

Galvanic vestibular stimulation impairs specific executive functions

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Recent research suggests that patients with peripheral vestibular disease have problems in executive functions, but to date, not much is known about the direct vestibular influence on executive functioning. We artificially induced mild vestibular impairment in healthy participants by suprathreshold galvanic vestibular stimulation (GVS) and measured their performance in core executive functions. Seventy-nine participants solved two executive tasks (n-back task and Stroop task), assessing core components of executive functions (working memory, inhibition and cognitive flexibility). These tasks were solved twice, before and during simultaneous bilateral bipolar sinusoidal GVS. Participants were randomly assigned to three different stimulation protocols: They were either exposed to suprathreshold GVS (2mA, comparable to mild vestibular impairment), subthreshold GVS (0.8mA) or to sham GVS (0mA). Participants receiving suprathreshold GVS showed diminished performance in working memory ability when compared to participants receiving subthreshold GVS or sham GVS. Performance in inhibition and cognitive flexibility did not differ between groups. These results indicate that artificially induced mild vestibular impairment has a selective negative effect on working memory performance. The results provide important evidence about the specific effects vestibular impairment can have on executive functions, and this in turn can help the design of new treatment options for patients with peripheral vestibular disease.

Keywords: *vestibular disease, galvanic vestibular stimulation, executive functions, working memory, inhibition, cognitive flexibility*