

Autonomic nervous system

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Publication year: 2014

The part of the nervous system that controls visceral functions of the body. This system innervates smooth and cardiac muscle and the glands, and regulates visceral processes including those associated with cardiovascular activity, digestion, metabolism, and thermoregulation. The autonomic nervous system functions primarily at a subconscious level. It is traditionally partitioned into the sympathetic system and the parasympathetic system, based on the region of the brain or spinal cord in which the autonomic nerves have their origin. The sympathetic system is defined by the autonomic fibers that exit thoracic and lumbar segments of the spinal cord. The parasympathetic system is defined by the autonomic fibers that either exit the brainstem via the cranial nerves or exit the sacral segments of the spinal cord. *See also:* PARASYMPATHETIC NERVOUS SYSTEM; SYMPATHETIC NERVOUS SYSTEM.

The defining features of the autonomic nervous system were initially limited to motor fibers innervating glands and smooth and cardiac muscle. This arbitrary definition limited the autonomic nervous system to visceral efferent fibers and excluded the sensory fibers that accompany most visceral motor fibers. Although the definition is often expanded to include both peripheral and central structures (such as the hypothalamus), contemporary literature continues to define the autonomic nervous system solely as a motor system. This bias ignores the importance of the afferent pathways. Moreover, it confuses the study of the dynamic regulatory function of the autonomic nervous system, since the regulation of visceral state and the maintenance of homeostasis implicitly assume a feedback system with the necessary constituents of motor, sensory, and regulatory components. Thus, from a functional perspective, the autonomic nervous system includes afferent pathways conveying information regarding the visceral organs and the brain areas (such as the medulla and the hypothalamus) that interpret the afferent feedback and exert control over the motor output back to the visceral organs.

Phylogeny provides insights into the functional and anatomical organization of the autonomic nervous system. The autonomic nervous system may be phylogenetically organized by proceeding from primitive structures that conserve metabolic resources and regulate visceral homeostasis, to structures that mobilize for fight-flight behaviors, and finally to structures found only in mammals that promote social and emotional behavior. Paralleling these functional shifts are increases in the interaction between visceral and somatic neurons and increases in influences from higher brain structures. *See also:* HOMEOSTASIS; NERVOUS SYSTEM (VERTEBRATE).

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Additional Readings

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