



Effect of Acceleration on Simulator Sickness in Virtual Reality

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Background

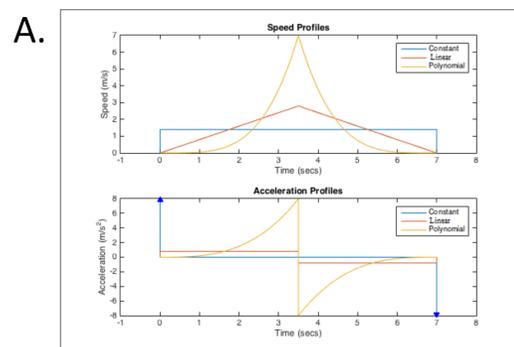
- Visually induced motion sickness is driven by visual stimulation in the absence of physical movement ¹
- Postural instability theory states that postural instability precedes, causes, and is a consequence of visually induced motion sickness ³
- Discomfort will increase as a function of frequency, size, and duration of acceleration ²

Motivation

Examine the consequences of instantaneous versus gradual acceleration on simulator sickness and postural control during linear displacement

Hypotheses

Constant acceleration will yield less simulator sickness, followed by linear, and polynomial acceleration, respectively

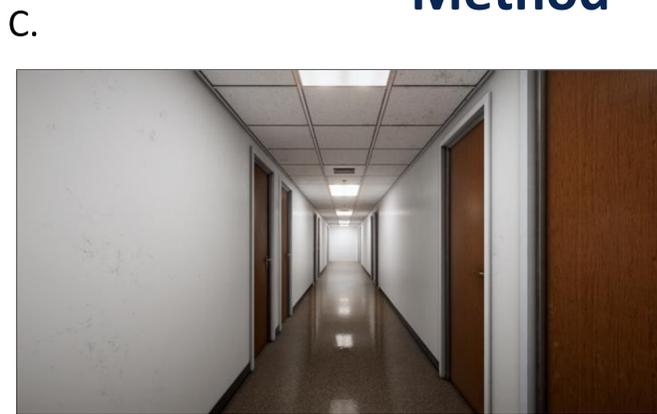


A. Graphical representation of each acceleration profile

Method



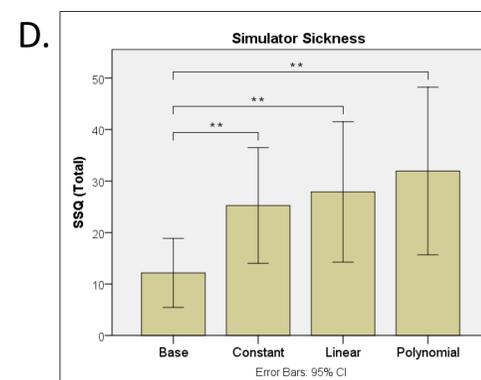
B. Image of participant standing on the Wii Board in virtual reality



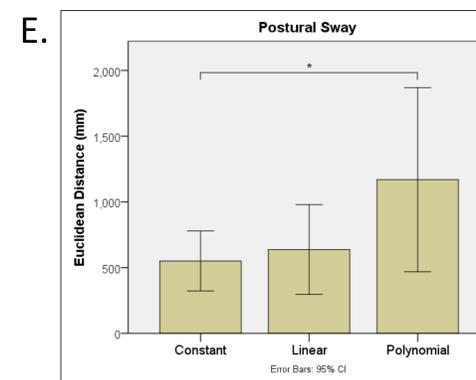
C. View of the virtual environment

- Simulator Sickness Questionnaire (SSQ) is a 16-item inventory with a 4-point Likert scale
Example:
 - Fatigue: None, Slight, Moderate, Severe
- Baseline SSQ is taken at the beginning
- For each acceleration profile:
 - Postural control
 - 2 minute rest
 - Acceleration effect
 - 2 minute rest and SSQ

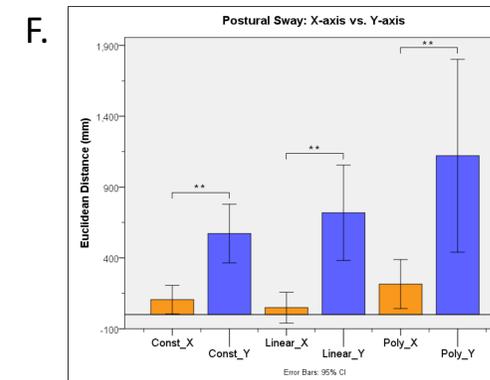
Results



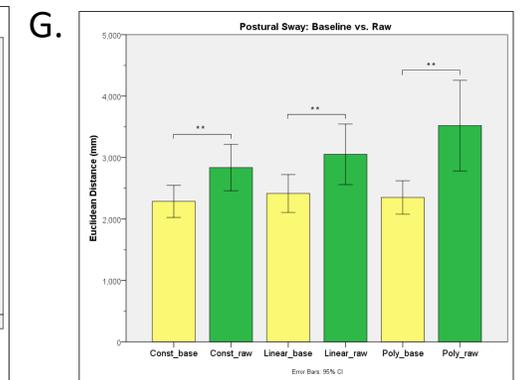
D. Sickness was induced for each acceleration profile, but there was no significant difference between them



E. Polynomial acceleration profile induced more postural sway than constant acceleration, but not linear



F. Postural sway successfully induced for all acceleration profiles



G. Greater postural sway along naso-occipital than the inter-aural axis

Discussion

- No significant effect between the three acceleration profiles in terms of simulator sickness, even though an effect was induced
- Polynomial acceleration induced more postural sway than constant acceleration
- Strong directional component in postural changes for linear self-motion cues

References

1. Keshavarz, B., Riecke, B. E., Hettinger, L. J., & Campos, J. L. (2015). Vection and visually induced motion sickness: how are they related? *Frontiers in Psychology*, 6, 472.
2. *Oculus Best Practices* [PDF]. (2017). Oculus VR.
3. Villard, S. J., Flanagan, M. B., Albanese, G. M., & Stoffregen, T. A. (2008). Postural instability and motion sickness in a virtual moving room. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 43, 452–461.