Contribution ID: **260** Type: **Poster**

Galvanic vestibular stimulation interferes with the selection of egocentric spatial navigation strategies.

In space, changes of gravitational input strongly alter the functioning of the vestibular system, whose sensory information is important not only for postural balance, but also for relevant cognitive functions, such as spatial navigation [1]. During navigation, the surrounding environment may be encoded using different reference frames: egocentric (body-centered), allocentric (stimuli-centered), or landmark-dependent (landmark-centered) [2]. Alterations of vestibular input during parabolic flights have been recently linked to weakened egocentric reference frames [3]. However, no study has systematically investigated the selective influence of vestibular alterations on the use of all spatial navigation strategies simultaneously.
To selectively interfere with vestibular input, left-anodal (L-GVS), right-anodal (R-GVS) and sham bipolar sinusoidal GVS were administered in counterbalanced orders in 8 healthy participants. During each GVS condition, participants performed a new immersive navigation task in virtual reality. In a circular arena with four landmarks at cardinal points, they were first asked to search and reach a target platform. At the end of each trial, using a two-alternative forced choice paradigm, they were asked to indicate (1) the traveled path to reach the platform (egocentric strategy), (2) the platform position with respect to the landmarks disposition (allocentric strategy), or (3) the arena spatial map based on landmark positions (landmark-based strategy). For each stimulation condition, participants' Response Times (RTs) and the proportion of correct answers for each navigation strategy were recorded as dependent variables.
Results revealed significantly slower RTs in L-GVS condition compared to R-GVS and sham-GVS. No other comparison resulted to be significant.
This is the first evidence showing that GVS-induced vestibular alteration interferes with the selection of egocentric navigation strategies, while leaving allocentric or landmark-based strategies unaffected. This is in line with prior studies showing impaired egocentric spatial transformation during microgravity [4] and decreased use of egocentric strategies in patients with unilateral and acute vestibular disorders on Earth [5]. These results suggest that artificially-induced vestibular changes affect spatial navigation abilities, by hindering the integration of sensory stimuli with respect to the body's orientation. These findings enhance our understanding of the effects of altered gravity on human navigation and may offer relevant insights for the design of effective countermeasures to be applied in the space environment.

[1] Dieterich, M. Ann. N. Y. Acad. Sci., 1343(1), 10-26.
[2] Zhong, J.Y. J. Environ. Psychol., 46, 154-175.
[3] Salatino, A. NPJ Microgravity, 7(1), 29.
[4] Stahn, A. FRONT NEURAL CIRCUIT, 14, 20.
[5] Gammeri R. J. Neurol., 269(8), 4333-4348.

Primary authors: Prof. BERTI, Annamaria (University of Turin); ZAVATTARO, Claudio (University of Turin); Dr CIRILLO, Emanuele (University of Turin); Dr SERRA, Hilary (University of Turin); Prof. RICCI, Raffaella (University of Turin); Dr GAMMERI, Roberto (University of Turin); Dr CENTO, Samuel (University of Turin)