

# Sympathetic and Parasympathetic nervous system

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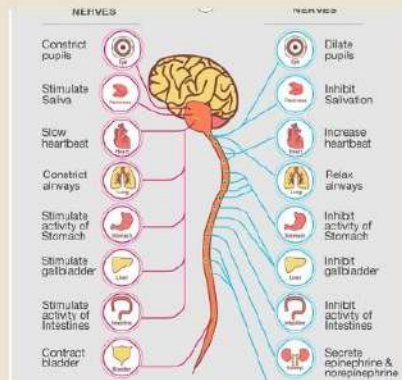
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# Introduction

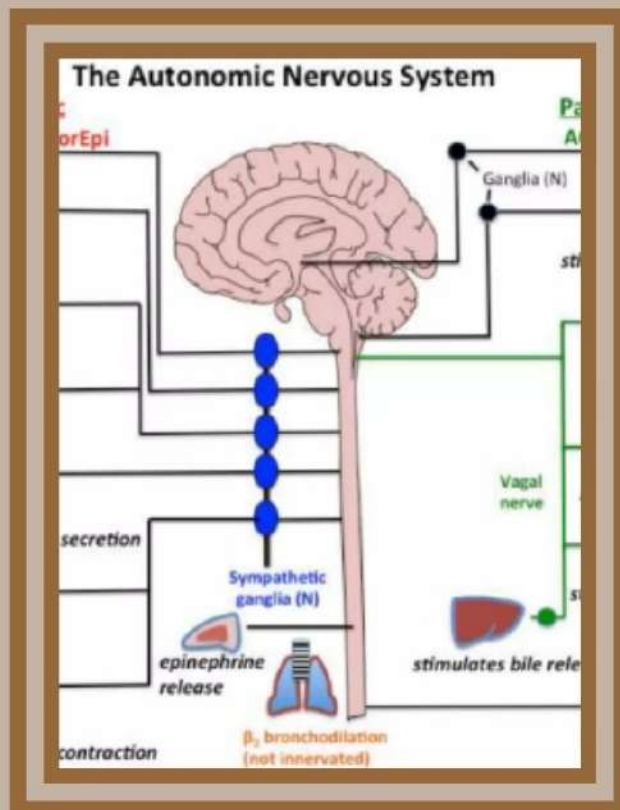


The parasympathetic nervous system (PNS) is one of the two functionally distinct and continuously active divisions of the autonomic nervous system (ANS). It is in opposition to the other, the sympathetic nervous system (SNS). The parasympathetic nervous system predominates in quiet “rest and digest” conditions while the sympathetic nervous system drives the “fight or flight” response in stressful situations. The main purpose of the PNS is to conserve energy to be used later and to regulate bodily functions like digestion and urination.



# Autonomic Nervous System (ANS)

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The Autonomic Nervous System is a widespread system of nerves that innervates, with the exception of skeletal muscle, nearly every process in the body. This Autonomic Nervous System (ANS) is a completely unconscious process which is responsible for maintaining homeostasis, as well as having many other functions such as control of digestion.

The Autonomic Nervous System was first discovered, and studied by Walter Gaskell who had his work on the ANS first published in 1916, two years after his death. Although the ANS plays an unconscious process, it can sometimes be overridden by conscious thought; one example of this is in breathing, although breathing happens automatically without any need for purposeful thought, it is possible to take control of your breathing, such as holding your breath, or exhaling forcefully (to inflate a balloon for example). The autonomic nervous system is a control system that acts largely unconsciously and regulates bodily functions, such as the heart rate, its force of contraction, digestion, respiratory rate, pupillary response, urination, and sexual arousal. This system is the primary mechanism in control of the fight-or-flight response.

The autonomic nervous system is regulated by integrated reflexes through the brainstem to the spinal cord and organs. Autonomic functions include control of respiration, cardiac regulation (the cardiac control center), vasomotor activity (the vasomotor center), and certain reflex actions such as coughing, sneezing, swallowing and vomiting. Those are then subdivided into other areas and are also linked to autonomic subsystems and the peripheral nervous system. The hypothalamus, just above the brain stem, acts as an integrator for autonomic functions, receiving autonomic regulatory input from the limbic system.



# Sympathetic Nervous system



The sympathetic nervous system is one of the two main divisions of the autonomic nervous system, which is responsible for regulating involuntary bodily functions. The other division is the parasympathetic nervous system. The sympathetic nervous system is primarily involved in the body's response to stress, danger, or emergencies, and is often referred to as the "fight-or-flight" system.

When activated, the sympathetic nervous system prepares the body for action by increasing heart rate, constricting blood vessels, and dilating the airways. It triggers the release of stress hormones like adrenaline and noradrenaline, which increase blood pressure, boost energy levels, and enhance alertness. These physiological changes help the body respond quickly and effectively to perceived threats.

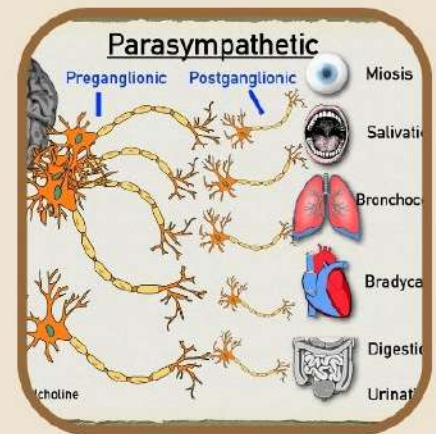
The sympathetic nervous system also affects various other organs and systems in the body. For example, it can increase sweating, dilate the pupils, inhibit digestive processes, and relax the bladder. These responses collectively enhance the body's ability to deal with immediate challenges and promote survival.

It's important to note that while the sympathetic nervous system prepares the body for action and stress, the parasympathetic nervous system works in opposition to it. The parasympathetic system promotes relaxation, slows down heart rate, and facilitates digestion and other restorative processes once the stressor has passed.

Overall, the sympathetic nervous system plays a crucial role in the body's response to stress and helps maintain balance and harmony between different bodily functions.



# Parasympathetic Nervous system



The parasympathetic nervous system is one of the two main divisions of the autonomic nervous system, along with the sympathetic nervous system. While the sympathetic nervous system is responsible for the "fight-or-flight" response to stress and emergencies, the parasympathetic nervous system is involved in the body's rest, relaxation, and maintenance activities. It is often referred to as the "rest-and-digest" system.

When activated, the parasympathetic nervous system works to conserve and restore energy in the body. It promotes activities such as digestion, elimination, and reproduction. It helps the body return to a state of calm and balance after a stressful situation, counteracting the effects of the sympathetic nervous system.

The parasympathetic nervous system slows down heart rate, constricts the airways, and relaxes blood vessels, promoting efficient digestion and absorption of nutrients. It stimulates the release of digestive enzymes, increases intestinal motility, and enhances the production of saliva and digestive juices.

Additionally, the parasympathetic system promotes relaxation and reduces muscle tension. It also regulates other functions such as pupil constriction, promoting near vision, and stimulating sexual arousal and genital blood flow.

Overall, the parasympathetic nervous system counterbalances the effects of the sympathetic nervous system, helping the body conserve energy, promote restorative processes, and maintain homeostasis. The interplay between the sympathetic and parasympathetic systems ensures the body can appropriately respond to different situations and maintain overall physiological balance.

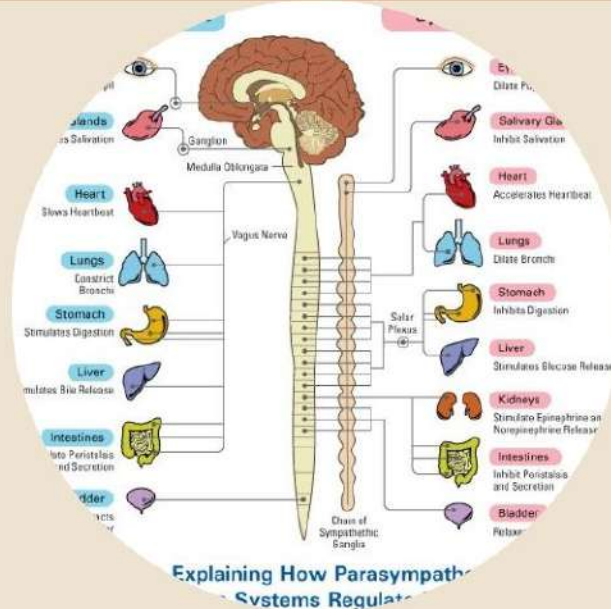


## Difference between sympathetic and parasympathetic nervous system

Sympathetic nervous system	Parasympathetic nervous system
<p>It is the division of the autonomic nervous system which prepares the body for stressful situations and is located near the lumbar and thoracic regions in the spinal cord. A small amount of sympathetic nervous system activity can regulate vital body functions by stimulating the body's fight or flight response. It responds as a physiological reaction by perceiving a threat or attack to survival. A few examples are regulating the rate of respiration, heart rate and pupillary responses.</p>	<p>It is one of the divisions of the autonomic nervous system also known as the rest and digest system. It conserves energy when the body is relaxed, feeding or resting. Situated between the spinal cord and the medulla, it slows the heart rate, increases gland and intestinal activity in the gastrointestinal tract. Parasympathetic nervous system activities are essential for the overall functioning of the body as restoring the body's nervous system is important to further function at the optimal level</p>



# Physiological importance of sympathetic and parasympathetic



Sympathetic and parasympathetic divisions typically function in opposition to each other. But this opposition is better termed complementary in nature rather than antagonistic. For an analogy, one may think of the sympathetic division as the accelerator and the parasympathetic division as the brake. The sympathetic division typically functions in actions requiring quick responses. The parasympathetic division functions with actions that do not require immediate reaction. The sympathetic system is often considered the "fight or flight" system, while the parasympathetic system is often considered the "rest and digest" or "feed and breed" system.

However, many instances of sympathetic and parasympathetic activity cannot be ascribed to "fight" or "rest" situations. For example, standing up from a reclining or sitting position would entail an unsustainable drop in blood pressure if not for a compensatory increase in the arterial sympathetic tonus. Another example is the constant, second-to-second, modulation of heart rate by sympathetic and parasympathetic influences, as a function of the respiratory cycles. In general, these two systems should be seen as permanently modulating vital functions, in a usually antagonistic fashion, to achieve homeostasis.



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