



What are the 12 cranial nerves?

The cranial nerves are a set of twelve nerves that originate in the brain. Each has a different function responsible for sense or movement. They include the olfactory nerve, which is essential for detecting smells and the optic nerve, which enables a person to see. The functions of the cranial nerves are sensory, motor, or both. Sensory cranial nerves help a person see, smell, and hear. Conversely, motor cranial nerves help control muscle movements in the head and neck. Each nerve has a name that reflects its function and a number according to its location in the brain. Scientists use Roman numerals from I to XII to label the cranial nerves in the brain.

The 12 cranial nerves include the:

- I. Olfactory Nerve
- II. Optic Nerve
- III. Oculomotor Nerve
- IV. Trochlear Nerve
- V. Trigeminal Nerve
- VI. Abducens Nerve
- VII. Facial Nerve
- VIII. Vestibulocochlear Nerve
- IX. Glossopharyngeal Nerve
- X. Vagus Nerve
- XI. Accessory Nerve
- XII. Hypoglossal Nerve

This article will explore the functions of each of the cranial nerves and provide a diagram.

I. Olfactory nerve

The olfactory nerve transmits information regarding a person's sense of smell to the brain. When an individual inhales fragrant molecules, olfactory receptors within the nasal passage [send](#) the impulses to the cranial cavity, which then travel to the olfactory bulb. Specialized olfactory neurons and nerve fibers meet with other nerves, which pass into the olfactory tract. The olfactory tract then travels to the frontal lobe and other areas of the brain that have a role in memory and the notation of different smells.

II. Optic nerve

The optic nerve transmits information to the brain regarding a person's vision. When light enters the eye, it hits the retina, which contains rods and cones. These are photoreceptors that [translate](#)

signals from light into visual information for the brain. These cones sit within the central retina and have a role in color vision. Conversely, the rods in the peripheral retina are responsible for noncolor vision. The photoreceptors carry signal impulses along nerve cells to form the optic nerve. Most of the fibers of the optic nerve cross into a structure called the optic chiasm. The optic tract then projects to the primary visual cortex in the occipital lobe at the back of the brain. The occipital lobe is where the brain handles visual information.

III. Oculomotor nerve

The oculomotor nerve helps control muscle movements of the eyes. The oculomotor nerve provides movement to most of the muscles that move the eyeball and upper eyelid, known as extraocular muscles. The oculomotor nerve also helps with involuntary functions of the eye. For example, the sphincter pupillae muscle automatically constricts the pupil to allow less light into the eye in bright light conditions. When it is dark, the muscle relaxes to allow more light to enter. Another function is when the ciliary muscles help the lens adjust to short-range and long-range vision. This happens automatically when a person looks at near or far objects.

IV. Trochlear nerve

The trochlear nerve also has a role in eye movement. The trochlear nerve, like the oculomotor nerve, originates in the midbrain. It powers the contralateral superior oblique muscle that allows the eye to point downward and inward.

V. Trigeminal nerve

The trigeminal nerve is the largest cranial nerve and has both motor and sensory functions. Its motor functions help a person to chew and clench the teeth. It also gives sensation to muscles in the tympanic membrane of the ear. Its sensory division has three parts that connect to sensory receptor sites on the face:

- The ophthalmic part gives sensation to parts of the eyes, including the cornea, mucosa in the nose, and skin on the nose, the eyelid, and the forehead.
- The maxillary part gives sensation to the middle third of the face, side of the nose, upper teeth, and lower eyelid.
- The mandibular part gives sensation to the lower third of the face, the tongue, mucosa in the mouth, and lower teeth.

Trigeminal neuralgia is a common disorder of the trigeminal nerve that can cause intense pain and facial tics.

VI. Abducens nerve

The abducens nerve [also helps](#) control eye movements. It helps the lateral rectus muscle, one of the extraocular muscles, turn the gaze outward. The abducens nerve starts in the pons of the brainstem, enters an area called Dorello's canal, travels through the cavernous sinus, and ends at the lateral rectus muscle within the bony orbit.

VII. Facial nerve

The facial nerve also has both motor and sensory functions. The facial nerve [consists of](#) four nuclei that serve different functions:

- movement of muscles that produce facial expression
- movement of the lacrimal, submaxillary, and submandibular glands
- the sensation of the external ear
- the sensation of taste

The four nuclei originate in the pons and medulla and join together to travel to the geniculate ganglion. [Bell's palsy](#) is a common disorder of the facial nerve, which causes paralysis on one side of the face and possibly loss of taste sensation.

VIII. Vestibulocochlear nerve

The vestibulocochlear nerve [helps](#) with a person's hearing and balance. This nerve contains two components: the vestibular nerve and the cochlear nerve. The vestibular nerve helps the body sense changes in the position of the head with regard to gravity. The body uses this information to maintain balance. The cochlear nerve helps with hearing. Specialized inner hair cells and the basilar membrane vibrate in response to sounds and determine the frequency and magnitude of the sound. These fibers combine in the pons and exit the skull via the internal acoustic meatus in the temporal bone.

IX. Glossopharyngeal nerve

The glossopharyngeal nerve possesses both motor and sensory functions. The sensory function receives information from the throat, tonsils, middle ear, and back of the tongue. It also has a role in the sensation of taste on the back of the tongue. The motor division provides movement to the

stylopharyngeus, a muscle that allows the throat to shorten and widen. The glossopharyngeal nerve starts in the medulla oblongata in the brain and leaves the skull through the jugular foramen, which leads to the tympanic nerve.

X. Vagus nerve

The vagus nerve has a range of functions, providing motor, sensory, and parasympathetic functions.

- The sensory part provides sensation to the outer part of the ear, throat, heart, and abdominal organs. It also plays a role in taste sensation.
- The motor part provides movement to the throat and soft palate.
- The parasympathetic function regulates heart rhythm and innervates the smooth muscles in the airway, lungs, and gastrointestinal tract.

Doctors use vagus nerve stimulation therapy to treat various conditions, including epilepsy, depression, and anxiety.

XI. Accessory nerve

The accessory nerve provides motor function to some muscles in the neck. It controls the sternocleidomastoid and trapezius muscles that allow a person to rotate, extend, and flex the neck and shoulders. The accessory nerve separates into spinal and cranial parts. The spinal component starts in the spinal cord and travels into the skull through the foramen magnum. From there, it meets the cranial component of the accessory nerve and exits the skull along the internal carotid artery. The cranial part of the accessory nerve combines with the vagus nerve.

XII. Hypoglossal nerve

The hypoglossal nerve is a motor nerve that supplies the tongue muscles. It originates in the medulla. Disorders of the hypoglossal nerve can cause paralysis of the tongue, most often occurring on one side.

Diagram of cranial nerves

The following diagram illustrates the different ways cranial nerves impact the brain:

12 Cranial Nerves

