# Nervous System: Facts, Function & Diseases

by Kim Ann Zimmermann, Live Science Contributor

The nervous system is a complex collection of nerves and specialized cells known as neurons that **transmit** signals between different parts of the body. It is essentially the body’s electrical wiring.

Structurally, the nervous system has two components: **the central nervous system** and **the peripheral nervous system**. The central nervous system is made up of the brain, spinal cord and nerves. The peripheral nervous system consists of sensory neurons, ganglia (clusters of neurons) and nerves that connect to one another and to the central nervous system.

Functionally, the nervous system has two main subdivisions: **the somatic**, or voluntary, component; and **the autonomic**, or involuntary, component. The autonomic nervous system regulates certain body processes, such as blood pressure and the rate of breathing, that work without conscious effort. The somatic system consists of nerves that connect the brain and spinal cord with muscles and sensory receptors in the skin.

**Description of the nervous system**

Nerves are cylindrical bundles of fibers that start at the brain and central cord and branch out to every other part of the body. Neurons send signals to other cells through thin fibers called axons, which cause chemicals known as neurotransmitters to be released at junctions called synapses, the NIH noted. A synapse gives a command to the cell and the entire communication process typically takes only a fraction of a millisecond.

Sensory neurons react to physical stimuli such as light, sound and touch and send feedback to the central nervous system about the body’s surrounding environment. Motor neurons, located in the central nervous system or in peripheral ganglia, transmit signals to activate the muscles or glands.

Glial cells, derived from the Greek word for "glue," are specialized cells that support, protect or nourish nerve cells.

## ****Diagnosing nervous system conditions****

There are a number of tests and procedures to diagnose conditions involving the nervous system. In addition to the traditional X-ray, a specialized X-ray called a fluoroscopy examines the body in motion, such as blood flowing through arteries.

Other standard neurological exams include an MRI (magnetic resonance imaging), CT scan, and an electroencephalogram (EEG), which records the brain's continuous electrical activity. Positron emission tomography (PET) is a procedure that measures cell or tissue metabolism and brain activity to detect tumors or diseased tissue or tumors, the NIH noted.

A spinal tap places a needle into the spinal canal to drain a small amount of cerebral spinal fluid that is tested for infection or other abnormalities, according to the NIH.

## ****Diseases of the nervous system****

“Of all the diseases of the nervous system, the most common difficulty that people have is pain, and much of that is nerve-related,” according to Dr. Shai Gozani, founder and CEO of NeuroMetrix, a medical device company. “There are 100 million people who live with chronic pain.”

According to the Mayo Clinic, patients with nerve disorders experience functional difficulties, which result in conditions such as:

* Epilepsy in which abnormal electrical discharges from brain cells cause seizures
* Parkinson's disease, which is a progressive nerve disease that affects movement
* Multiple sclerosis (MS), in which the protective lining of the nerves is attacked by the body’s immune system
* Amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig's disease, is a motor neuron disease which weakens the muscles and progressively hampers physical function
* Huntington's disease, which is an inherited condition that cause the nerve cells in the brain to degenerate
* Alzheimer's disease, which covers a wide range of disorders that impacts mental functions, particularly memory.

Mayo Clinic also noted that the nervous system can also be affected by vascular disorders such as:

* Stroke, which occurs when there is bleeding on the brain or the blow flow to the brain is obstructed;
* Transient ischemic attack (TIA), which are mini-type strokes that last a shorter period of time but mimic stroke symptoms; and
* Subarachnoid hemorrhage,  which is specifically bleeding in the space between your brain and the surrounding membrane that can be the result of a trauma or rupturing of a weak blood vessel;

Infections such as meningitis, encephalitis, polio, and epidural abscess can also affect the nervous system, the NIH noted.

Treatments vary from anti inflammatory medications and pain medications such as opiates , to implanted nerve stimulators and wearable devices, Gozani said. “Many people also turn to herbal and holistic methods to reduce pain, such as acupuncture.”

## ****Study of the nervous system****

The branch of medicine that studies and treats the nervous system is called neurology, and doctors who practice in this field of medicine are called neurologists. Once they have completed medical training, neurologists complete additional training for their specialty and are certified by the American Board of Psychiatry and Neurology (ABPN).

There are also physiatrists, who are physicians who work to rehabilitate patients who have experienced disease or injury to their nervous systems that impact their ability to function, according to the ABPN.

Neurosurgeons perform surgeries involving the nervous system and are certified by the American Association of Neurological Surgeons.

TASKS:

1. Write out all the terms and their definitions
2. Study the text thoroughly and make sure you understand everything
3. **With a partner**, pick one of the nervous system diseases and prepare a brief report on it: description, causes and risk factors, symptoms, diagnosis and treatment, prevention
4. **Read text 2 Nervous System for the additional information. Сделайте схематический конспект этого текста, как опорную шпаргалку для устного ответа.**

**Text 2 Nervous System - Overview**

|  |
| --- |
| **Introduction:**  The nervous system is composed of all nerve tissues in the body. The functions of nerve tissue are to receive stimuli, transmit stimuli to nervous centers, and to initiate response. The **central nervous system** consists of the brain and spinal cord and serves as the collection point of nerve impulses. The **peripheral nervous system** includes all nerves not in the brain or spinal cord and connects all parts of the body to the central nervous system. The peripheral (sensory) nervous system receives stimuli, the central nervous system interprets them, and then the peripheral (motor) nervous system initiates responses.  The**somatic nervous system** controls functions that are under conscious voluntary control such as skeletal muscles and sensory neurons of the skin.  The **autonomic nervous system**, mostly motor nerves, controls functions of involuntary smooth muscles, cardiac muscles, and glands. The autonomic nervous system provides almost every organ with a double set of nerves - the **sympathetic** and **parasympathetic**. These systems generally but not always work in opposition to each other.  The **sympathetic** **system** activates and prepares the body for vigorous muscular activity, stress, and emergencies. While the **parasympathetic** **system** lowers activity, operates during normal situations, permits digestion, and conservation of energy.  The two systems generally act in opposition to each other. For example, a stimulation by the sympathetic system on the heart would increase contractions, while a stimulation by the parasympathetic system would decrease heart contractions. Where dual control of an organ exists, both systems operate simultaneously although one may be operating at a higher level of activity than the other. The operation is similar to the operation of a car with both the accelerator and brake pedals depressed.  In the peripheral nervous system, a chemical neurotransmitter carries the nerve impulses from neuron to neuron across a **synapse** (space between neurons). **The neurotransmitters are acetylcholine, norephinephrine, serotonin,** and others.  Nerves that release acetylcholine are called cholinergic nerves. Cholinergic nerves are part of the parasympathetic system, somatic motor nerves, preganglionic sympathetic nerves\* and central nervous system. (\*The nerve that carries the message from the central nervous system to a ganglion - junction for a group of nerve cells - is a preganglionic nerve.)  Nerves that release norepinephrine are called adrenergic nerves. Adrenergic nerves are part of the postganglionic sympathetic nerve system\*\* and parts of the central nervous system. (\*\*A nerve that carries the impulse from the ganglion to the effecter cell is a postganglionic nerve.) |