The Relationship Between The Special Sense Of Audition And The Autonomic Nervous System

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Sense of Audition

Introduction

The cerebrum plays a significant role in perceiving and interpreting the information sent by the special senses. Some special senses also influence the autonomic functions of the brain. Every special sense has a specific organ and a specific cranial nerve associated with it, which helps it accomplish the process. The ear is the specific organ that is dedicated to the special sense of audition. The sense of hearing and the entire process comes under the paradigm of the auditory system. The sense of hearing is also called the special sense of audition. This research paper tends to explore the relationship between the special sense of audition and the autonomic nervous system.

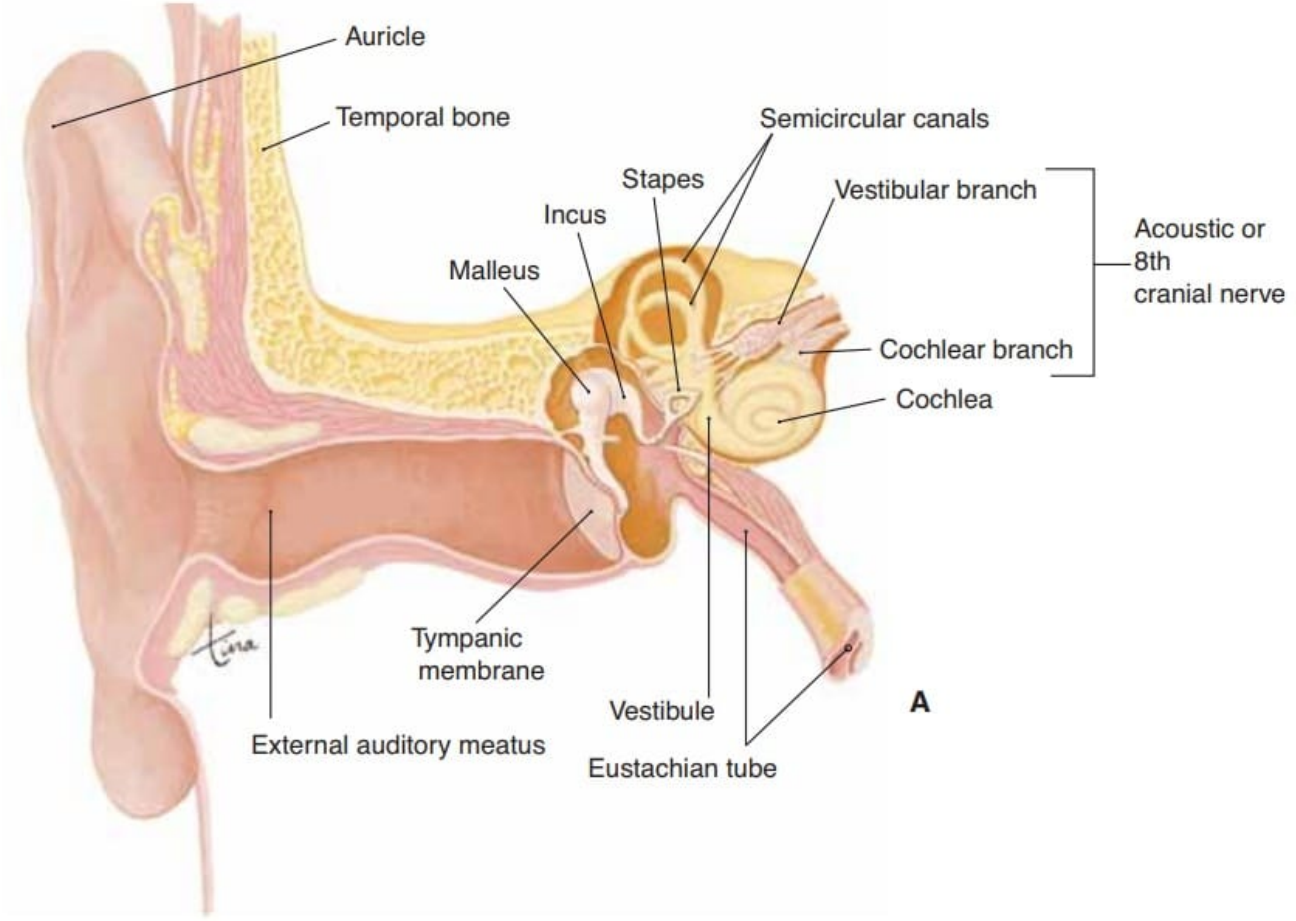
Sense of Hearing: Role of Eighth Cranial Nerve

The nerve fibres which carry information on and out of the brain stem are called cranial nerves. There are twelve different types of cranial nerves. These include information related to vision, gustation, equilibrium, olfaction, and audition. The type of Cranial nerve associated with the special sense of hearing is the Auditory nerve, also called the “vestibular nerve” (Sanders & Gillig, 2010). It is also called the Eighth cranial nerve in the human ear. This cranial nerve is accountable for the sense of audition and equilibrium or balance.

The Relation of Anatomy and Physiology of Ear

Sense of hearing is accomplished with the help of the ear. It is classified into three different sections, which are “the external/outer ear, the middle ear, and the internal/ inner ear”. The external ear comprises the “pinna, external auditory canal, and the eardrum”. The eardrum is the other name used for the tympanic membrane. When the sound waves travel through the external ear, they enter

the middle part of the ear through the eardrum. The role of the outer ear is to gather the sound waves and amplify them. These amplified sound waves are directed to the middle ear through the eardrum. The middle ear comprises the “tympanic cavity, pharyngotympanic tube, and ossicles”. The tympanic cavity is attached to the eardrum. The ossicles are the three small bones which are present in the tympanic cavity. The ossicles transmit the sound waves of the eardrum in the form of vibratory motions to the inner ear. The middle ear acts as a protective barrier of the internal ear from high-frequency damaging sound waves. The sound waves are turned into vibrations within the cochlea. The inner part of the ear is also called a “bony labyrinth (positioned in temporal bone)”. The inner ear consists of “the cochlea, the vestibule, and the semicircular canals”. The cochlea is filled with perilymph (plasma fluid). It also has a membranous labyrinth, which is also a thick fluid called endolymph. These sound vibrations are turned into nerve impulses in the cochlea. These electric/ nerve impulses reach the brain (cerebral cortex), where these nerve impulses are interpreted.



(The Ear: Anatomy and Physiology, n.d.)

Transduction of Signals in Ear

The transduction of signals in the ear is also known as auditory transduction. The process of transduction refers to the conversion of sound waves into electric impulses or the nerve impulses in

the ear and sending these nerve impulses to the brain to interpret the sound. The function of the external and the middle ear is to amplify the sound waves and send them to the inner ear. The actual process of the transduction of these sound waves takes place in the inner ear. The inner ear comprises the cochlea, which is the main organ that transforms these sound vibrations into nerve impulses and accomplishes the transduction. These nerve impulses are sent to the brain for interpretation, where the listener becomes aware of the sounds he or she is listening to.

Transduction of Signals in Somatic Peripheral Sensory Nerve and Hearing

There are different processes and functionalities of the transduction of signals taking place in the somatic peripheral nervous system and sense of audition. The somatic peripheral nervous system controls voluntary actions (intentional influence) in the body through the skeletal muscles. The "Somatic Peripheral sensory nerve transmits signals from the CNS (central nervous system) to skeletal muscles" (Akinrodoye & Lui, 2021). The transduction takes place with the help of sensory and motor neurons. The process starts with the receptors of the external stimuli of vision, hearing, touch, and smell. On the other hand, the process of hearing consists of nerve impulses that are converted from the sound waves/ vibrations in the cochlea. These nerve/electric impulses are directed to the brain for the completion of the process of hearing.

Sense of Hearing: Downstream Effects

If a sharp or high-frequency sound is heard, it can be frightening to the person. When the person is frightened or scared by loud and abrupt sounds, it can activate the autonomic nervous system, causing tension, sweating, shivering, or involuntary muscle movement. The inner ear is the most important part of the process of hearing. Homeostatic imbalance in the fluids of the cochlea can cause various physiological complexities, such as deafness and hearing disorders. If the ear is exposed to high-frequency sound waves or homeostatic fluid imbalance, it can cause permanent deafness and hearing loss (Juhn et al., 1991).

Conclusion

In a nutshell, the sense of hearing or audition plays the main role in accomplishing communication. The sense of hearing is deeply rooted in social living and requires effective communication. The ear is the main organ that transforms sound vibrations/ waves into nerve/ electric impulses through the process of hearing. Any damage or fluid imbalance in any part of the middle or inner ear can cause temporary or permanent hearing loss.

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