

Impact of galvanic vestibular stimulation on mood

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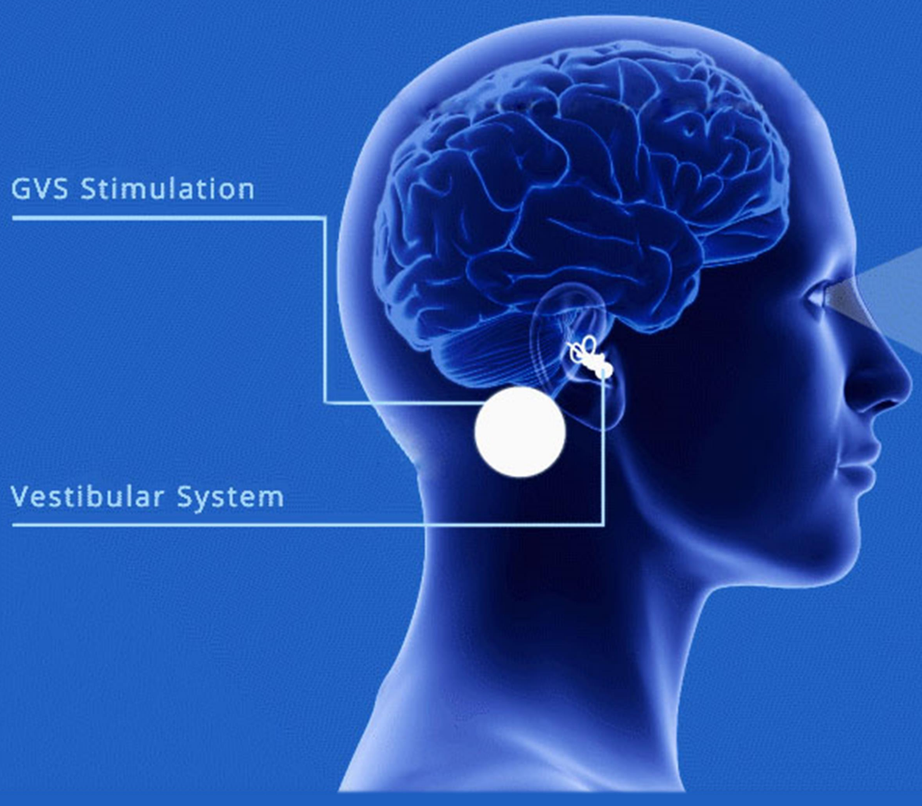
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Introduction

Galvanic Vestibular Stimulation (GVS) is a variant of transcranial direct current (tDCS) used to treat depression. In GVS, the electrodes are attached to the mastoids process behind the ears in order to stimulate the vestibular system including vestibular cortex. In addition to its role in gaze stabilization and postural control, the vestibular system has an influence into dimensions of emotion processing, mental health and social cognition. Moreover, several studies demonstrated that vestibular stimulation has a modulating effect on mood, affective control, and especially in anxiety level.

Objectives :

- Demonstrate the feasibility of our experimental protocol for clinical treatment (motion sickness).
- Test if the dose (duration) of stimulation has an impact on mood.



Discussion

Our results confirm that GVS induces motion sickness symptoms. Vegetative disturbances rated by the participants appeared only for the double-dose session and provoked minor level of motion sickness symptoms.
Present study demonstrates also a significant decrease of anxiety level after a dose of GVS, in a student population. This result corroborates similar findings in the literature. It confirms that vestibular system consists of afferent and efferent connections with most of the brain structures involved in emotional processes, such as insula and prefrontal areas.

- **Methodological perspectives**
- **Chronobiological perspectives**

Methodology

- Participants :
  22 students in sport sciences were recruited.
  Criteria of exclusion : vestibular disorders, psychiatric diagnoses.

- Measures :
  Motion sickness symptoms were assessed by Graybiel scale (*Figure 1.A*). To evaluate mood in particular anxiety, participants completed a Visual Analog Scale/VAS (*Figure 1.B*). Each test was completed before and after GVS.

A

TABLE II. DIAGNOSTIC CATEGORIZATION OF DIFFERENT LEVELS OF SEVERITY OF ACUTE MOTION SICKNESS

Category	Pathognomonic 16 points	Major 8 points	Minor 4 points	Minimal 2 points	AQS* 1 point
Nausea syndrome	Vomiting or retching	Nausea† II, III	Nausea I	Epigastric discomfort	Epigastric awareness
Skin color		*Pallor III*	*Pallor II*	*Pallor I*	*Flushing*
Cold sweating		III	II	I	
Increased salivation		III	II	I	
Drowsiness		III	II	I	
Pain					Headache
Central nervous system					Dizziness: Eyes closed ≥ II, Eyes open III
	Levels of Severity Identified by Total Points Scored				
	Frank Sickness (S) ≥ 16 points	Severe Malaise (M III) 8-15 points	Moderate Malaise A (M IIA) 5-7 points	Moderate Malaise B (M IIB) 3-4 points	Slight Malaise (M I) 1-2 points

*AQS = Additional qualifying symptoms. †III = severe or marked, II = moderate, I = slight.

B

calm ——————— anxious

Figure 1 : Graybiel scale (A) and the visual analog scale for anxiety (B).

- Experimental design :
  3 randomized sessions (sham, dose, double-dose) of stimulation (NeuroConn®, Germany), the same day and the same hour for three consecutive weeks.
  The intensity was 1000 µA and the polarity was changed four or eight times according to the session.

Pré-tests : Graybiel scale & VAS anxiety → **Stimulation :** 3 sessions of GVS (sham/dose/double-dose), for three consecutive weeks → **Post-tests :** Graybiel scale & VAS anxiety

Results

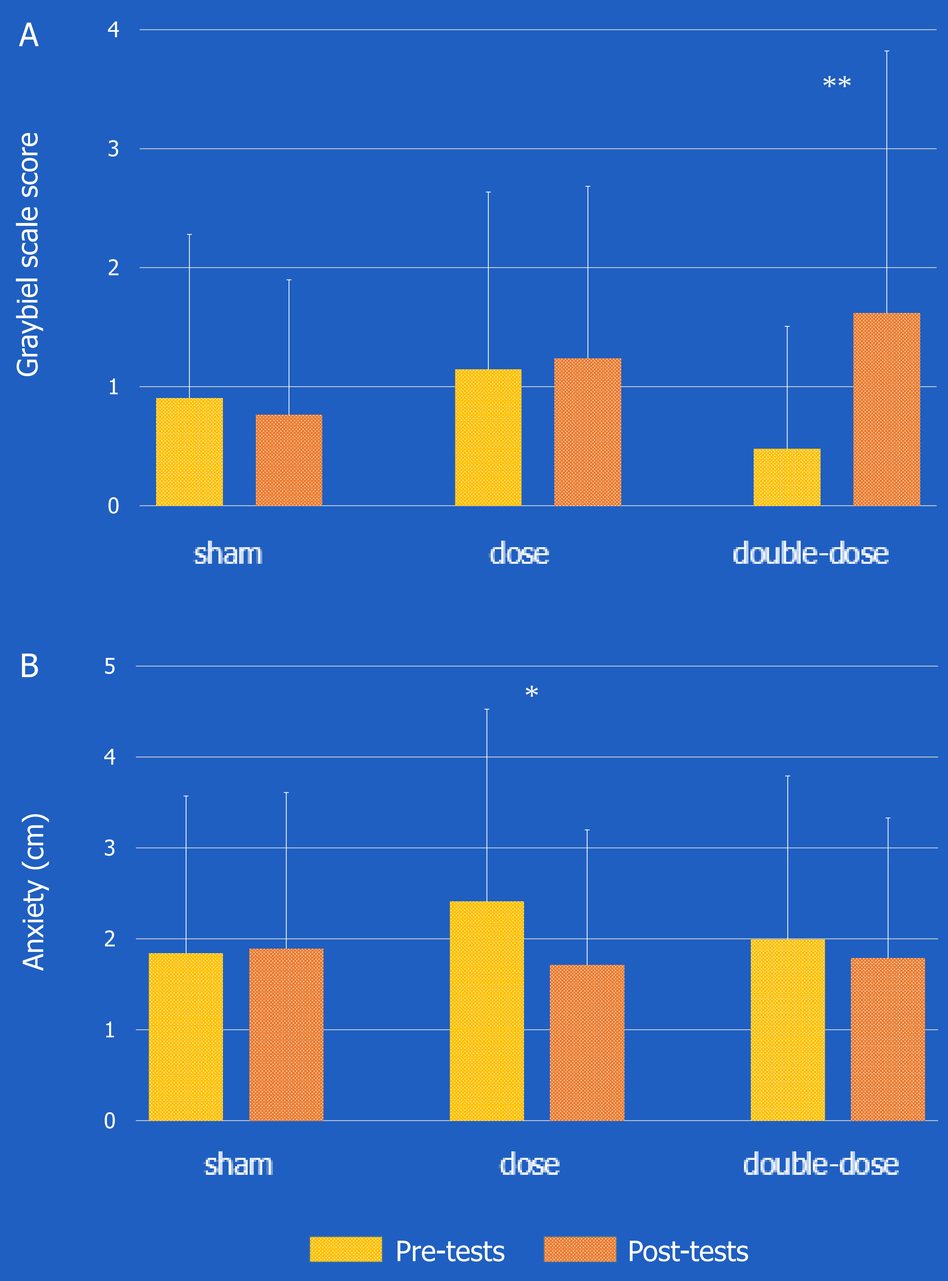


Figure 2 : Representations of Graybiel scale score (A) and anxiety score (B) before and after each session.
* : p < 0,05 ; ** : p < 0,01.