



Glossary / Key Concepts

Allostatic Load

A range of markers of stress, including cortisol and adrenaline levels in the blood, as well as immune system activity and blood pressure.

Amygdala

A small brain region that is part of the limbic system, which activates based on the strength of an emotional or motivational response. Plays a major role in scanning for and reacting to perceived threats.

Basal Ganglia

The basal ganglia is a large region deep in the brain. This area controls habitual behavior such as walking or driving – activities that need little conscious attention due to long practice.

Cortisol

Released in response to stress, cortisol activates bodily functions associated with short term survival and in doing so suppresses the immune system, reduces digestion, and decreases bone formation. Cortisol works with epinephrine (adrenaline) to create memories of short-term emotional events; this is the proposed mechanism for storage of flash bulb memories, and may originate as a means to remember what to avoid in the future. However, long-term exposure to cortisol damages cells in the hippocampus; this damage results in impaired learning. Furthermore, it has been shown that cortisol inhibits memory retrieval of already stored information.

Dopamine

Dopamine plays a major role in the brain system that is responsible for reward-driven learning, and is one of two neurotransmitters important for stabilizing circuits in the prefrontal cortex (the other is norepinephrine). Every type of reward that has been studied increases the level of dopamine transmission in the brain, and a variety of highly addictive drugs, including stimulants such as cocaine and methamphetamine, act directly on the dopamine system.

Fight/Flight/Freeze Response

Catecholamine hormones, such as adrenaline or noradrenaline, facilitate immediate physical reactions associated with a preparation for violent muscular action (moving toward or moving away). These include the following:

- Acceleration of heart and lung action
- Paling or flushing, or alternating between both
- Inhibition of stomach and upper-intestinal action to the point where digestion slows down or stops
- Constriction of blood vessels in many parts of the body
- Liberation of nutrients (particularly fat and glucose) for muscular action
- Dilation of blood vessels for muscles
- Auditory exclusion (loss of hearing)
- Tunnel vision (loss of peripheral vision)
- Shaking

GABA

GABA stands for Gamma-aminobutyric acid, which is a chief inhibitory neurotransmitter (regulates muscle tone as well). When we are stressed and we access our prefrontal cortex, we are rewarded with a release of GABA, which acts as a sort of Pepto-Bismal to the brain, calming down the impact of adrenalin in the body (norepinephrine in the brain).

Hippocampus

A brain region central to memory functions, especially longer-term declarative (recallable) memory.

Integration

The linkage of differentiated parts.

Limbic System

A region in the center of the brain important for experiencing emotions, memories and motivations; includes the amygdala, insula, hippocampus and orbital frontal cortex. The limbic system operates by influencing the endocrine system and the autonomic nervous system.

Metaphor

The visual circuits in our brains are very highly developed. Thus, when we can “see” a picture in our mind’s eye through the use of evocative metaphor, we can quickly and easily create a mental map using these well-developed circuits. This makes it easier to comprehend complex information. Additionally, we can often access information flowing to the non-verbal right hemisphere through a mental image.

Mindfulness

The opposite of mindlessness – the close paying of attention to one’s experience, in the present moment, in an open and accepting manner. Ongoing research over the last twenty or thirty years and has found numerous mental and physical health benefits, including changes in gray matter concentration in brain regions involved in learning and memory processes, emotion regulation, self-referential processing, and perspective taking.

Mirror Neurons

A mirror neuron is a neuron that fires both when an animal acts and when the animal observes the same action performed by another. Thus, the neuron “mirrors” the behavior of the other, as though the observer were itself acting. The function of the mirror system is a subject of much speculation. Many researchers argue that mirror neurons may be important for understanding the actions of other people, and for learning new skills by imitation. Mirror neuron systems in the human brain may help us understand the actions and intentions of other people and may serve as the neural basis of the human capacity for emotions such as empathy.

Myelin (Myelination)

As part of the nervous system, myelin lines nerve fibers to protect and insulate neurons. Myelin aids in the quick and accurate transmission of electrical current carrying data from one nerve cell to the next. Nerves are like an electrical wire. Current (the message) must be conducted along a path (the nerve) to successfully get from point A to point B (the brain to a fingertip). The electrical current must travel without being corrupted, scrambled, diverted from the proper path, or leaking energy. Therefore, myelin is like the layer of plastic insulation surrounding an interior wire, which is the nerve. Additionally, myelin speeds the conduction, so it’s also analogous to a secondary coating on the wire that reduces the resistance facing an electrical current. The interior wire represents the series of axons and nerve cells that relay the electrical impulse.

Neurons

An electrically excitable cell that processes and transmits information by electrical and chemical signaling. Chemical signaling occurs via synapses, specialized connections with other cells. Neurons connect to each other to form neural networks. Neurons are the core components of the nervous system, which includes the brain, spinal cord, and peripheral ganglia.

Neuroplasticity

The susceptibility to physiological changes of the nervous system, due to changes in behavior, environment, neural processes, or parts of the body other than the nervous system. The brain changes throughout life. Neuroplasticity occurs on a variety of levels, ranging from cellular changes due to learning, to large-scale changes involved in *cortical remapping* in response to injury. The role of neuroplasticity is widely recognized in healthy development, learning, memory, and recovery from brain damage. During most of the 20th century, the general consensus among neuroscientists was that brain structure is relatively immutable after a critical period during early childhood. This belief has been challenged by findings revealing that many aspects of the brain remain plastic even into adulthood.

Norepinephrine

One of two neurotransmitters (the other is dopamine) important for stabilizing circuits in the prefrontal cortex (brain adrenaline). A moderate amount of norepinephrine is central to feeling alert and paying close attention, but too much overloads the pre-frontal cortex and decreases mental acuity.

Oxytocin

Oxytocin acts as a neurotransmitter, reducing the stress hormone cortisol and facilitating bonding. Oxytocin evokes feelings of contentment, reductions in anxiety, and feelings of calmness and security around the mate. Many studies have already shown a correlation of oxytocin with human bonding, increases in trust, and decreases in fear. One study confirmed that there is a positive correlation between oxytocin plasma levels and an anxiety scale measuring the adult romantic attachment. This suggests that oxytocin may be important for the inhibition of brain regions that are associated with behavioral control, fear, and anxiety, thus allowing orgasm to occur.

Parasympathetic Nervous System

The parasympathetic nervous system is one of the two main divisions of the autonomic nervous system, responsible for regulation of internal organs and glands, which occurs unconsciously. To be specific, the parasympathetic system is responsible for stimulation of "rest-and-digest" activities that occur when the body is at rest. Its action is described as being complementary to that of one of the other main branches of the ANS, the sympathetic nervous system, which is responsible for stimulating activities associated with the fight-or-flight response.

Prefrontal Cortex

A section of the outer layer of the brain, behind the forehead, associated with executive function. Executive function relates to abilities to differentiate among conflicting thoughts, determine good and bad, better and best, same and different, future consequences of current activities, working toward a defined goal, prediction of outcomes, expectation based on actions, and social "control" (the ability to suppress urges that, if not suppressed, could lead to socially unacceptable outcomes). Highly sensitive to norepinephrine, the prefrontal cortex needs to be in chemical balance for optimal effectiveness.

Serotonin

Serotonin is a neurotransmitter that plays an important part in the regulation of learning, memory mood, sleep and vasoconstriction (constriction of blood vessels). Experts say serotonin also might have a role in anxiety, migraine, vomiting and appetite. Approximately 90% of the human body's total serotonin is located in gut.

Stress

Stress in humans results from interactions between persons and their environment that are perceived as straining or exceeding their adaptive capacities and threatening their well-being. The element of perception indicates that human stress responses reflect differences in personality, as well as differences in physical strength or general health.

Sympathetic Nervous System

Perhaps best known for mediating the neuronal and hormonal stress response commonly known as the fight-or-flight response.

Tend and Befriend Response

A behavior exhibited by some animals, including humans, when under threat. It refers to protection of offspring (tending) and seeking out the social group for mutual defense (befriending) that evolved as the typical female response to stress, just as the primary male response was fight-or-flight. There is evidence to suggest that the hormone oxytocin is released in response to stress along with forms of adrenaline and cortisol. It may have a more pronounced effect on women than it does on men due to enhancing interactions with estrogen and diminishing interactions with testosterone.

Vagus Nerve

The vagus nerve conveys sensory information about the state of the body's organs to the central nervous system. Information comes from the heart and the gut to the right side of the brain.