Influence of Form and Motion on Biological Motion Prediction

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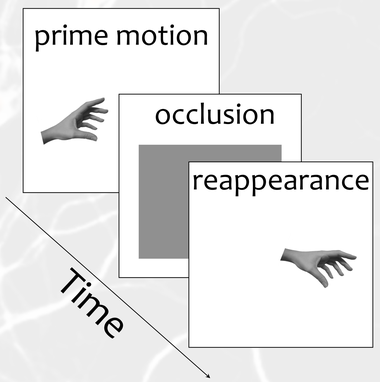
Introduction

- AIM: To explore the role of form and motion in biological motion prediction using an occlusion paradigm.
- Object form plays an important role in prediction of motion (Shiffrar & Freyd, 1990; Stadler et al., 2012)
- Amount of motion exposure prior to occlusion also influences prediction performance (Parkinson et al., 2012)
- We compared **biological vs. non-biological form** and **long vs. short motion exposure** in a prediction task.
- We hypothesized the motion of biological objects would be more accurately predicted, particularly at short motion exposures.

Methods



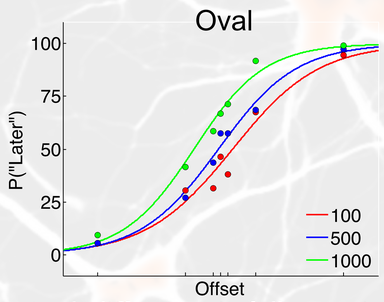
- Occlusion paradigm (Graf et al., 2007)
- Factors: rime motion duration, object type, and temporal offset
- Offset: # of frames away from correct continuation
- All experiments within-subjects

Experiment 1

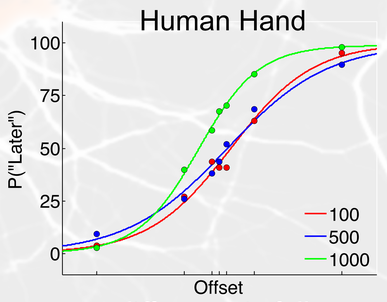
- Object type: human hand vs. oval

- Prime duration: 100ms, 500ms, 1000ms
- Offsets: -350, -100, -20, 0, 20, 100, 350
- Task: Respond early/late
- Measures: psychophysical curve threshold & slope
- N = 8; 28 trials per condition per subject
- Predictions: difference in full curves between prime durations & object types

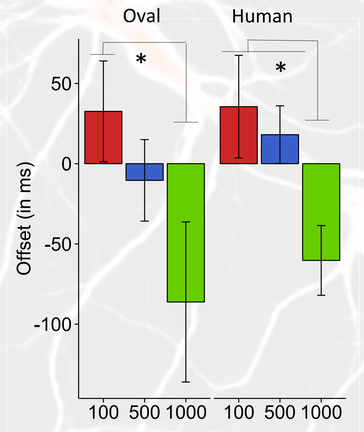
Experiment 1 Results

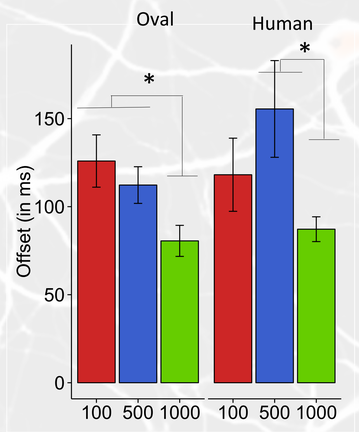


Oval: difference in full curve in 100 vs 1000, no other differences



Human: difference in full curve in 100 vs 1000 and 500 vs. 1000





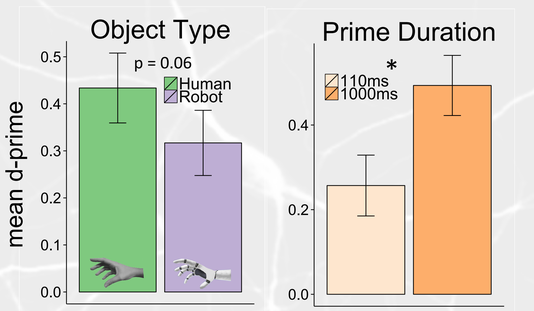
Experiment 2

- Investigate more complex objects
- Object type: human hand vs. robot hand

- Prime duration: 110ms, 1000ms
- Offsets: -350, -200, -75, 0, 75, 200, 350
- Task: Respond congruent or not
- Measures: d-prime, response bias (c)
- N = 12; 30 trials per condition per subject
- Predictions: main effects of object type, prime duration, and offset in d-prime; possible interaction between object type & prime duration

Experiment 2 Results

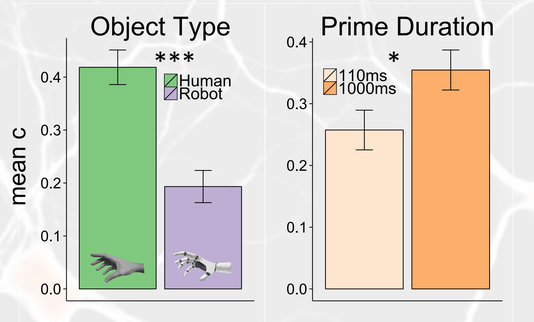
D-Prime Results



driven by an increase in hits; no change in false alarms

driven by a decrease in false alarms; no change in hits

Response Bias Results



Conclusions

- Both object form and motion exposure contribute to biological motion prediction, seemingly independently
- Increases in sensitivity for form & motion are driven by an increase in hits
- Increases in sensitivity for larger offset values are mainly driven by a decrease in false alarms

References

Graf, M., Reitzner, B., Corves, C., Casile, A., Giese, M., and Prinz, W. (2007). Predicting point-light actions in real time. NeuroImage 36:T22-T32.

Parkinson, J., Springer, A., and Prinz. W. (2012). Before, during, and after you disappear: aspects of timing and dynamic updating of the real-time action simulation of human motions. Psychological Research, 76:421-433.

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Stadler, W., Springer, A., Parkinson, J., and Prinz, W. (2012). Movement kinematics affect action prediction: comparing human to non-human point-light actions. Psychological Research, 76:395-406.