

Hans Selye looked beyond the body's immediate response to stress and observed that:

(a) Long term exposure to stressful situations can deplete the organism's ability to maintain the stress response, and

(b) The pattern of these deleterious effects is independent of the source of stress. In 1956, he outlined a three-stage progression of responses to stress termed the General Adaptation Syndrome: Alarm, Resistance and Exhaustion.

Stage of Alarm. When a stressor is first encountered, the initial series of responses depends upon the autonomic nervous system, the immune system and other defenses to cope with the emotional, behavioral and physiological aspects of the stressor.

Stage of Resistance. Involves maintenance of this reaction to the stressor, which includes reparative processes such as fever regulation, tissue repair, control of inflammation, etc.

Stage of Exhaustion. The defenses fail, metabolic reserves are depleted, physiological functions undergo a general decline, and serious illness (or even death) ensues.

Note that this general response is independent of the initial trigger event, being more closely related to the interpretation of the environment than to the physical intensity of the aversive stimuli.

The degree to which an event is stressful to an individual may vary, but one of the main factors is thought to be the element of control over the situation that the people perceive themselves to have.

For instance, in natural and technological disasters (earthquakes, train crashes), the individual may have no control over the situation, which can compound the effect of the stressful life event.

A further significant component is the presence of conflicting consequences (e.g. in animal studies, reward or punishment).

In animal experiments, exposure to shock (even if unpredictable and uncontrollable) will not cause physical illness such as stomach ulcers unless the frequency of occurrence is fairly high: an occasional brief shock does not cause this problem.

However, acute trauma such as surgery can lead to the 'shock syndrome' a diffuse outpouring of the entire autonomic nervous system. I suspect this is even more likely if post-operative pain control is sub optimal.

In animals, a lack of coping response for acute, profound stressors can cause sudden death through hyperactivity of the parasympathetic nervous system (part of the ANS).

Relatively mild stressors, if not controllable by the individual, can lead to suppression of the immune system, which in turn can increase the vulnerability to diseases, trigger allergies, or lead to autoimmune disorders.

Note that acute episodes of stress lower the level of neurotransmitters (catecholamines such as noradrenaline: see below) in the reward system.

When an animal is acutely or chronically stressed, the hippocampal (part of the brain) level of the growth factor BDNF dramatically decreases; antidepressants (but not other psychotropic medications) have the opposite effect.

Neuroimaging studies have found that stress-related disorders are associated with reduced

hippocampal volume, which may be related to elevation in plasma cortisol levels and the duration or severity of the stress or depressive episode.

Reduced hippocampal volume in patients suffering from major depression has been seen in various studies.

Conclusion:

“Feedback from the autonomic nervous system plays an important role in determining whether or not an emotion will be experienced; environmental cues interact with this feedback to determine the nature of the emotional response.”

(Source: Drugs, Brains and Behavior by C. Robin Timmons & Leonard W. Hamilton).