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Discuss the physiology of balance

**Physiology of balance**

The semicircular canals and the vestibule are concerned with balance. Any change of position of the head causes movement in the perilymph and endolymph, which bends the hair cells and stimulates the sensory nerve endings in the utricle, sacculr and ampullae. Theresultant nerve impulses are transmitted by the vestibular nerve which joins the cochlear nerve to form the vestibule cochlear nerve. The vestibular branch passes first to the vestibular nucleus, then to the cerebellum.

The cerebellum also receives nerve impulses from the eyes and sensory receptors in the skeletal muscles and joints. Impulses from these three sources are coordinated and efferent nerve impulses pass to the cerebrum and to skeletal muscles. This results in awareness of body position, maintenance of upright posture and fixing of the eyes on the same point, independently on the head movements

* Balance is mediated by the vestibular nuclei in the brain stem
* the labyrinth (a part of the inner ear), is a major organ of our vestibular (balance) system
* the three semicircular canals of the labyrinth is associated with sensing rotary motion (1)
* the brain senses the direction and speed of rotation of the head by the movement of fluid in the semicircular canals (1)
* balance is maintained by the interactions between the labyrinth and other systems in the body, such as the visual and skeletal systems (1)
* the main inputs into the balance system are the:

1. vestibular labyrinths
2. visual system (eyes)
3. somatosensory system, especially proprioception

the main outputs from the vestibular nuclei are:

1. vestibulo-ocular:permitting reflex eye movements related to posture
2. vestibulo-spinal which supply: anti-gravity muscles in the lower limbs, reflex arcs which control gait

The vestibular system is the sensory apparatus of the inner ear that helps the body maintain its postural equilibrium. The information furnished by the vestibular system is also essential for coordinating the position of the head and the movement of the eyes. There are two sets of end organs in the inner ear, or labyrinth: the semicircular canals, which respond to rotational movements (angular acceleration); and the utricle and saccule within the vestibule, which respond to changes in the position of the head with respect to gravity (linear acceleration). The information these organs deliver is proprioceptive in character, dealing with events within the body itself, rather than exteroceptive, dealing with events outside the body, as in the case of the responses of the cochlea to sound. Functionally these organs are closely related to the cerebellum and to the reflex centres of the spinal cord and brainstem that govern the movements of the eyes, neck, and limbs.