Electro-tactile stimulation of the neck induces body anteropulsion during stance

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Background
Neck Proprioception and the Control of Posture

- Behavioural goals
  1. Postural orientation
  2. Postural equilibrium

Background
Neck Proprioception and the Control of Posture

- **Spindle** stimulation of the neck muscles has a powerful body-orienting effect during quiet stance.

Aim

- Investigate how skin mechanoreceptors from the neck region contribute to the control of posture and body schema formation.

Materials
Electro-tactile Stimulation

- 1 ms biphasic sinusoid @ 100Hz
- Stimulation intensity @140 % of the perception threshold = 5.1 ± 2.3 mA (Mean ± SD)
Methods

- 10 young healthy participants (8M, 29.5 ± 5.5 years, mean ± SD)
- Eyes Closed stance
- 4 repetitions
- Centre of Foot Pressure (Force Platform)
Experimental protocol and data analysis

- Mean Position & Standard Deviation of the Centre of Foot Pressure (CoP) along Antero-Posterior and Medio-Lateral Axis

Graphical representation of the experimental protocol

- 20 s - data analysis
- 30 s

Phase
- Pre (stim off)
- Stim (stim on)
- Post (stim off)
Results

- The CoP position moved forward (along the A-P axis) with a delay in the anteropulsion effect of ~10 s from the start of the stimulation.

![Diagram showing CoP movement and timeline with labeled axes and markers for left, right, anterior, and posterior movements, along with stim start and stop times.](image)
Results

- The stimulation induced a net forward CoP movement of approximately 1.2 cm.
Conclusions

- Integration, during static condition, of tactile afferences from the posterior aspect of the neck is fundamental for body orientation.

- Specifically, the stimulation of tactile receptors from the posterior aspect of the neck induces body anteropulsion during stance.
Implications

- Forward leaning of the body takes place in the transition phase of gait initiation.
- The tested stimulation protocol can be used to train elderly and neurologically impaired subjects to improve their control over transition phases and ability to lean forward without falling.

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