

The Peripheral Nervous System ^[1]

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The peripheral nervous system is comprised of nerves and ganglia (groups of nerve cell bodies) that are found outside the brain and the spinal cord. The main purpose of this system is to connect the limb and organs to the central nervous system.

The peripheral nervous system ^[3] or PNS is divided into two systems – the sensory-somatic nervous system or SNS and the autonomic nervous system.

Sensory-Somatic Nervous System

The SNS is comprised of two kinds of nerves- the cranial nerves and the spinal nerves. As the terms suggest, the cranial nerves originate from the brain, while the spinal nerves emerge from segments of the spinal cord. The cranial nerves function as transmitters of sensory information (sensory nerves), innervators of muscles (motor nerves) or both (mixed nerves). On the other hand, the spinal nerves control the rest of the body functions of the limbs and most organs.

Cranial Nerves

The brain houses 12 cranial nerves, each nerve possessing very important functions. Cranial nerve I is called the olfactory nerve, which processes all information related to the sense of smell. Cranial nerve II is the optic nerve for the sense of sight, and contains 38% of all brain axons. Cranial nerves III, IV and VI control the movement of the eyeballs. They include the oculomotor, trochlear, and abducens nerves, respectively. Cranial nerve V, the trigeminal nerve, has a mixed function for facial & mouth sensation and chewing movement. Cranial nerve VII, the facial nerve, also has a mixed function – sense of taste and motor function for salivary glands and facial muscles. Cranial nerve VIII, the acoustic nerve, has a sensory function for hearing and balance. Cranial nerve IX, the glossopharyngeal nerve, has a mixed function of the sense of taste and swallowing. Cranial nerve X, the vagus nerve, is known as the main nerve of the parasympathetic nervous system. Cranial nerve XI, the accessory nerve, innervates the head and shoulder muscles and assists in swallowing. Lastly, cranial nerve XII, the hypoglossal nerve, innervates the tongue muscles.

To memorize the 12 cranial nerves faster, use this mnemonics and sing it to the tune of “Twinkle, Twinkle Little Star”:

“Se¹ Se² Mo³ Mo⁴ Mi⁵ Mo⁶ Mi⁷ Se⁸ Mi⁹ Mi¹⁰ Mo¹¹ Mo¹²”, which stands for:

Se – sensory function

Mo – motor function

Mi – mixed function (both sensory and motor)

All the cranial nerves except cranial nerve II (optic nerve) are parts of the PNS. This is because the optic nerve is a tract of the diencephalon, whereas the other 11 extend from the brain.

Spinal Nerves

There are 31 pairs of spinal nerves that originate in the spinal cord (8 cervical, 12 thoracic, 5 lumbar, 5 sacral and 1 coccygeal). These nerves are comprised of both sensory and motor axons, and thus they are called “mixed nerves”. The nerves’ sensory neurons send nerve impulses to the brain, while the motor neurons of the brain transmit signals to the spinal cord’s motor neurons for execution.

The first 4 pairs of spinal nerves are collectively called “cervical spinal nerves” (coming from the neck) and are named C1 to C4. C1 innervates the muscles located at the skull’s base. C2 and C3 are comprised of neck nerves, while C3 and C4 form the phrenic nerve, which is responsible for innervating the diaphragm. The second set is called “brachial plexus” and is comprised of C5 to C8 and T1 innervate the upper limb and the upper back. The third set is a combination of lumbar, sacral and pudendal plexuses and is called “lumbosacral plexus”. It includes L1 to S4.

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