

# Study examining Human Postural Stability with Perturbations Applied utilizing Dual-Axis Robotic Platform

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## Research Question

- How do 2D oscillatory perturbations affect human standing postural stability compared to only 1D perturbations?
- How does changing the frequency and amplitude of 2D oscillatory perturbations affect postural stability?

## Instrumentation

- A dual-axis robotic platform was utilized to apply oscillatory perturbations in the anterior-posterior (AP) and medio-lateral (ML) directions
- Perturbations were applied in the AP or ML directly only (1D) or in both directions simultaneously (2D)

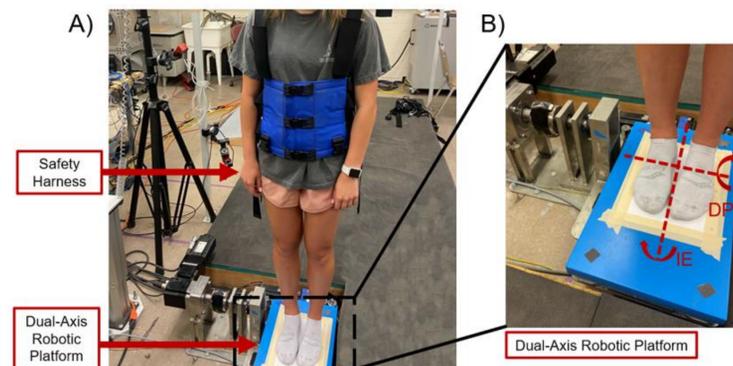


Fig. 1. A) The experiment setup in which a subject was standing on the robotic platform with B) both feet together

## Methods

- Data was collected from 14 subjects for this study
- Time-to-Boundary (TTB), Center-of-Pressure (COP) path length, and sway area were computed to measure postural stability

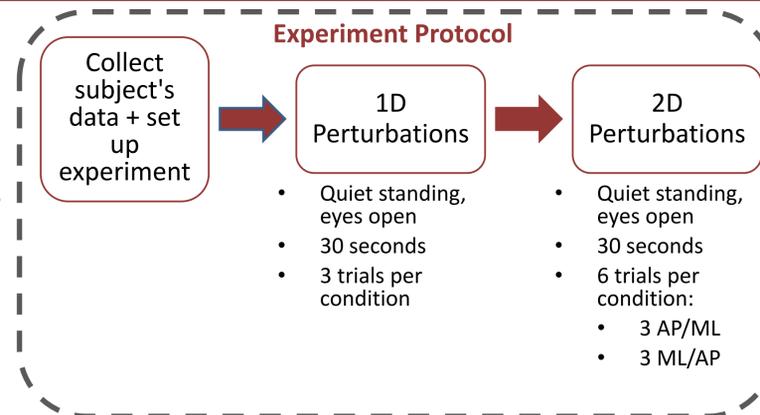


Fig. 2. Experimental protocol utilized in this study

## Conclusions

- Oscillatory perturbations applied in 2D caused more severe instability compared to only 1D perturbations
- Increasing the frequency and amplitude of the 2D perturbation worsened postural stability (increased COP path length and sway area, decreased TTB)

## Results

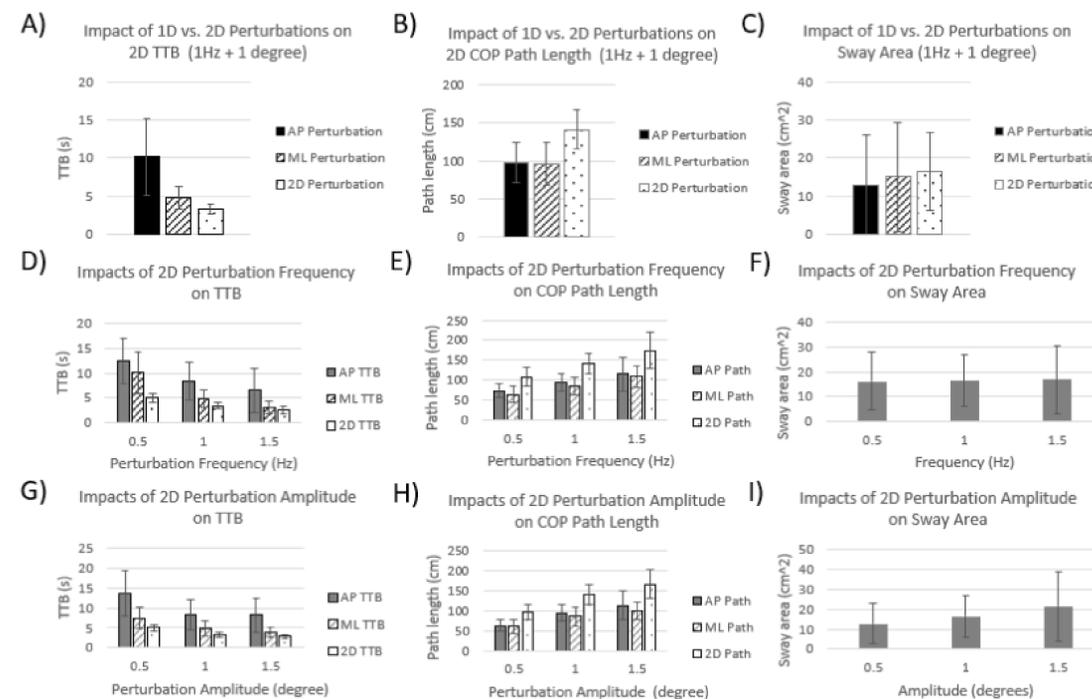


Fig. 3. Impacts of changing direction (A-C), changing frequency (D-F), and changing amplitude (G-I) on postural stability measures of TTB, COP path length, and sway area

## Future Work

- Using 2 separate platforms to apply oscillatory perturbations and quantify the differences between stability in each foot
- Introduce dual-tasking or other conditions during active perturbation to examine interactions between variables

## Acknowledgements

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