Changes of the Reverse Pulfrich Effect at various levels of illumination

Victor Rodriguez-Lopez1,2, Carlos Dorronsoro1, Johannes Burge2,3,4

1. Institute of Optics, Spanish National Research Council (IO-CSIC), Madrid, Spain
2. Department of Psychology, University of Pennsylvania, Philadelphia, PA
3. Neuroscience Graduate Group, University of Pennsylvania, Philadelphia, PA
4. Bioengineering Graduate Group, University of Pennsylvania, Philadelphia, PA

Introduction
The Pulfrich Effect is a perceptual illusion that causes people to misperceive the depth of moving objects. It is caused by the interocular blur difference. The effect sizes of the reverse Pulfrich effect raise concerns about public safety. But how effect sizes are impacted by light levels (nighttime vs. daytime) is unknown.

Goal
How does overall light level impact the perceptual illusions caused by the Classic and Reverse Pulfrich effects?

Methods

Stimulus
- Gray, planar, horizontal strips textured with randomly positioned white bars
- Adjacent strips drifting horizontally in opposite directions (4deg/sec)

Procedure
- Task: Null perceived depth by changing onscreen disparity
- Manual adjustment procedure
- Each condition repeated 5 times
- Average of final settings provides Point of Subjective Equality (PSE)

Experiment
Effect sizes measured for multiple light levels, pupil sizes, and left and right eye image differences.

Results

Classic Pulfrich effect
- Dimming the left eye (ΔO=0.6OD) delays left-eye processing by 1.2ms
- Dimming the right eye (ΔO=0.6 OD) delays right-eye processing by 1.2ms

Reverse Pulfrich effect
- Blurring the left eye (ΔF=3.0OD) advances left-eye processing by 1.17ms
- Blurring the right eye (ΔF=3.0OD) advances right-eye processing by 1.14ms

Take-Home Message
Classic Pulfrich effect increases with light-level decreases (replication)
Reverse Pulfrich effect increases with light-level decreases (novel result)

Similarity of interocular delays for 4mm and 6mm pupils suggests that high order aberrations equate retinal blur in the Reverse Pulfrich effect

References

Acknowledgements
VRL was supported by La Caixa Foundation LCF/BQ/DR19/11749202. OD by discretionary funds from the University of Pennsylvania. VL, CD and JB by Spanish government LIA20122

Session: Poster Session 1
June 1, 2022, 10:00 am – 12:00 pm CEST.