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Introduction

- Augmented Reality (AR) refers to the addition of virtual assets into the real world¹.
- AR may enhance spatial cognition, including navigation, wayfinding, and spatial memory.
- Consider: Individuals' spatial preferences and abilities vary
 - Some prefer overhead map-like spatial perspectives, others, ground-level route perspectives².
- Interactive AR permitting manipulation of 3-D environmental models may promote environmental learning by matching learning experience to spatial preferences and abilities³.

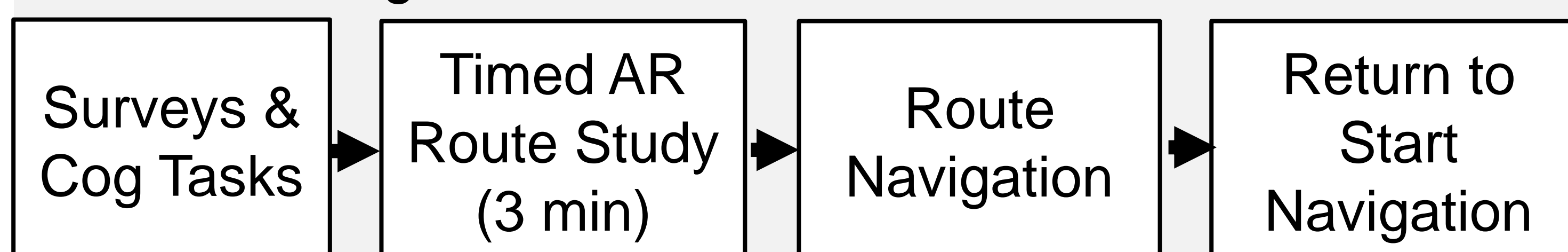
Here, we used the MS HoloLens and virtual navigation to examine how **interaction strategies** and **individual differences** in an AR-based urban route learning task predict route memory and spatial memory.

Methods

Participants

- $n = 65$: 43 TU undergraduates (23 male); 22 male Soldiers

Materials/Design/Procedure



1. Surveys & cognitive tasks assessing individual differences⁴
2. Manipulated a 3-D city model to learn a prescribed route
3. Virtual navigation, following learned route from memory
4. Unexpected navigation back to the origin

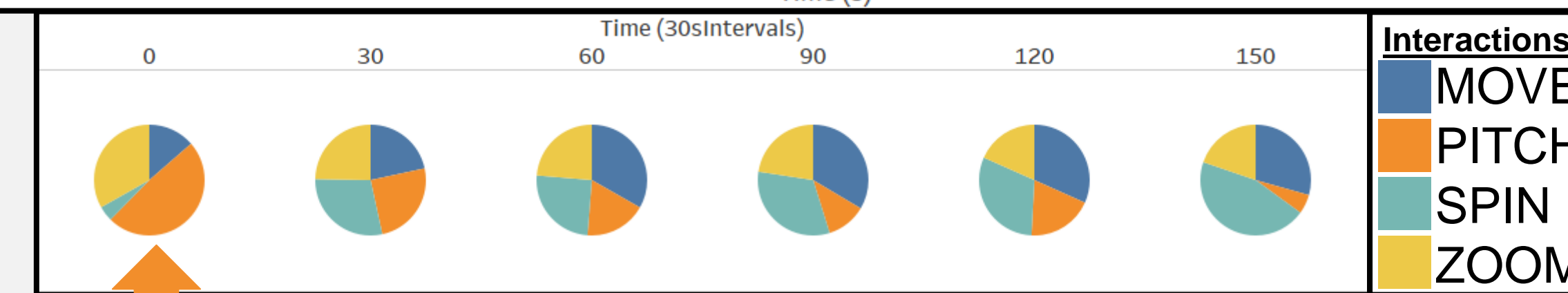
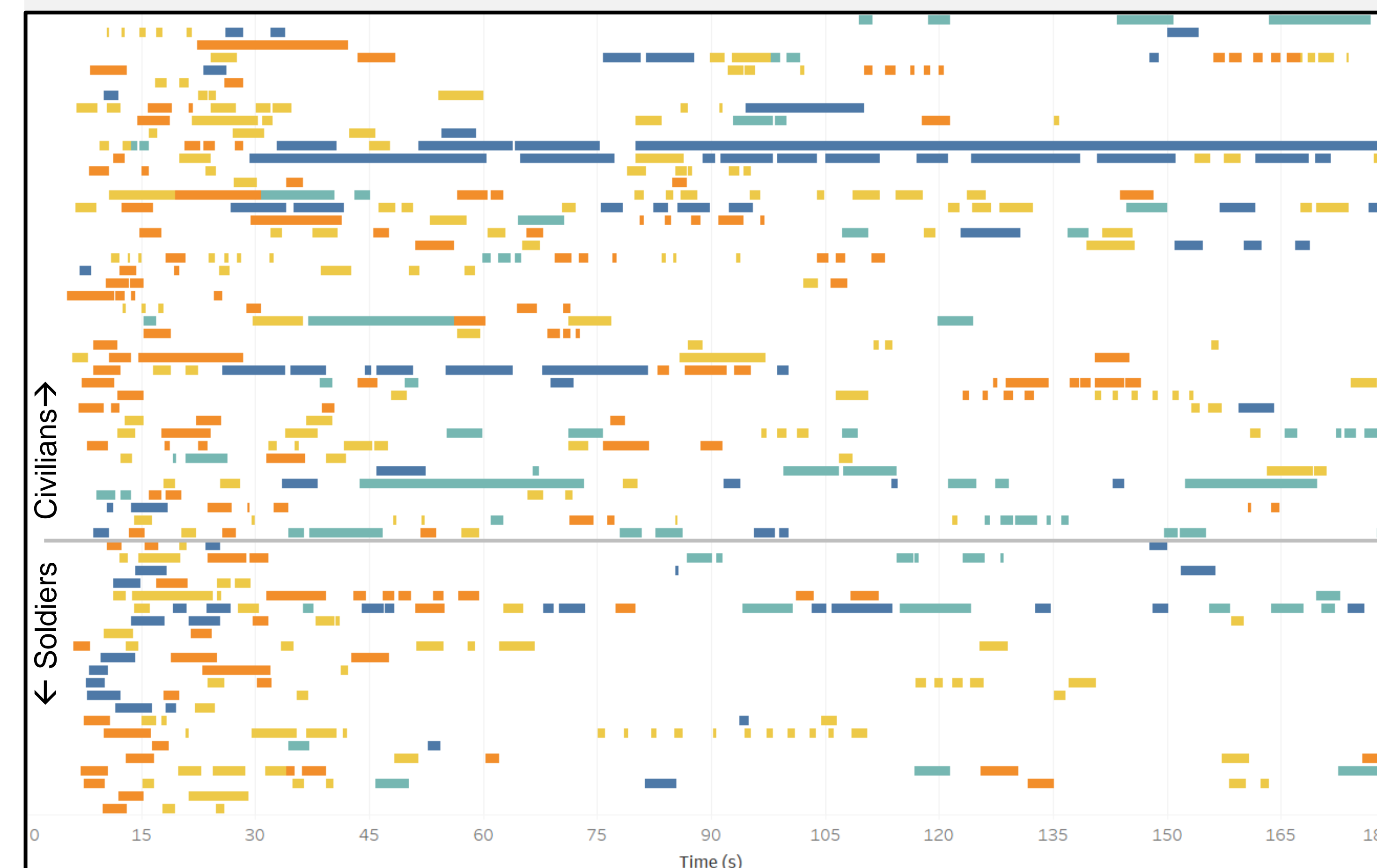


Interactions

- Move
- Pitch
- Spin
- Zoom
- Reset

Results

Interactions With Model Over Time

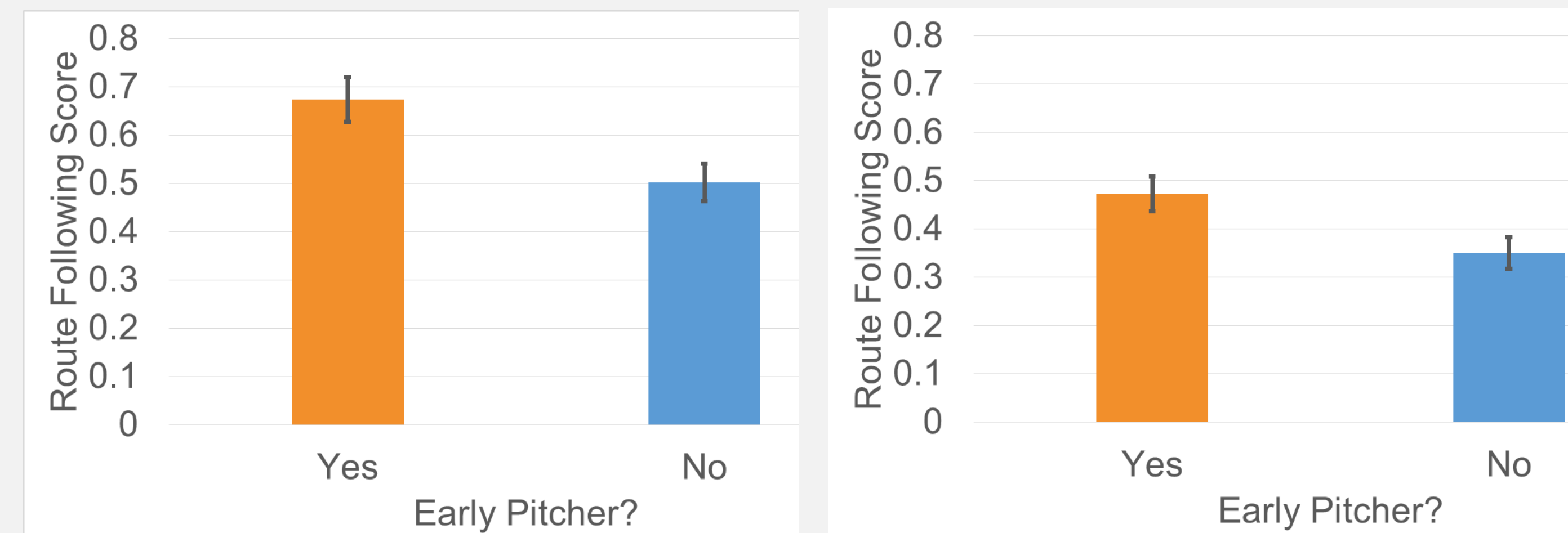


Pitching Model Early A Dominant Strategy?

Early Pitchers ($n = 26$) ...

Followed the route better on both

Route task and Return task

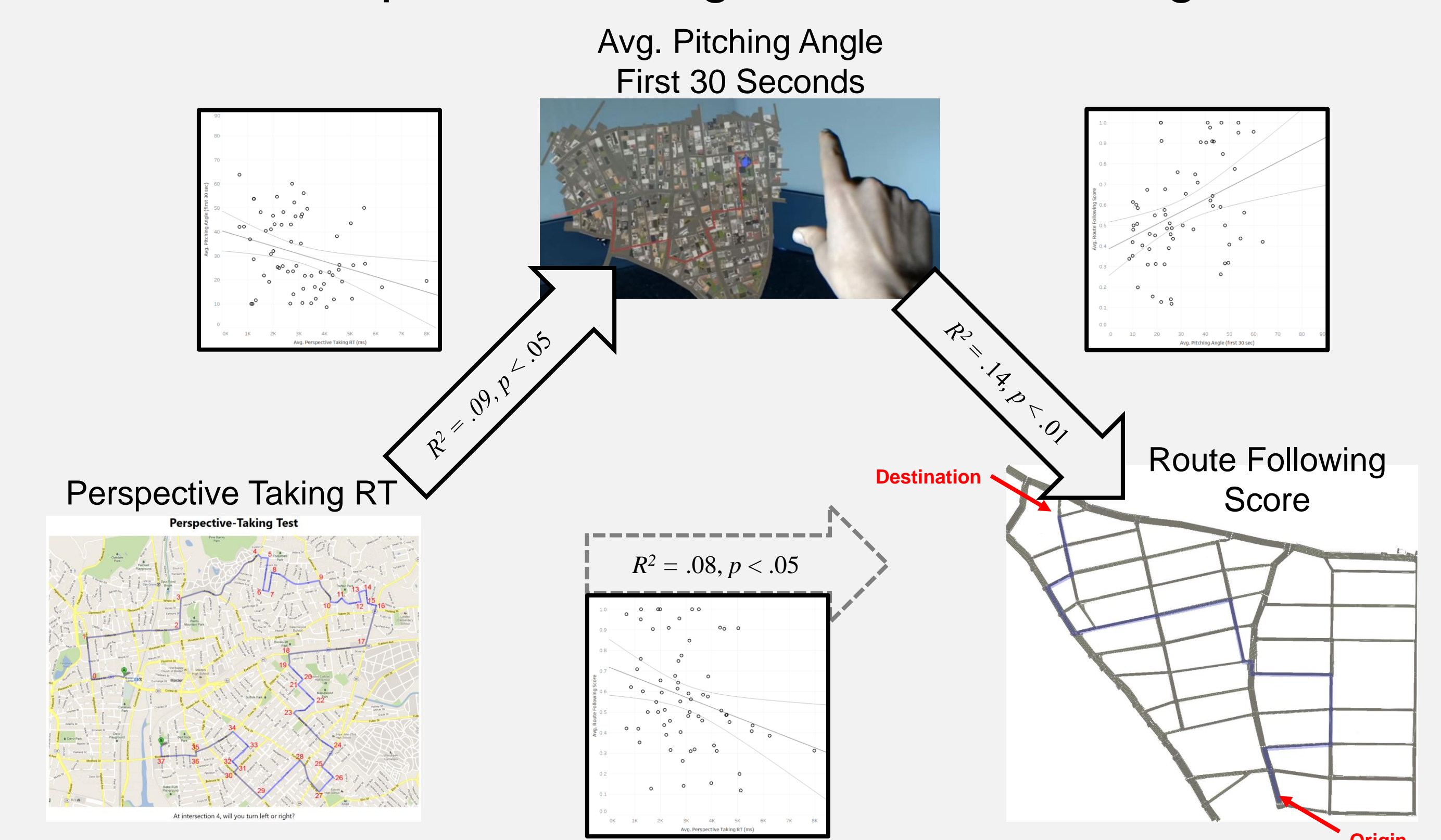


but did not differ in path efficiency on Return task



Results (cont)

Model Pitching Behavior Mediates Relationship b/w Perspective Taking & Route Following



Discussion

- Our results suggest variability in how individuals interacted with the virtual city when learning a prescribed route.
- Pitching early emerged as an effective strategy, yielding improved route following in both navigation tasks.
- Overall, these findings suggest that preference-flexible learning media, such as AR, may improve spatial learning outcomes compared to existing approaches by permitting self-selection of learning experiences tailored to individual differences.
- Our current research aims to identify the advantages, limitations, and cognitively-informed design principles of AR-based user interfaces for spatial cognition.

References

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