

ASTEROID: The Effects of Motion in Depth on Stereoacuity

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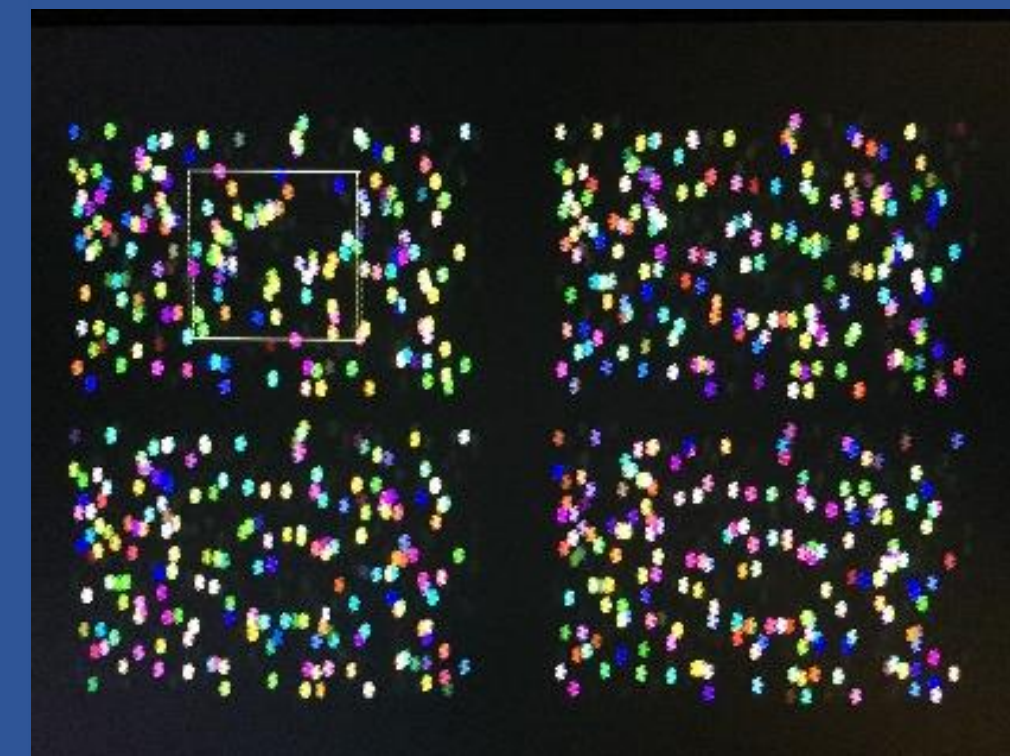


Introduction

- Current 3D vision (stereovision) tests can be uninteresting and unreliable to children. ASTEROID is a stereovision test that aims to be more engaging and accurate than these existing tests (1).
- A previous study suggests that 3D images are easier to see if they jump back and forth between two different depths (2).
- But other research suggests that changes in space and time, such as jumping, would limit stereovision (3).
- This study aimed to investigate how motion in depth affects 3D vision. The other aim was, if possible, to improve ASTEROID using findings from the study.

Method

- Subjects with normal stereovision were instructed to choose a 3D square that seemed to “stand out”. They pressed keys on a keyboard to make a choice out of the 4 squares presented.
- The square’s depth was constant (Static Depth) or jumped between two different depths (Flipping Depth). The jumping was either slow (jumps every second), moderate (every 2/3 of a second), or fast (every 1/3 of a second).
- The images were displayed on a 3D TV. Subjects needed to wear 3D glasses to see the 3D square on the TV.
- Subjects also played ASTEROID on a tablet. The instructions for ASTEROID were the same (choose the square that “stands out”). ASTEROID only uses constant depth and does not need 3D glasses to play.

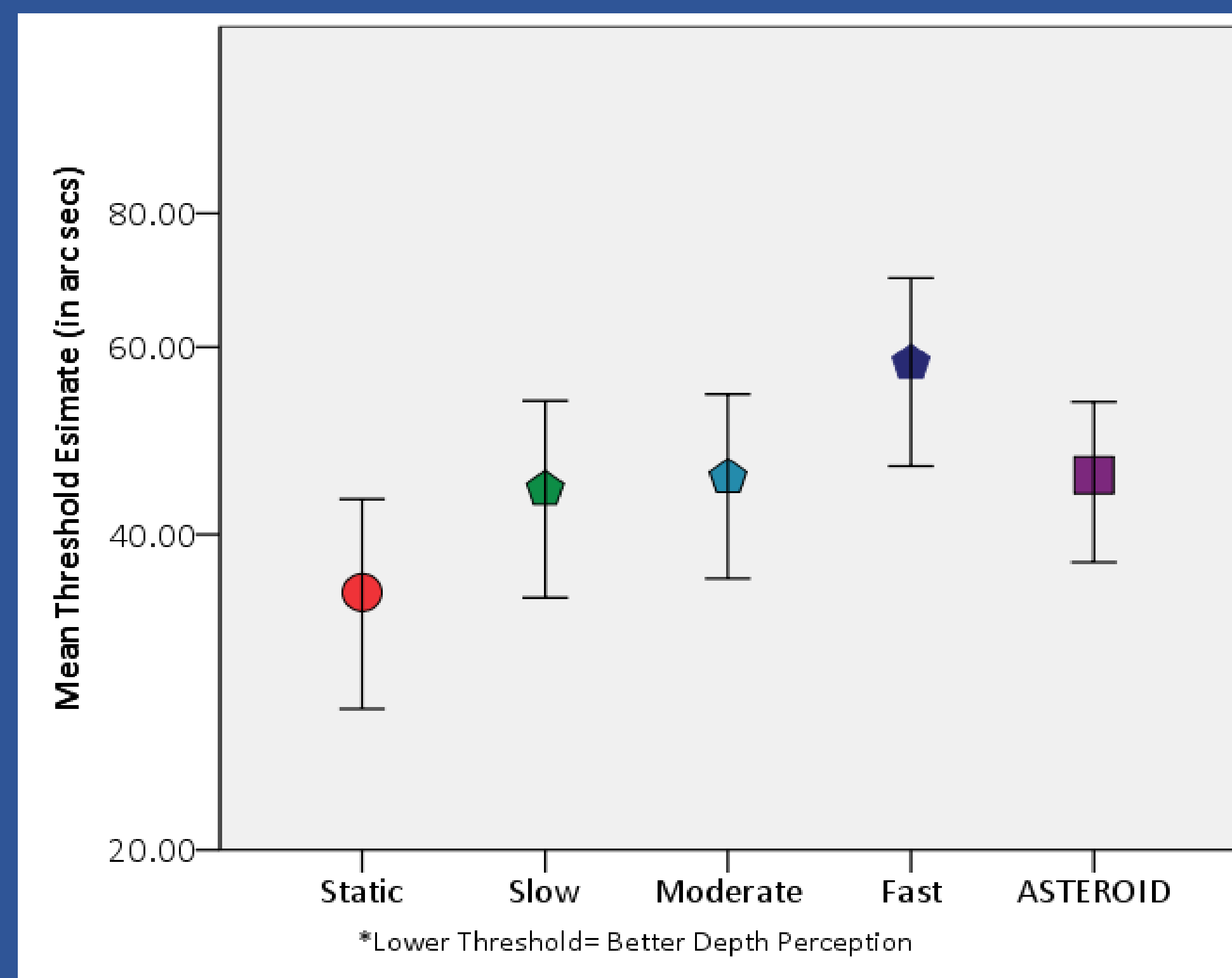


Discussion

- Increasing rate of jumping leads to worse depth perception.
- Static condition and ASTEROID had similar results. Thus, we expect that the same effects will happen with ASTEROID.
- How people see Static Depth can predict how well they see most types of Flipping Depth.
- Future studies should focus on people with abnormal stereovision. These people may show different effects to people with normal 3D vision.
- A jumping motion may make the task easier for people with abnormal stereovision. If so, it may be useful to have Flipping Depth for children who struggle with ASTEROID.

Results

- Depth perception significantly worse when jumping was fast than when it was slow ($p < 0.05$), moderate ($p < 0.05$) or when the square was Static ($p < 0.01$).
- No significant difference between perception under Static and ASTEROID conditions.
- Perception of Static Depth significantly predicted perception when jumping was slow ($p < 0.01$) and fast ($p < 0.05$), but not when it was moderate.



References

1. ASTEROID. (2017, August 23). *ASTEROID*. Retrieved from <http://research.ncl.ac.uk/asteroid/>.
2. Tidbury, L. P., Brooks, K. R., O'Connor, A. R., & Wuerger, S. M. (2016). A Systematic Comparison of Static and Dynamic Cues for Depth Perception. *Investigative ophthalmology & visual science*, 57(8), 3545-3553.
3. Kane, D., Guan, P., & Banks, M. S. (2014). The limits of human stereopsis in space and time. *Journal of Neuroscience*, 34(4), 1397-1408.

Acknowledgements

- This project was supported by a Newcastle University Research Scholarship