VESTIBULAR CONTRIBUTIONS TO SELF-WORLD INTERACTION

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Objectives: Vestibular inputs do not produce conscious perceptions of their own, yet correct processing of these signals is essential for our interactions with the external environment. For instance, the ability to acquire a sense of direction and orientation in external space depends on the capacity of our brain to integrate vestibular inputs arising from the otolith organs and semicircular canals with other sensory signals. Here we demonstrated that vestibular system contributes to self-world interaction at least in three different ways: modulating bodily sensations, affecting the representation of the body as a spatially extended object, influencing the mechanisms for maintaining the self-world differentiation.

Methods: In a series of psychophysical and electrophysiological experiments, the vestibular organs of healthy volunteers were non-invasively stimulated either thermally (Caloric Vestibular Stimulation, CVS) or electrically (Galvanic Vestibular Stimulation, GVS). Participants made judgements about the body and its relation to the environment both under vestibular stimulation, and under control conditions.

Results: Both CVS and GVS modulated somatosensory processing, increasing the sensitivity for touch, but decreasing sensitivity for pain [1,2]. Accordingly, vestibular stimulation influenced somatosensory brain evoked potentials [3], suggesting a role of the vestibular system in influencing bodily sensations. Further, GVS altered the localisation of stimuli on body surface [4]. Blindfold participants were touched at one of several different locations on the hand, and immediately attempted to point to the location where they had been touched. During GVS, touches on the hand were perceived as shifted toward the wrist [4]. The shift was systematically in a distal-proximal direction, thus directed towards the centre of the body, indicating a vestibular-induced shrink of the representation of the body. Finally, the spatial relation between body and environment was investigated by judging the distance between one’s own body and an external stimulus. Both visual and auditory stimuli were presented. In both cases, GVS caused overestimation of distance, particularly for objects located farther away. These results suggest that the vestibular system maintains the normal spatial relation between the body and external objects.

Conclusions: Vestibular organs are activated by head movements. However, every movement of the head implies a new relation between the self and the world. Our findings revealed that the vestibular system directs a form of sensory signal management, balancing bodily sensations and behaviours in relation with the external environment changes [5].
**Publications:**

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