Study on Human Postural Stability during Upright Standing Using Novel Two-Axis Robotic Platform

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Research Question

- How do *2-dimensional (2D) compliant environments* affect standing balance of young healthy subjects?
- Does *Virtual Time-to-Contact (VTC)*, a relatively new stability measure, outperform traditional ones in detecting postural instability?

Instrumentation

- *Dual-axis robotic platform* to simulate different compliant environments

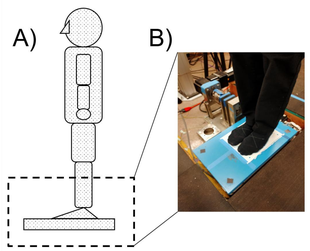

Fig. 1. A) Subject standing on the platform during standing tasks with B) both feet together

- *EMG sensors* were applied to soleus and medial gastrocnemius to check calf muscle fatigue since it is related to the deterioration of postural stability.

Methodology

- Sixteen healthy subjects participated in this study.

Experiment Protocol

Subject information	Standing tasks *(18 trials)*	Leaning tasks *(6 trials)*
• Name & age • Anthropometric measures	• Quiet standing	• Leaning in different directions • Practice trials given

- VTC, Center-of-Pressure (COP) path length, and sway area were computed for stability assessment.

Results

- Compliance and vision significantly affect stability.

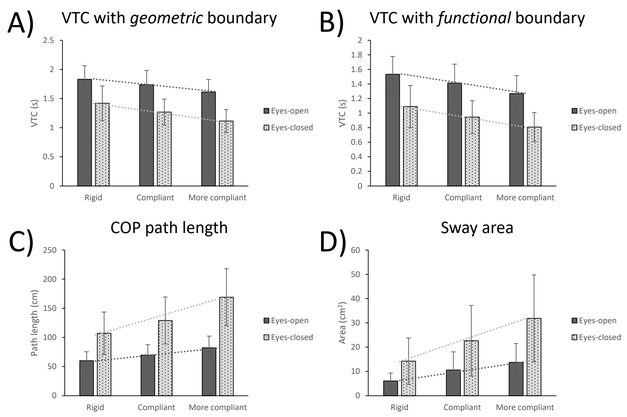

Fig. 2. Impacts of compliance and vision on A) VTC with geometric boundary, B) VTC with functional boundary, C) COP path length, and D) sway area

Implication

- This study suggested that *different stability measures can be used* to efficiently assess instability under dynamically unstable environments.

Future Work

- *Impacts of assistive devices* on postural standing balance under dynamically unstable environments will be investigated in the future.

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