

Individual Differences in the Perception of a Motion-Based Bistable Stimulus Based on Multiple Axes of Rotation

Brooke Lim (brooke.lim@mail.mcgill.ca)¹, Anna Kosovicheva^{2,3}, Keisuke Fukuda^{2,3}

¹Department of Ophthalmology and Visual Sciences, McGill University; ²Department of Psychological and Brain Sciences, University of Toronto Mississauga; ³Department of Psychology, University of Toronto



Background

- Bistable perception occurs when an ambiguous stimulus triggers spontaneous alternations in perception
- Differences in switch rates correlate across stimulus types, indicating shared mechanisms¹
- For bistable stimuli based on rotational motion, how do individual differences in switch rates vary with changes in the rotational axis?

Do individual differences in bistable perception remain consistent across different axes of rotational motion, and what behavioural and neural mechanisms underlie this consistency?

Behavioural Switch Rates

Does **spatial context** within the stimulus influence perceptual stability?

Are **individual differences** stable across axes?

Does perceptual stability differ **between stimuli**?

Does perceptual stability differ **between axes**?

Is perceptual stability **consistent** across time within the axis rotation?

Methods

Task: Continuously report the direction of the sphere throughout the entire trial

Horizontal Rotation: Left or Right?

Vertical Rotation: Up or Down?

Perceptual landmark

N = 25

32-channel EEG recording

30 trials per rotation direction, randomly interleaved

Press Space to Start! / Stimulus (60s) / Press Space to Start the Next Trial!

Systematic Patterns

Do individuals have **systematic** switching tendencies?

P116 p=0.000107

p < 0.05: Systematic
p > 0.05: Nonsystematic

Systematicity (Ljung Box)

Physiological Decoding

Do **neural signals** differ across perceptual landmarks?

Are there **systematic EEG signals** that encode spatial context and perceived motion direction?

Are **individual** decoding differences stable across axes?

Stimulus Identity

4-way decoding of the location (°) of the green dot

Chance Level (25%)

Perceived Rotation Direction

2-way decoding of the perceptual direction, where the location (°) of the green dot is the same

Chance Level (50%)

Horizontal Rotation (Red)
Vertical Rotation (Blue)

Time After Epoch Onset (ms)

Stimulus Identity

Vertical Axis Rotation (Decoding Accuracy)

Horizontal Axis Rotation (Decoding Accuracy)

r = 0.87, p < 0.001

Perceived Rotation Direction

r = 0.52, p < 0.01

Bistable perception is stable across rotation axes, with consistent individual differences, while EEG reveals distinct neural representations of stimulus features and perceptual interpretation

Acknowledgements: We would like to thank both the APPLY and Fukuda Lab for all their invaluable advice throughout this project.
References: [1] Cao, T., Wang, L., Sun, Z., Engel, S. A., & He, S. *Frontiers in psychology* (2018)

