

# Individual differences in accuracy of direct blind walking to targets on the floor

Scott A. Kuhl\*, Sarah H. Creem-Regehr† & William B. Thompson\*

\*School of Computing, †Department of Psychology, University of Utah



## Background & Motivation

Direct blind walking is a commonly used method to measure the perception of distance to objects in both real and virtual world experiments. In the direct blind walking data presented in this work, subjects viewed a target on the floor in a real environment until they had a good mental image of the space they were in. Next, they closed their eyes, and walked with their eyes closed until they thought they were standing on top of the target. The distance subjects walked was recorded.

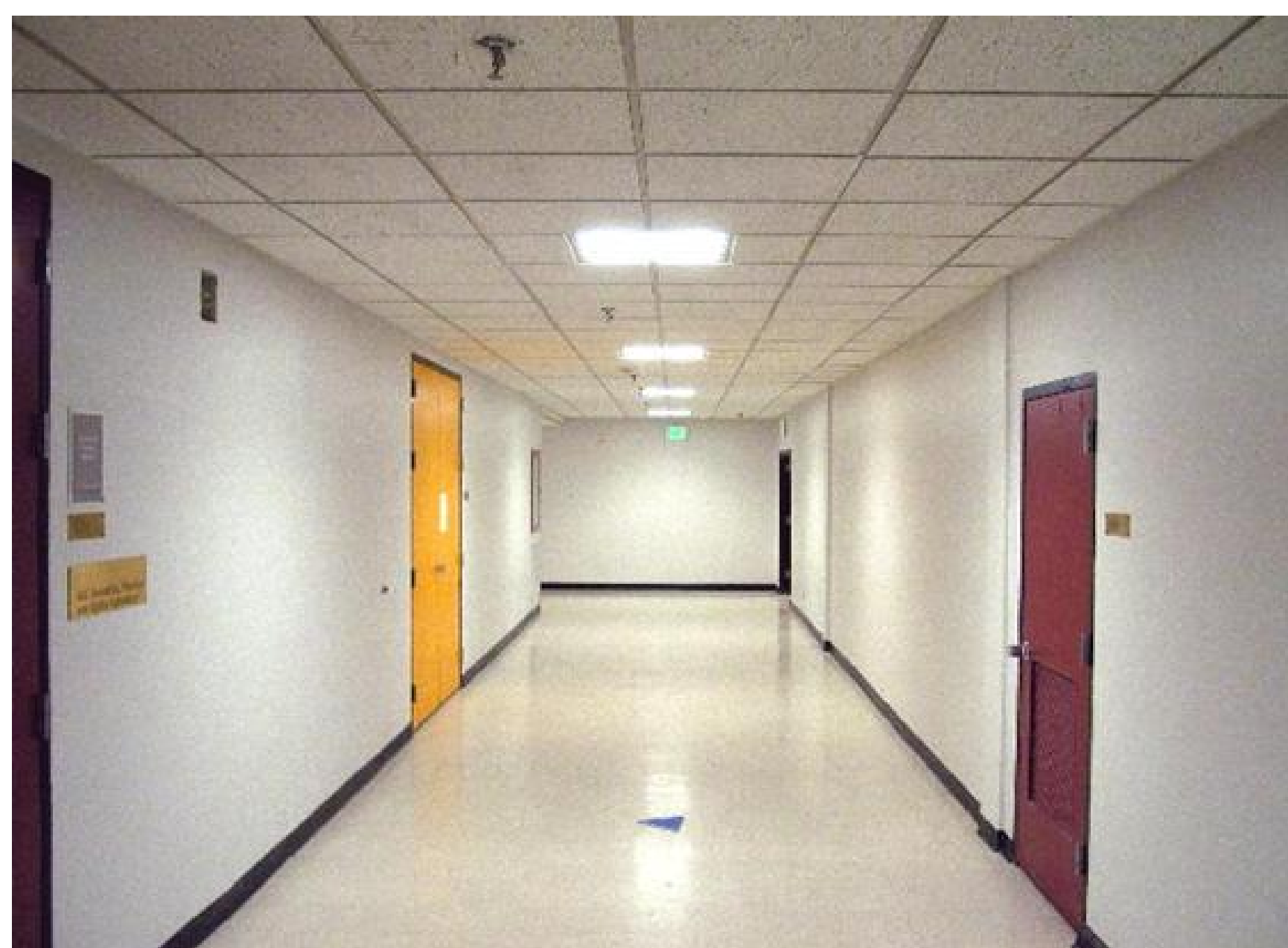
Previous work indicates that people are accurate at this task in full cue real world environments up to 20 meters (Loomis et al. 1992). This work uses data from previous experiments conducted within our laboratory to determine if there are individual differences between subjects, gender differences, environment differences, and changes in performance over trials.

## Data

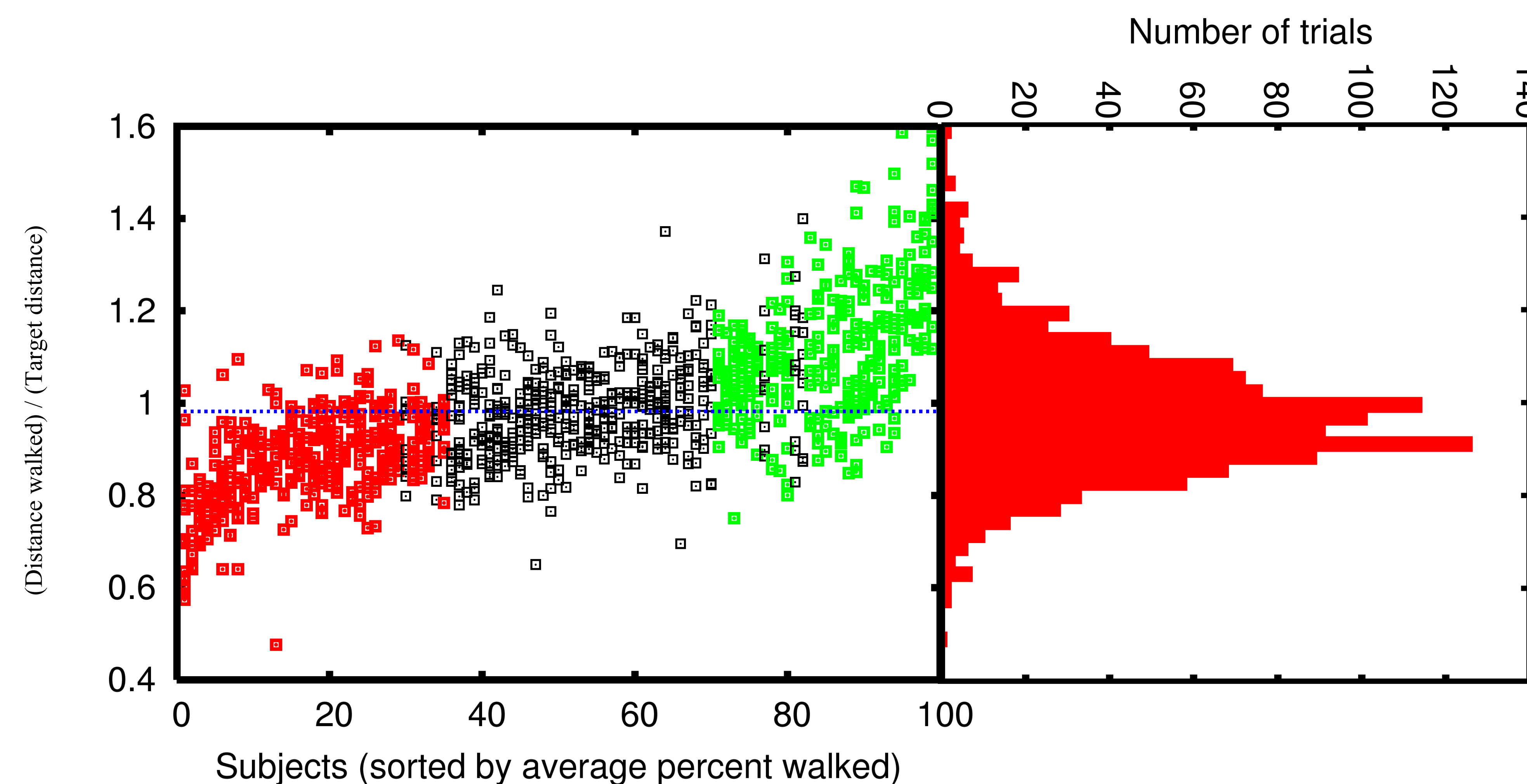
- 99 subjects; 1,195 trials
- Targets on floor at distances from 1.52 to 12 meters away from starting position.
- Subjects performed between 9 and 18 blind walking trials.
- Subjects were given no feedback about their accuracy.
- Prior to all experiments, subjects were assisted by the experimenter in walking around blindfolded for a few minutes so they would become familiar with walking without vision.
- Two different environments were used:

### Hallway environment

### Large room environment

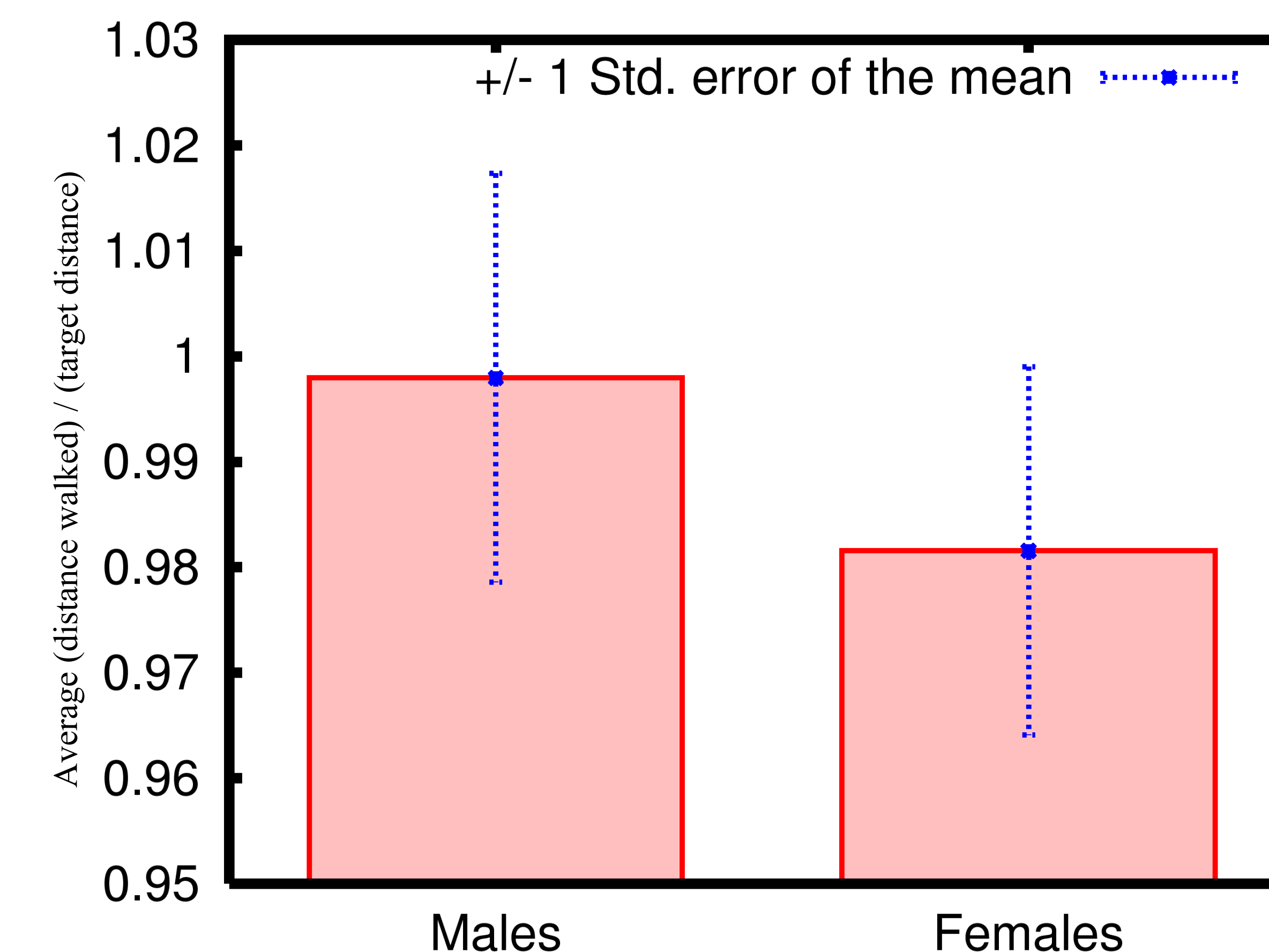


## Results & Discussion

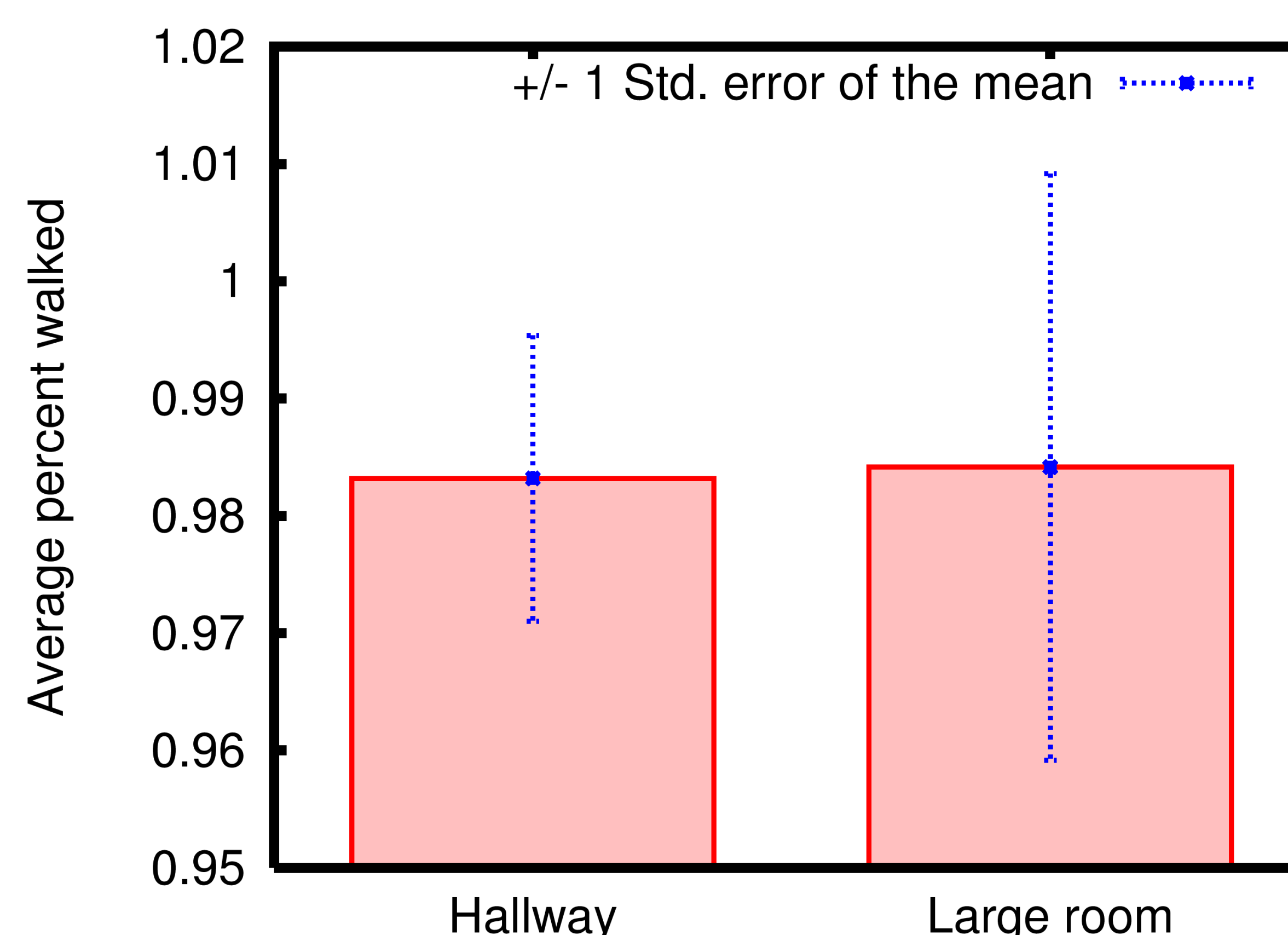


**Individual differences:** *Left:* The scatter plot shows the percent walked for each trial that each subject performed. The vertical axis is the distance walked divided by the actual distance to the target. Subjects are sorted by their average percent walked over all trials on the x-axis. The horizontal blue line indicates the average percent walked by all subjects (98%). Thirty-three subjects walked significantly less (red) and 26 subjects walked significantly more (green) than the global average (one sided t-test with  $p < .05$ ). (99 subjects, 1,195 trials)

*Right:* Histogram of the percent walked for all trials.



**No gender differences:** There was no significant difference in the average distance walked between genders ( $t(68)=0.63$ ;  $p=0.50$ ). (34 males, 36 females)



**No environment differences:** There was no significant difference in the average distance walked in the two different environments. (73 subjects in hallway, 26 subjects in large room)

**Performance changed marginally over trials:** The percent walked in the last four trials minus the percent walked in the first four trials was 2.8% on average. A t-test showed that this change in percent walked was significantly different than no change ( $t(69)=2.45$ ;  $p=0.02$ ). In addition, a linear regression was performed for each subject to measure the change in average percent walked over trials. The average slope was 0.3 (% walked / trial number). A t-test showed that the slopes of the linear regressions approached a significant difference from a slope of 0 ( $t(69)=1.86$ ,  $p=.07$ ). (70 subjects, 796 trials). Although the change over trials is small, this may be a result of the limited time or number of trials or the variability in trial number among experiments. Philbeck et al. (2004) has indicated that subjects walk farther after walking without vision continuously for three minutes.

## References

- Loomis, J. M.; Silva, J. A. D.; Fujita, N.; & Fukusima, S. S. 1992. Visual space perception and visually directed action. *Journal of Experimental Psychology: Human Perception and Performance*, 18, 906-921.
- Philbeck, J. W.; O'Leary S.; & Lew, A. L. B. 2004. Large errors, but no depth compression, in walked indications of exocentric extent. *Perception & Psychophysics*, 66(3), 377-391.

## Acknowledgements

This work was supported by NSF grant IIS-0121084. Special thanks to Pete Willemsen, Betty Mohler, and Valentina Dilda.