Continuous exposure to Galvanic Vestibular Stimulation (GVS): physiological and motor performance

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Funded by NSBRI through NASA NCC 9-58

BACKGROUND & SIGNIFICANCE

In the past we have shown that Galvanic vestibular stimulation (GVS) is well tolerated at different peak current levels during intermittent exposure. The present study is aimed to assess tolerance and postural control during 20 minutes of continuous GVS.

DESIGN

• Within-subject design
• Two groups (3.5 mA and 5 mA peak current)
• 3.5 mA: N=12 (8m; 4 f, mean age 29)
• 5 mA: N=12 (8m; 4 f, mean age 30)
• Subjects performed a battery of balance tests on a computerized dynamic posturography (CDP) before, during, and 15 minutes after GVS exposure.
• CDP tests:
  Limit of Stability (LOS)
  Sensory Organization Test (SOT)
  Rhythmic Weight Shift (RWS)

SYMPTOMS SCREENING

MSSQ (Global measure of motion sickness susceptibility)
• Motion sickness susceptibility questionnaire (MSSQ) were filled out by subjects prior the experiment. Subjects with history of severe motion sickness were excluded from the study.
• Motion sickness symptoms were monitored throughout the experiment. Testing was terminated if subjects experienced significant nausea.
• At 3.5 subjects did not report symptoms. At 5 mA 4 subjects asked to interrupt the study due to motion sickness symptoms.

RESULTS

Limit of Stability (LOS)
Subjects standing still in the center of the platform, were asked to initiate a sway movement in eight directions (three forward, three backward, two on the side) to approach a specific target presented in a clockwise order.

Sensory Organization Test (SOT)
6 conditions repeated 3 times to measure subjects’ ability to use visual, vestibular, and somatosensory system to maintain balance.

Rhythmic Weight Shift (RWS)
2 tasks (front/back; and left/right) at 3 speeds (slow, moderate, and fast) to measure subjects’ ability to coordinate their movements with a given rhythm.

CONCLUSIONS

These results indicate that 3.5 mA and 5mA GVS exposure induce similar postural instability during LOS, SOT and RWS CDP tests. GVS increased the amount of movement of the center of pressure while leaning towards a target, decreasing final accuracy, SOT scores decreased for conditions that challenge the vestibular system, and directional control while shifting weight forwards and backwards decreased. Exposure to the higher (5mA) current induced motion sickness symptoms in 25% of the subjects during motor tasks that directly involved vestibular sensorimotor integration.

BIBLIOGRAPHY


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