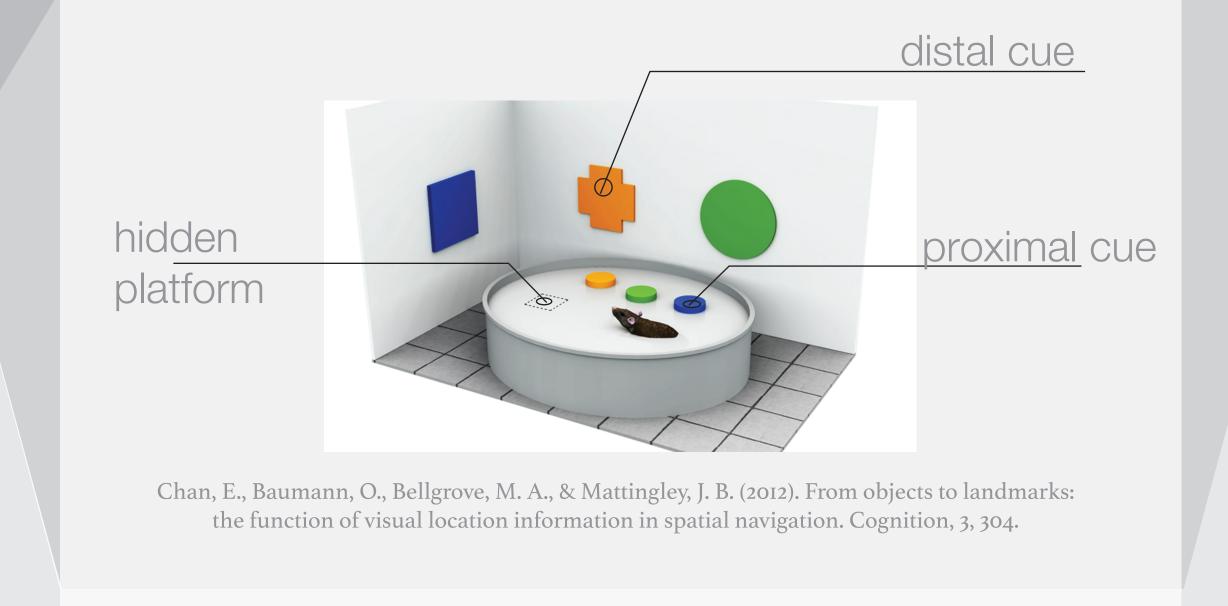
SEX DIFFERENCES IN VIRTUAL NAVIGATION INFLUENCED BY Scale, Visual Cue-Types, Spatial Memory and Lifetime Mobility

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BACKGROUND

The Morris water maze is a task adapted from the animal spatial cognition literature and has been studied in the context of sex differences in humans, particularly because of the standard design, which manipulates proximal (close) and distal (far) visual cues.



- There are mixed findings with respect to the interaction of cues and sex differences in virtual Morris water maze tasks with humans.
- These may be attributed to:
- Variations in the scale of the virtual mazes tested
 Previously unmeasured individual differences



AIM

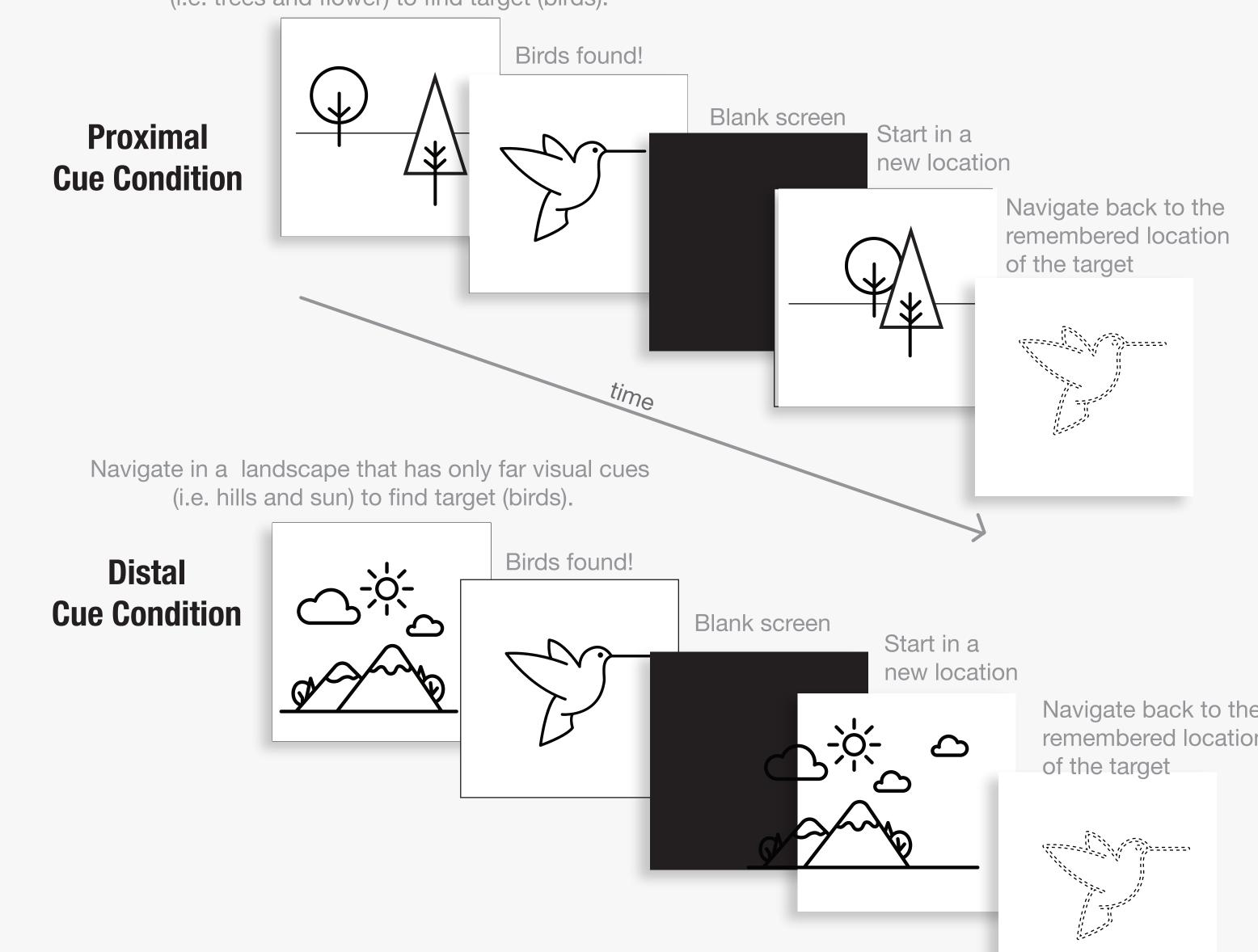
- 1. Test whether sex-specific differences in cue preference are similarly observed in large and smaller-scale environments.
- 2. Determine if performance on the maze task can be predicted by the individual differences measures of mental rotation and lifetime mobility.

HYPOTHESES

- Sex specific cue use may change with the scale of the environment.
- Individual differences measures of mental rotation and a measure of lifetime mobility will be significant predictors of maze performance.

MAZE TASK

Navigate in a landscape that has only close visual cue (i.e. trees and flower) to find target (birds).



INDIVIDUAL DIFFERENCES MEASURES

1) Paper and pencil Vandenberg and Kuse (MRT) Test

CUE CONDITIONS

2) Lifetime Mobility Questionnaire: Included 41 locations in Utah (local), and 13 regions in the United States (national). Participants indicated which locations they had traveled to.

METHODS

Participants

108 participants (54 M, 54 F)

Between-subjects

Scale

large

146.4 m in diameter

SCALES

-large and small landscapes
Within-subjects:

Cue condition
-distal and proximal





bush 🌓

flowers



DATA ANALYSIS

Performance accuracy was measured by calculating the Euclidean distance from the remembered location to the actual location of the birds (distance error).

Two analyses were conducted:

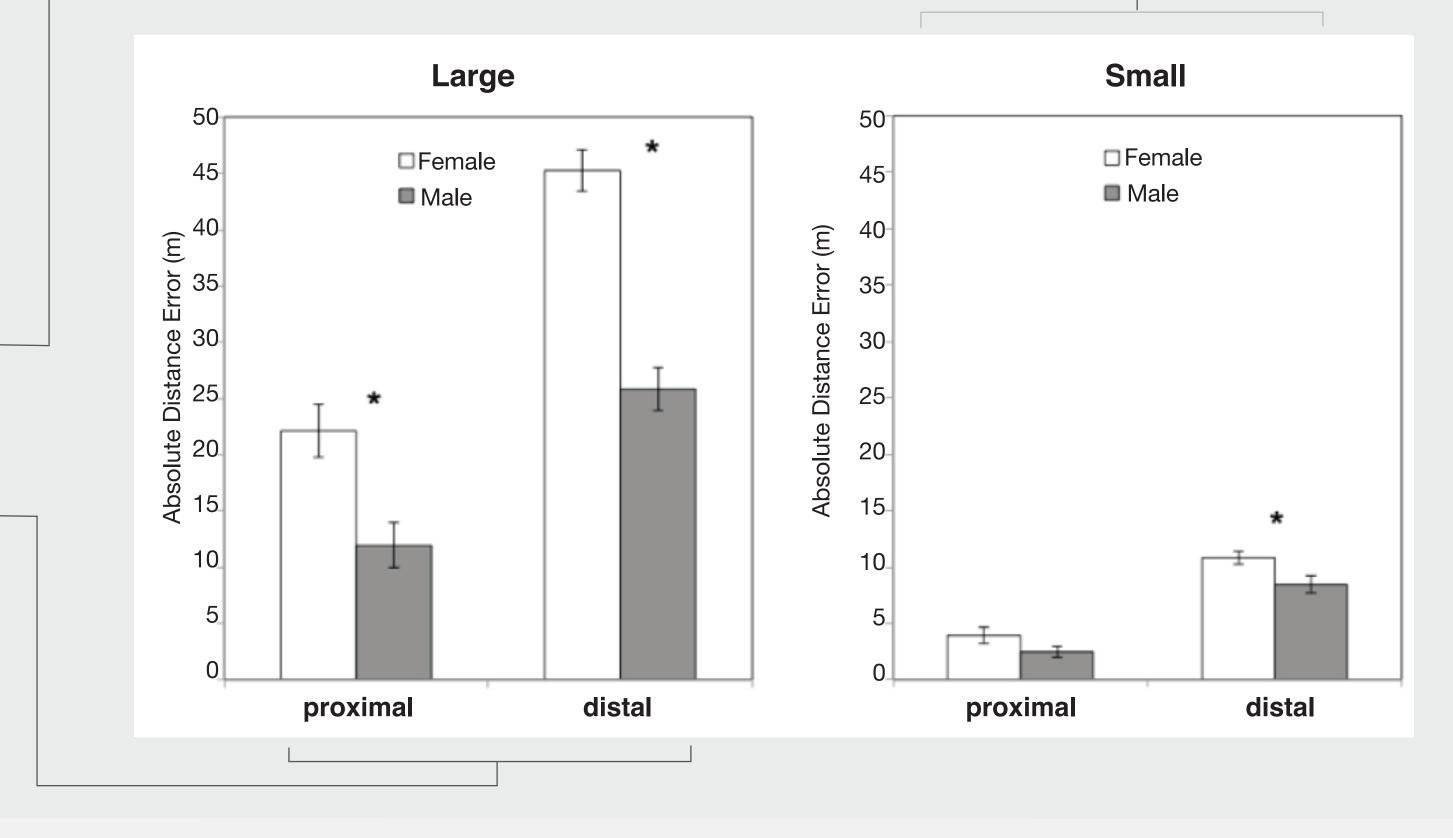
- 1) A mixed-design ANOVA, to determine if females and males performed differently when presented with distal and proximal cues in mazes of two different scales.
- 2) A linear mixed-effects analysis was used to assess the influence of the participants' lifetime mobility and MRT scores on maze performance.
- *To compare both large- and small-scale mazes to the individual differences measures, the large-scale distance error was divided by 4 (equating for the size differences between the scales) then the data was collapsed.

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ANALYSIS ONE

Virtual Maze Measures and Scale

- In the small-scale maze, we replicated the previously reported sex by cue interaction, showing that males only display an advantage when navigating with distal cues.
- However, this pattern did not extend to the large-scale maze. In the large-scale maze, males showed a strong advantage in both the proximal and distal cue conditions.



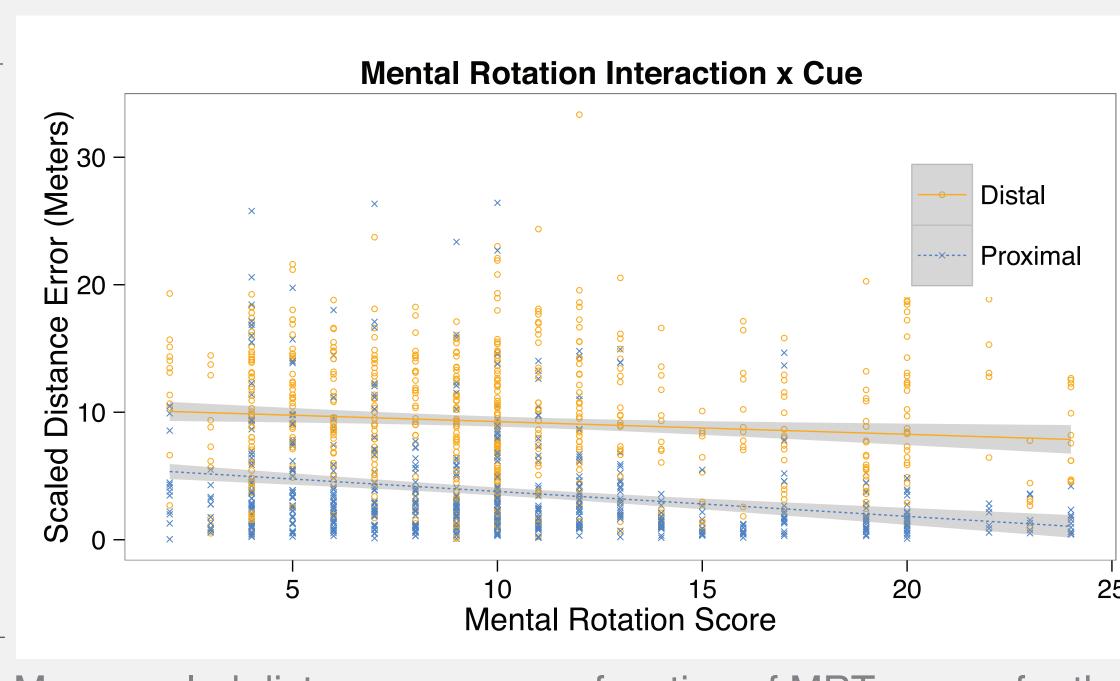
ANALYSIS TWO

Maze measures, Mobility, and MRT

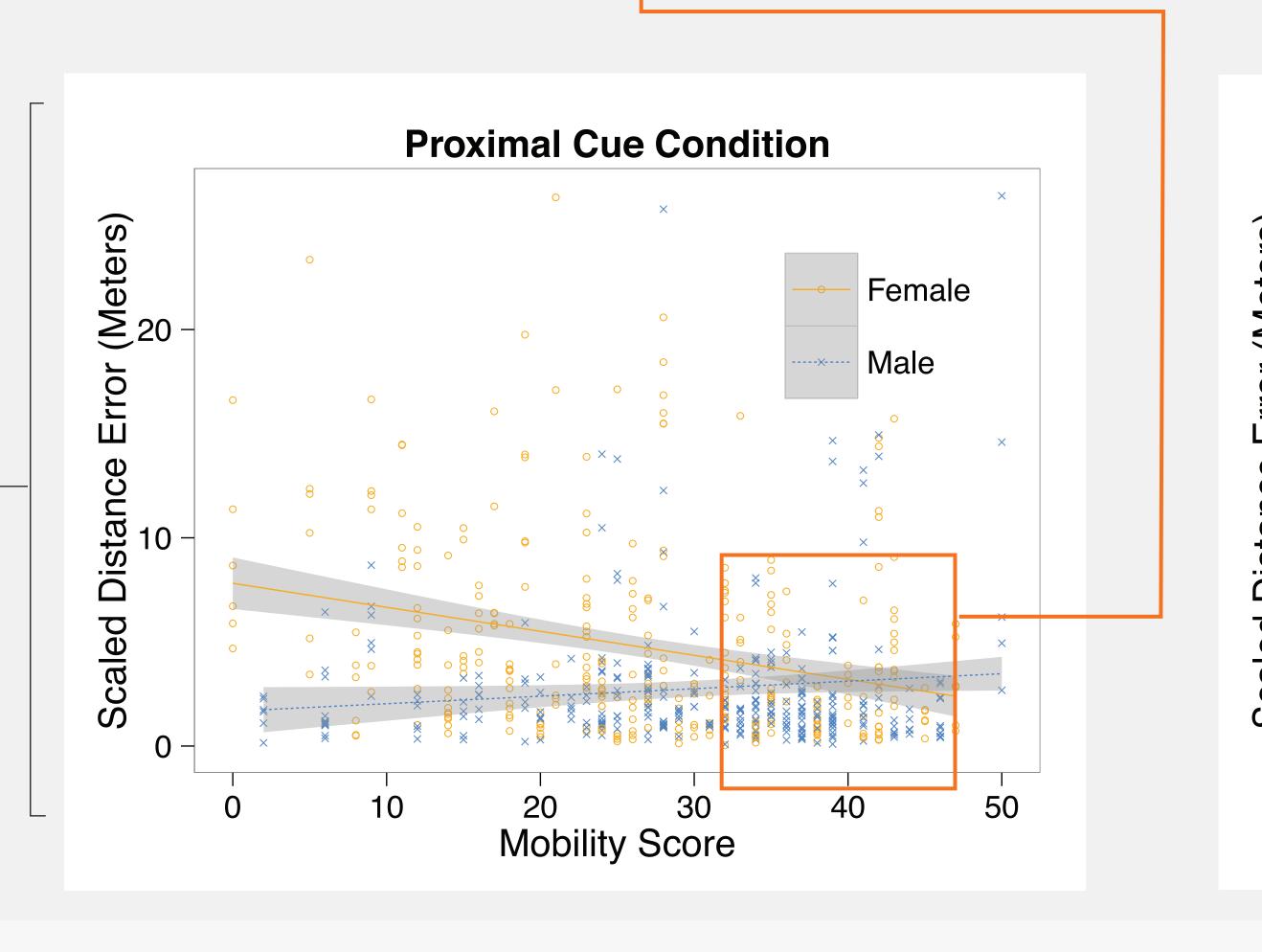
MRT x Cue: Maze performace improved with MRT score in the proximal cue condition at a greater rate than in the distal cue condition.

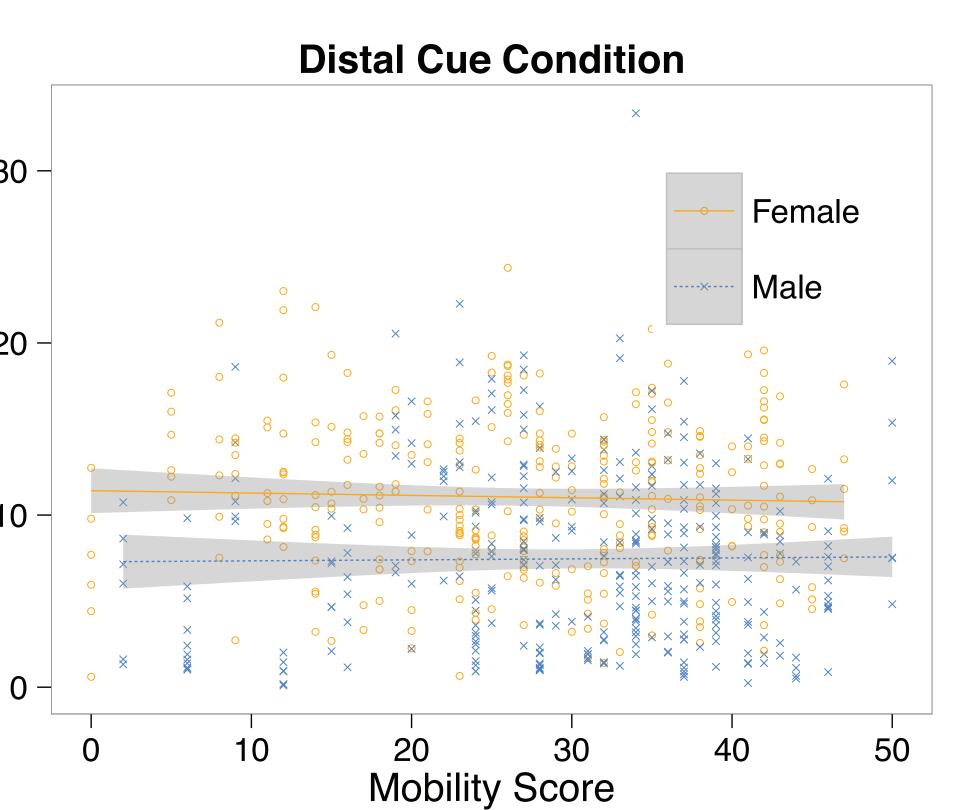
Cue x Mobility x Sex: In the proximal cue condition as mobility increased, —the rate of female performance increased significantly more than male performance.

Women who are highly mobile perform as well as highly mobile men when they were navigating with proximal cues.



Mean scaled distance error as a function of MRT scores for the distal and proximal cue conditions. The gray bands indicate 95% confidence intervals.





In the distal condition male and female maze performance did not change as a function mobility.

SUMMARY

- 1) Modifying the maze parameters (scale) affected performance on the virtual Morris maze.
- 2) Individual differences measures of MRT and mobility predicted maze performance more in the proximal cue condition and differently for females and males.
- 3) Women who have traveled to more places in their lifetimes have increased performance when navigating with only proximal cues, but not with distal cues.