/college	26	Changes in living conditions	25
Change in personal habits	24	Trouble with boss at work	23
Moving house	20	Change of school/college	20
Change of recreation	19	Change in social activities	18
Change in sleeping habits	16	Change in eating habits	15
Holiday	13	Christmas	12
Minor breaches of the law	11		

Table 4.1 *The stressful life events scale (adapted from Holmes and Rahe 1967)*

According to Holmes and Rahe, the scale can be used predictively. Adding up the scores from the scale for a person's stressful life events in 1 year should correlate with their physical health in the subsequent year. When Holmes and Rahe conducted correlational analyses to test this hypothesis, they did indeed find statistically significant correlations.

Evaluation

While Holmes and Rahe did confirm that life events scores on their scale correlated with the physical health of participants, several criticisms have been levelled at it:

- The way in which life events were scored in devising the scale, although reasonable in terms of being relative to other life events, was quite arbitrary. A score of 50 for marriage, for example, does not really tell us much about the true extent or nature of the stress involved, only that it is generally more stressful than being sacked from work (scoring 47) and generally less stressful than personal injury or illness (scoring 53).
- A correlation does not indicate causality — someone's general susceptibility to stress or their general level of health may also be important factors. Indeed, Dohrenwend and Dohrenwend (1974) pointed out that 29 of the items on the scale could be linked with a developing illness in some way other than causal.
- Adding up a person's scores from the scale and finding a high score may suggest that a health problem is imminent, but the nature of that problem is not apparent — different stress-related illnesses appear to be more or less associated with different forms of stressor.

- While Holmes and Rahe did find a statistically significant correlation between scores on the scale and subsequent measures of health, the correlation was quite small. Therefore, the number and type of life events that a person experiences has some association with subsequent health, but there is considerable variance and many individual differences in response to life event stressors that are not accounted for by the scale.

Other research studies into life changes as a source of stress

- Kanner et al. (1981) believed that long-lasting daily stressors would be a better indicator of stress than major life events. They produced a **hassles scale** as well as an **uplift scale** of items that gladden people.
- De Longis et al. (1988) studied stress in 75 married couples by giving them a life events questionnaire as well as using the hassles and uplift scale. No relationship was found between life events and health or between uplifts and health. This seems to indicate that stress is not related to these factors, although hassles did seem to be associated with next-day health problems.
- Jacobs and Charles (1980) found that children who had cancer were from families with higher life change scores than children with other illnesses.

Q Explain how life changes can be a source of stress in everyday life.

(4 marks)

Q Research into life changes as a source of stress has tended to use correlational analysis.

(a) Explain what is meant by a correlational analysis.

(2 marks)

(b) Explain one disadvantage of conducting a correlational analysis of life changes as a source of stress.

(2 marks)

3 Workplace stress

Workplace stressors can affect performance at work. Such stressors are workload, predictability and controllability of work role, environmental factors and role conflict and ambiguity.

Research on workplace stressors

Johansson et al. (1978) assessed if workplace stressors increased physiological arousal and led to stress-related illnesses in a Swedish sawmill.

A high-risk group of 10 finishers, whose jobs involved repetitiveness and high levels of responsibility, was compared with a low-risk group of 10 cleaners.

Stress-related hormones in urine samples were recorded on work days and rest days. Stress-related illnesses and number of days absent from work were also recorded.

It was found that the high-risk group of finishers had higher stress hormone levels than the low-risk group of cleaners. The high-risk group of finishers had higher stress hormone levels on work days than on rest days and the high-risk group of finishers had more stress-related illnesses and more days absent from work.

This suggests that work stressors such as repetitiveness and high levels of responsibility create long-term physiological arousal and lead to stress-related illnesses and absenteeism.

Evaluation

- A practical application of this research is that employers can reduce workforce illness and absenteeism by lessening workplace stressors.
- However, which work stressors were most stressful was not identified.
- In addition, individual differences were not accounted for. It may be that people who are more vulnerable to stressors are attracted to demanding jobs with lots of responsibility.

3.1 Other research studies into workplace stressors

- Dewe (1992) found that high workloads can be one of the biggest workplace stressors and they have a significant negative effect on family life.
- Marmot et al. (1991) studied civil servants and found that employees with low job control were four times more likely to have heart attacks than those with high job control. This strongly suggests that high job control is desirable in order to reduce the costs of work-related stress disorders.
- However, Caplan (1975) criticised this, as he found that ambitious individuals, such as those in Marmot's study, were more strongly affected by workplace stressors. Therefore the results may not be universally generalisable.
- Russek (1962) gave questionnaires to medical professionals and found that those in high-stress jobs were more likely to develop CVDs than people in low-stress jobs. This suggests a link between stress and heart disease, although it does not show whether the link is direct or indirect.

Q Cameron is a factory worker. Recently he has been exhibiting symptoms of stress-related illness. His doctor believes that certain features of Cameron's workplace are contributing to his illness.

Outline three factors of workplace stress that could be contributing to Cameron's stress-related illness.

(2+2+2 marks)

4

Effect of personality factors in modifying the effects of stressors

Research on personality types and stress

Friedman and Rosenman (1974) assessed the personality types of over 3500 healthy middle-aged men as part of a 12-year longitudinal study. Participants were asked questions relating to impatience, competitiveness, motivation for success, frustration at goals being hindered and their feelings towards being under pressure. High scorers were described as 'Type A' personalities, while low scorers were described as 'Type B' personalities. More than twice as many of the Type A personalities went on to develop cardiovascular disorders as did Type B personalities.

Evaluation

- The research by Friedman and Rosenman (1974) shows that Type A personalities are more prone to developing stress-related illness than other people. Assuming no confounding factors, this indicates that personality type can modify the effect of stressors.

- Jenkins et al. (1978) examined specific components and behaviours of the Type A personality and found that certain characteristics correlated more or less with specific forms of cardiovascular disorder. For example, angina sufferers tended to be composed of those Type A personalities who were impatient with other people and susceptible to feeling pressure at work, while those with heart failure tended to comprise those Type A personalities who had hasty personal habits and schedules (Hayes, 2000).
- Not all aspects of lifestyle were controlled, so it may be that other factors (e.g. hardiness) affected how vulnerable a person is to heart disease.
- Some researchers have failed to replicate this result, but Miller et al. (1991) reviewed several studies and confirmed the original finding.

4.1 Other research studies on personality factors

- Matthews and Haynes (1986) found that coronary heart disease was most associated with the hostility trait of Type A men, especially those who do not express their high levels of hostility.
- Chesney and Rosenman (1980) found that control was an important factor that interacted with personality type to determine responses to stressors. Type A managers experienced greater anxiety when they were not in control, while other managers experienced greater anxiety when they were in control. The issue of perception of control in moderating stress outcomes is an important one.
- Individuals differ in the way in which they are predisposed to respond to stressors. Gannon et al. (1987) exposed two groups of participants to stressors in the form of arithmetic problems. One group, chronic migraine sufferers, experienced headaches in response to the stressors far more than the second group, who were occasional headache sufferers. This demonstrates that individuals have predispositions in terms of the nature and extent of their response
- Morris et al. (1981) found that Type C women, who repressed their emotions when stressed, were more likely to develop cancer. This was believed to be due to emotional suppression leading to a lowering of the immune system's effectiveness. The study could be seen as being unethical as it could cause harmful distress to probe women who may be seriously ill about their emotional behaviours. However, the findings could be used to formulate effective strategies to reduce the chances of Type C women developing harmful tumours.
- Denollet et al. (1996) proposed a Type D personality as a 'distressed personality' characterised by depression and lack of sociability. Such people are more at risk of heart attacks. However, there is no real evidence that people divide up easily into separate personality types. Individuals may have elements of many of these characteristics, but to label people could lead to **self-fulfilling prophecies** where people adopt the characteristics they ascribe to the label put upon them.
- Kobasa (1977) proposed the **hardy** personality type. A hardy personality is characterised by having control over one's life, being committed to what one is doing and seeing stressors as enjoyable challenges to be mastered, leading to self-improvement. Having such a personality will result in lowered physiological arousal when in the presence of stressors, leading to a reduction in stress-related disorders. If aspects of such a personality are learnable, hardiness could form an effective stress management technique. However, it may be that hardiness does not exist and that it is negativity, not lack of hardiness, that leads to stressful experiences.

Q (a) Outline what is meant by Type A personality behaviour. (2 marks)

(b) Explain how Type A personality can contribute to stress-related illness. (4 marks)

5

Emotion-focused and problem-focused approaches to coping with stress

Roth and Cohen (1986) put forward the idea that some people confront stressors directly — this is known as **approach coping** — while others address stressors by finding ways to avoid thinking about them or by lessening their importance — this is known as **avoidant coping**.

Approach coping seems to work best with long-term stressors. Avoidant coping seems to work best with short-term stressors. However, most people seem to use one coping style regardless of the type of stressor being faced.

A different approach to coping strategies was put forward by Folkman and Lazarus (1980), who identified two general types of strategy used to cope with stressful events: **emotion-focused strategies** and **problem-focused strategies**.

Emotion-focused strategies are methods of dealing with stressful events that aim to reduce the negative effects of stressors by making an individual feel positive about a stressful situation. Such strategies include looking for distractions, preparing oneself for the worst possible outcome and keeping active to avoid thinking about the stressor.

Some emotion-focused strategies are positive strategies (e.g. perceiving the stressful situation in a positive manner), while other emotion-focused strategies are negative strategies (e.g. denying that the stressful situation exists).

Problem-focused strategies are methods of dealing with stressful situations that aim to reduce the negative effects of stressors by confronting them directly: for example, using knowledge gained from previous experience to address the stressor; getting advice from an experienced source; or creating alternative methods of addressing the stressor.

People tend to use both emotion-focused and problem-focused strategies, either collectively or individually, to address a stressful situation. The type of stressful situation being faced and previous experiences of using different coping strategies will tend to influence the type of coping strategy that will be used by a given individual.

5.1 Advantages of problem-focused strategies

Generally, problem-focused strategies are regarded as superior to emotion-focused strategies because they tend to deal directly with the cause of the problem by attempting to remove the stressor. They have also been found to have a less negative impact on health.

- Epping-Jordan et al. (1994) reported that cancer sufferers who used problem-focused strategies maintained physical health better and for longer than those patients using emotion-focused strategies.
- Desmond (2007) found that males who used problem-focused strategies to deal with the stress of having a limb amputated fared better than those using emotion-focused strategies. This suggests that problem-focused strategies are generally more efficient in helping people to cope with stressful situations.