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Physiology of balance

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.

In vertebrates the utricular maculae in the inner ear contain an otolithic membrane and otoconia (particles of calcium carbonate) that bend hair cells in the direction of gravity. This response to gravitational pull helps animals maintain their sense of balance.

The cristae of the semicircular ducts, which form one of the two sensory organs of balance (the second being the maculae of the utricle and saccule), respond to rotational movements and are involved in dynamic equilibrium.