# Chapter 18 Effects of Stress on Learning and Memory

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# Abstract

Stress activates the hypothalamus-pituitary-adrenal axis, which causes the release of glucocorticoids, a class of adrenal steroid hormones. Stress also activates the sympathetic nervous system and thereby, the release of the transmitters adrenaline and noradrenaline. Stress has a memory-modulatory effect in humans as well as in animals.

In humans, the hippocampus, prefrontal cortex, and amygdala are rich in cortisol receptors. Acute and tolerable stress may increase memory performance, while excessive levels and chronic stress may have negative effects, thereby mimicking the pattern in animals. Stress in humans seems to have different effects on the various stages of memory (the memory process: encoding, consolidation, and retrieval) and can be enhanced by emotional arousal.

Animals learn to associate events in their environment. Studies of the effects of manipulation of corticosterone levels in animals have helped to disentangle the influences of stress on memory and learning, and indicated that low levels enhance spatial learning, whereas higher levels impair performance.