



## The Autonomic Nervous System <sup>[1]</sup>

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Not all parts of the human body can be voluntarily controlled. The heart, lungs, viscera and glands are involuntary internal organs that are managed by the autonomic nervous system (ANS).

The autonomic nervous system is comprised of neurons (sensory and motor). The motor neurons control the contraction of smooth and cardiac muscles. The ANS monitors the conditions occurring in the internal environment. It is also the one that brings proper changes in the internal environment as needed.

The ANS is divided into two units: the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS).

### **Sympathetic Nervous System**

The SNS consists of preganglionic motor neurons that are found in the spinal cord. They synapse with the postganglionic neurons and then connect to the blood vessel walls and sweat glands. The SNS is very active during emergencies, as it prepares the body for the so-called “fight or flight” response. The neurotransmitter acetylcholine (ACh) is found in the preganglionic sympathetic neurons, while the one secreted by the postganglionic neurons is the noradrenaline, also known as norepinephrine (NE). When NE is released, heartbeat is stimulated, raising the blood pressure. The pupils, trachea and bronchi dilate, while the gastrointestinal peristalsis and bladder & rectum contraction are inhibited. The sympathetic nervous system also promotes ejaculation and increase in sweat secretion.

### **Parasympathetic Nervous System**

The vagus nerves that arise in the medulla oblongata plays a vital role in the parasympathetic system. Most neurons of the PNS release ACh, unlike in the SNS where the preganglionic and the postganglionic motor neurons release two different neurotransmitters.

When the PNS <sup>[3]</sup> is stimulated, heartbeat slows down, lowering blood pressure, as demonstrated by the frog heart experiment by physiologist Otto Loewi, a Nobel Prize winner. In contrast to the effects of SNS, stimulation of PNS causes increased blood flow to the viscera and skin, pupil constriction, and increased peristaltic movement in the gastrointestinal tract. This means that after the alteration made by the SNS, the PNS is responsible to returning the body to normal functions and achieve homeostasis. “SLUDD” is a common

acronym that summarizes the different roles of the parasympathetic nervous system. It stands for Salivation, Lacrimation, Urination, Digestion and Defecation.

## Debunking ANS Myth

In many books, the ANS is discussed as a system that controls involuntary muscles. However, recent research studies prove that the ANS is not entirely involuntary. These studies involved Zen Buddhism and yoga practitioners who were able to change their heart rate and oxygen consumption rate during meditations.

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