

# ***PRELIMINARY RESULTS USING GALVANIC VESTIBULAR REDUCTION AS A NON-PHARMACEUTICAL TOOL FOR MOTION SICKNESS MITIGATION***

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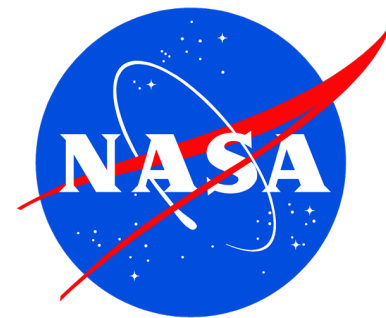
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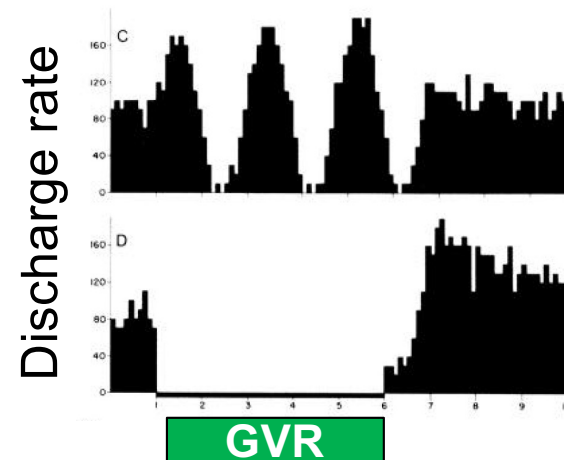
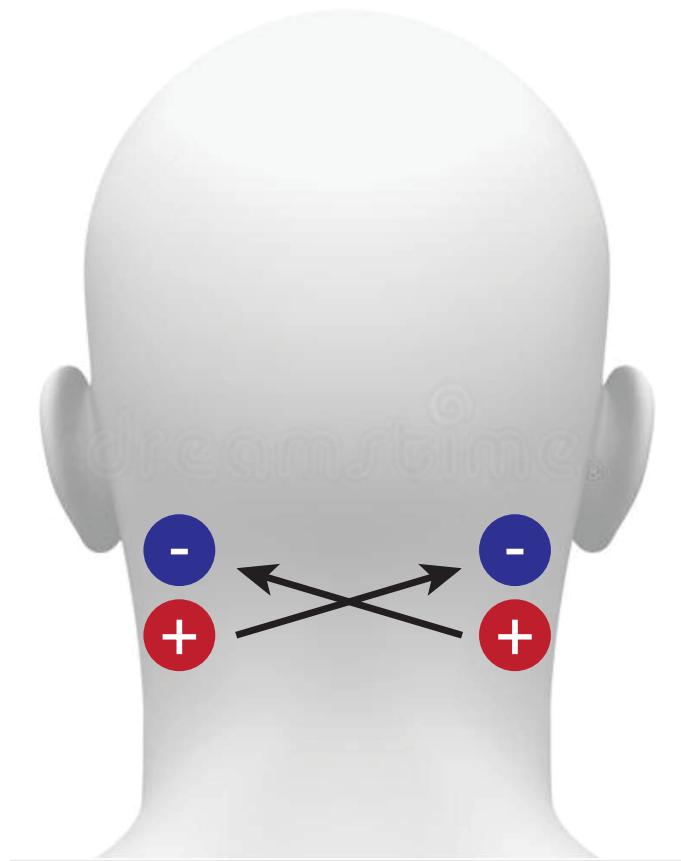
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**Purpose:** Validate a non-pharmaceutical tool using galvanic vestibular reduction (GVR) to mitigate G-transitional induced motion sickness following symptom onset while *customizing the treatment level* to maximize crew performance



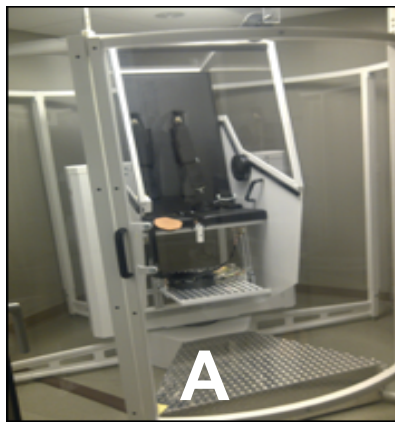
Bilateral galvanic anodal (inhibitory) current results in reversible ablation of irregular vestibular afferents (from Minor and Goldberg, 1991)

# Methods

Motion sickness and perception are obtained during Coriolis cross-coupling stimuli on a rotating chair across three sessions: (1) GVR throughout stimulus testing (prevention), (2) GVR following symptom onset (rescue), and (3) control w/out GVR.

- Subjects perform up to 10 sets of pitch head movements (7 forward and backward) until Pensacola Diagnostic Index endpoint is reached ( $PDI \geq 8$  pts).

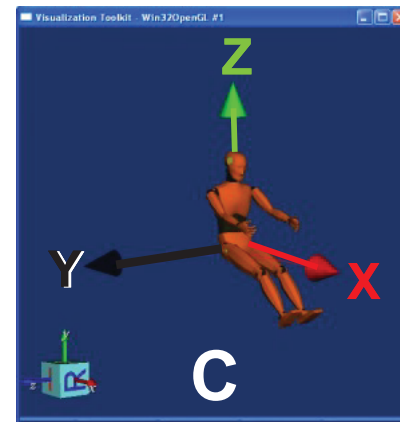
Performance on a sensorimotor and cognitive test battery is measured during a fourth session to map changes in GVR level with functional performance.



*Rotator*



*Joystick*



*AVATAR*

# Preliminary Results

- 9/16 subjects completed all 70 head movements (HMs) during the control session w/out GVR. These subject did not appear to show significant differences in motion sickness scores across sessions
- The remaining 7 subjects completed on average 31 HMs or 4.4 sets during the control session w/out GVR. The number of average HMs increased to 34 with GVR following symptom onset (rescue), and to 37 with GVR on the entire session (prevention). Max MS severity also decreased during the prevention session (PDI =  $13.3 \pm 2.0$  control versus  $10.1 \pm 1.0$  GVR, mean  $\pm$  sem)
- Based on the joystick, GVR reduced both the magnitude of perceived roll and pitch sensation during head movements
- It is important to note that comparable levels of GVR (up to 2.5mA) did not impair performance on a functional test battery
- While transfer to operational environment will need optimization, one potential advantage of this approach may be the ability to individually titrate GVR amplitude during recovery to maintain operational performance.