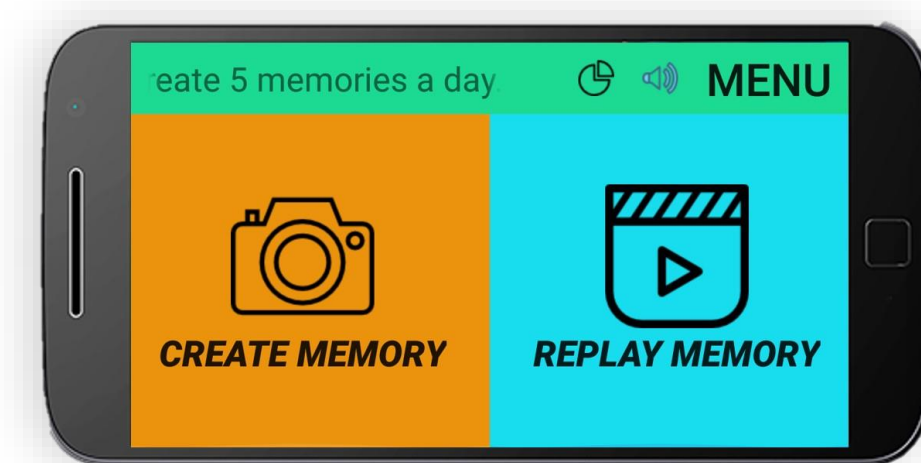


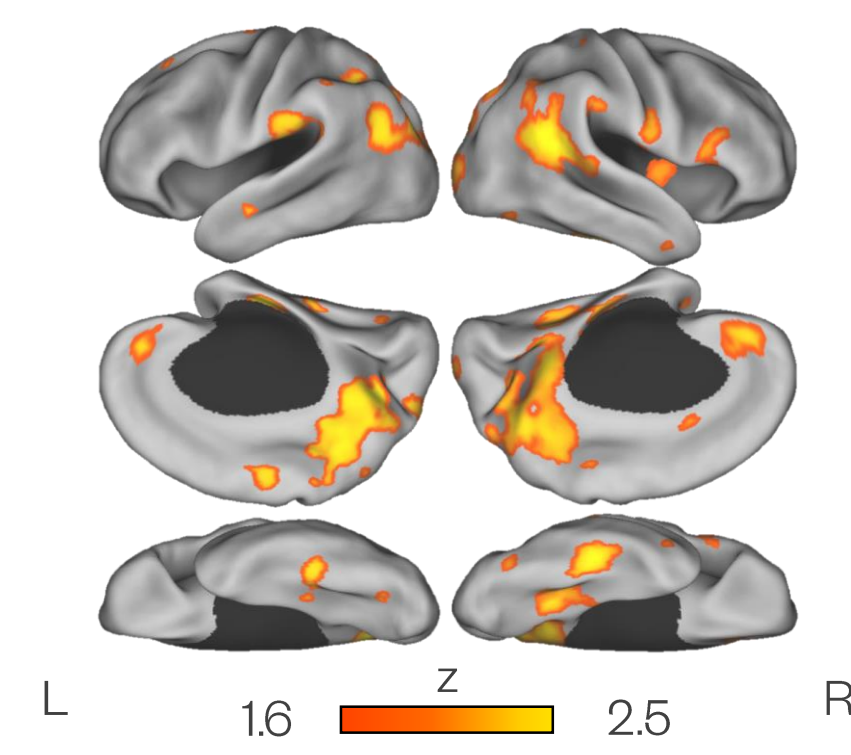
# Replay of novel spatial routes improves navigation in older adults

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We developed a novel digital memory augmentation smartphone app – replay of rich video memory cues with our app **improved the episodic richness of autobiographical memories**<sup>1</sup>



Replay with our app changed the way these events were represented in the default mode network and promoted **more distinct patterns of activity in the hippocampus**<sup>2</sup>



Spatial navigation is also dependent on the hippocampus – **spatial disorientation is associated with hippocampal volume loss** seen in both healthy aging and Alzheimer's disease progression<sup>3,4</sup>

## How does replay of rich video memory cues affect spatial memory for novel routes in older adults?

We had **31 older adults** (21 females,  $M_{Age} = 71.68$  years,  $M_{MoCA} = 25.32$ ) complete two different sessions of a **naturalistic route learning task**

- 4 participants were unable to complete the second session

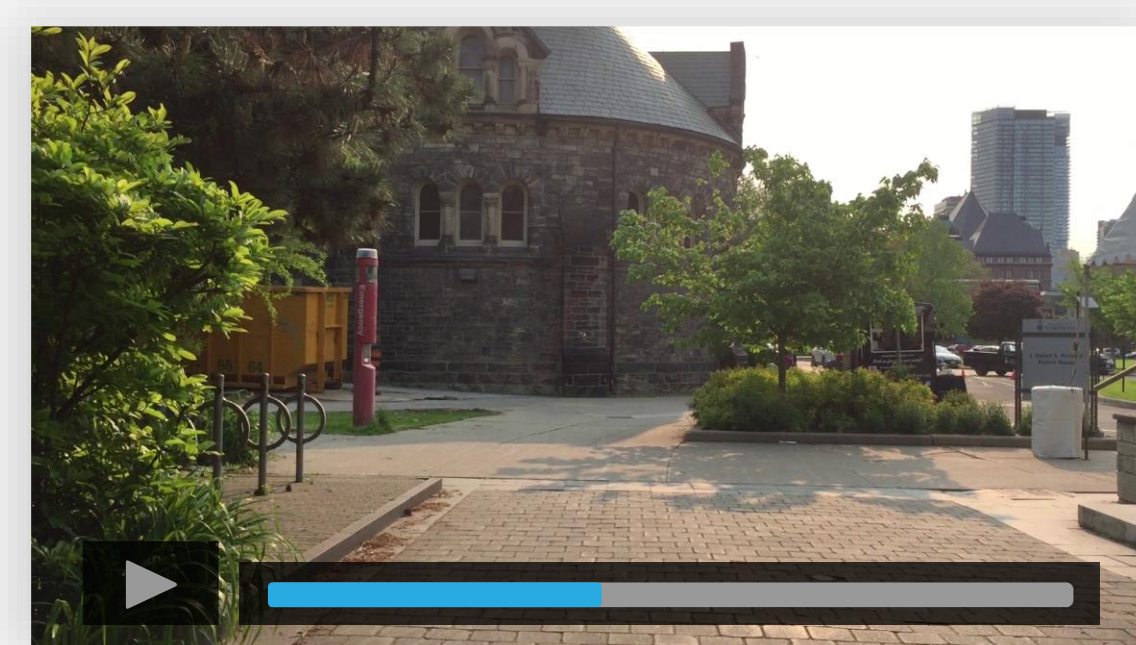
We used a **within-subjects design** where participants were assigned to either a **replayed or non-replayed condition** during each session – routes across sessions were non-overlapping

### 1 Encoding



All participants learned novel spatial routes on a guided walking tour of the UofT campus

### 2 Replay



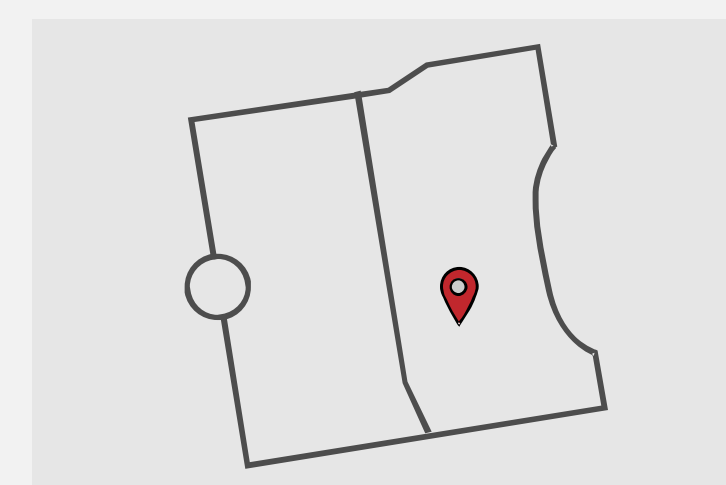
Participants in the replayed condition watched speeded video cues of the routes online

### 3 Test

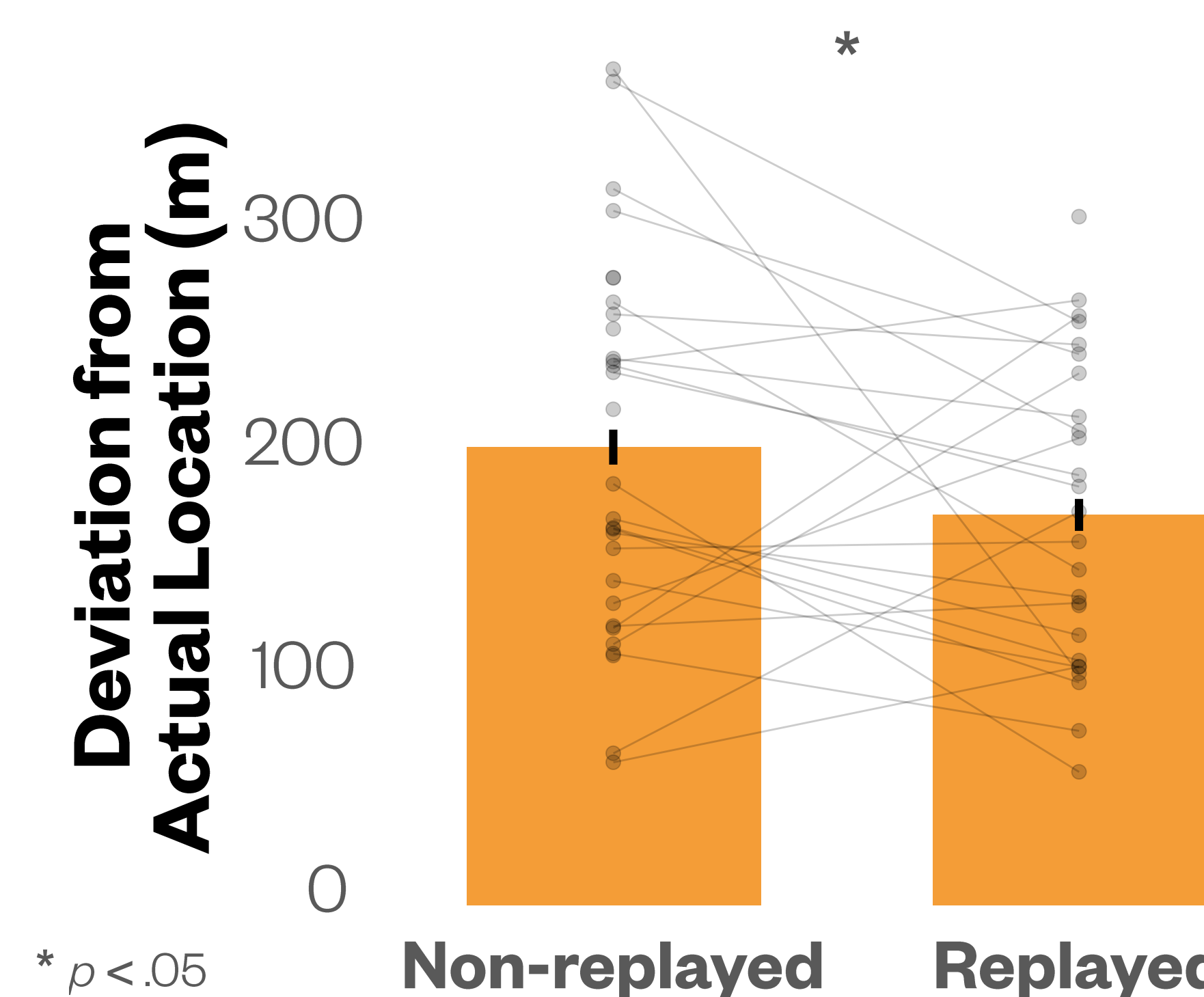


All participants returned to the lab two days after the tour to assess spatial memory for the routes

## Vector mapping

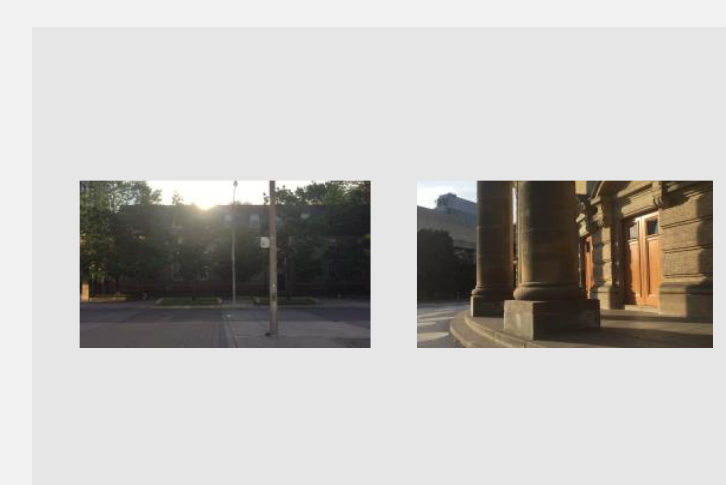


Participants are shown the outline of a map and are asked to pinpoint locations they encountered along the route

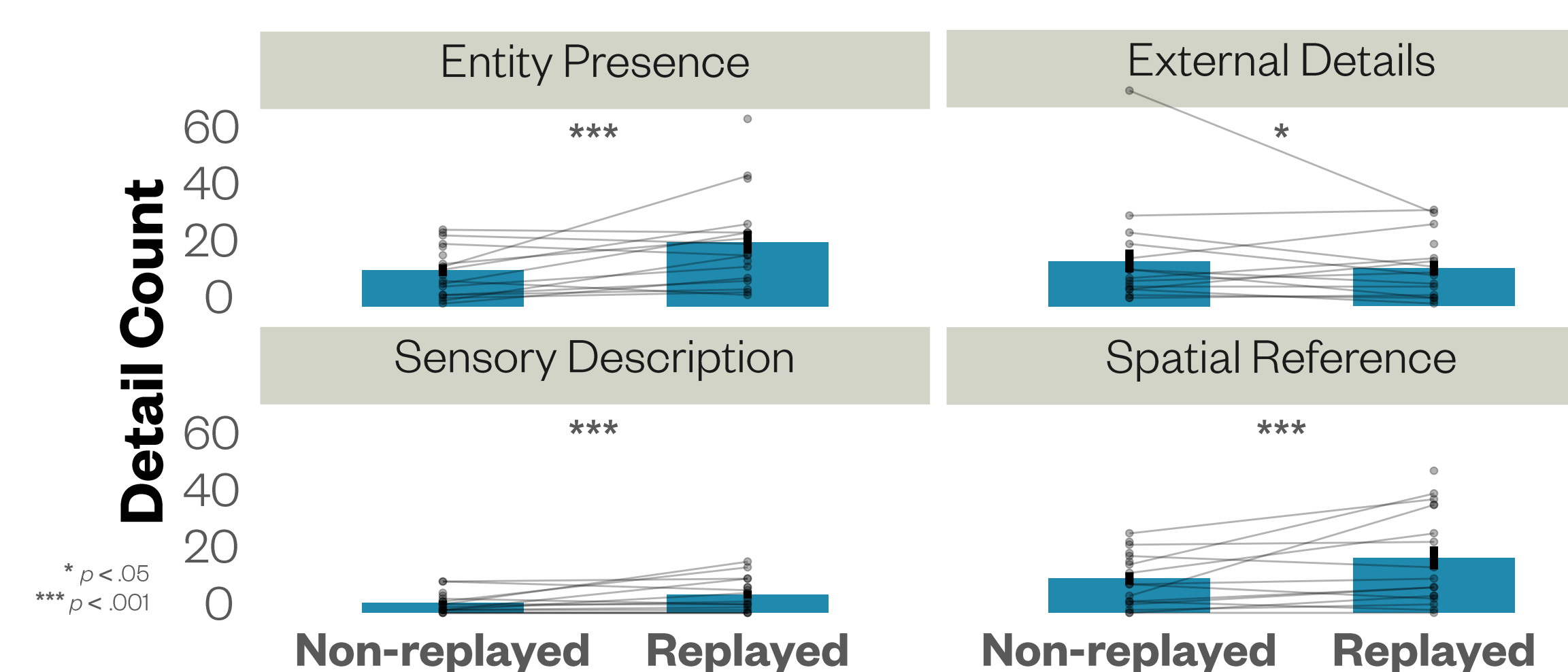


Participants had a smaller average error for locations on replayed routes, suggesting **better allocentric memory**

## Route description

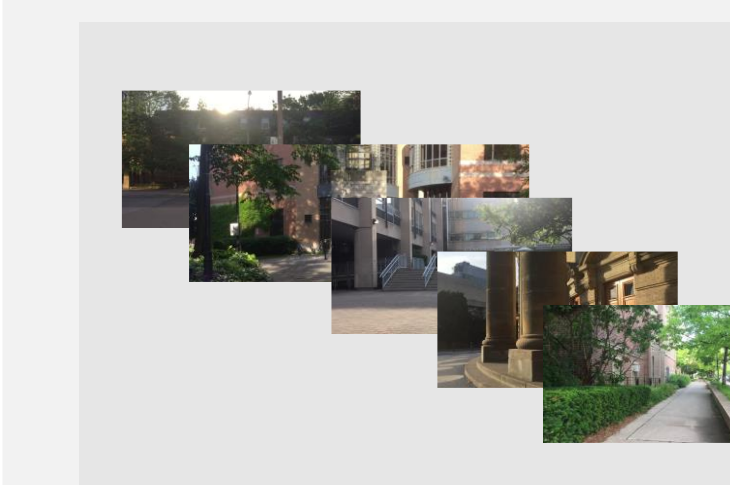


Participants are asked to verbally describe how to navigate from the start location to the end location of a route

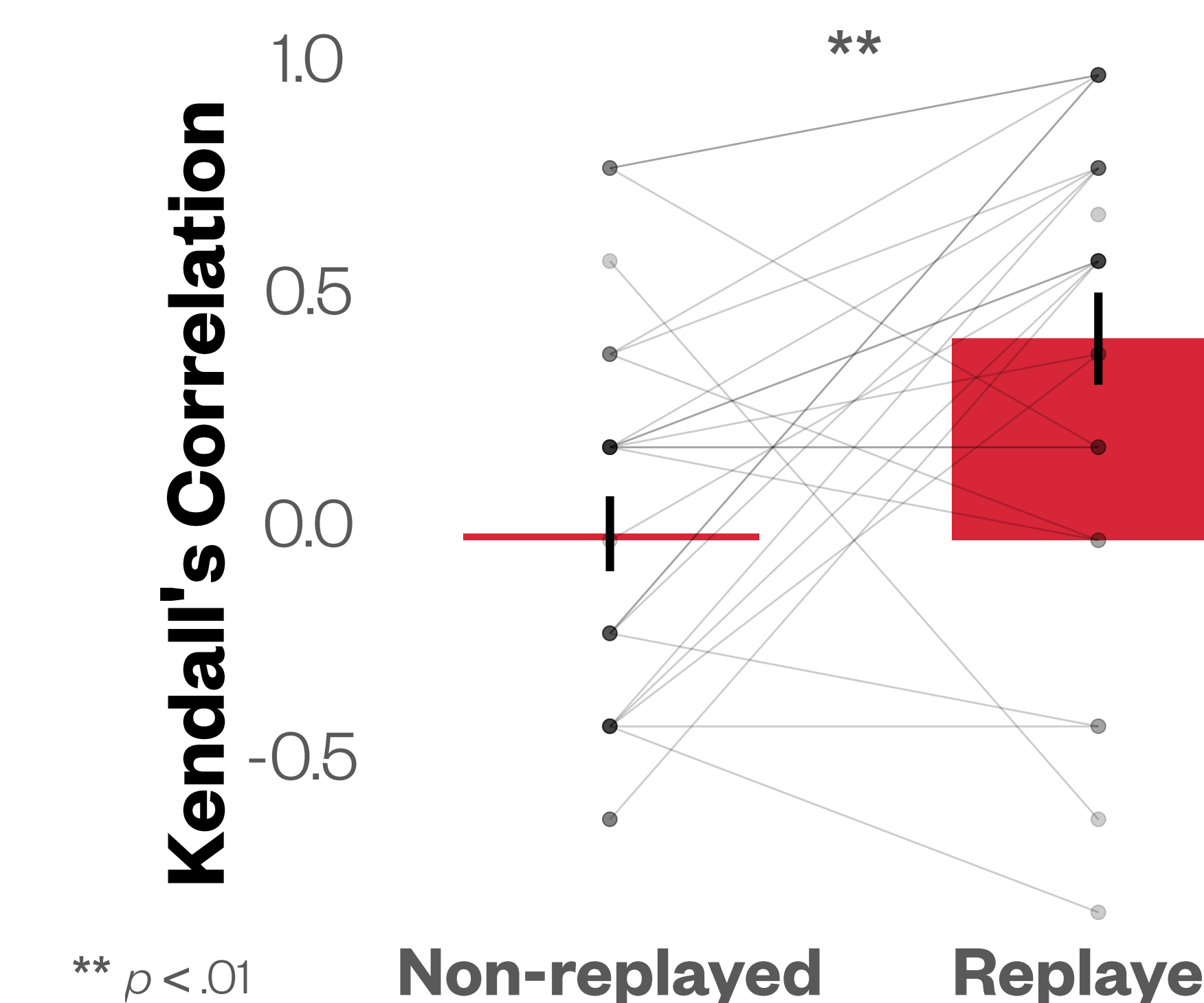


Data analysis is still ongoing, but preliminary results ( $n = 21$ ) suggest that **replay boosts the episodic richness**<sup>5,6</sup> of route recall

## Landmark sequencing



Participants are shown buildings they navigated between and are asked to organize them in sequential order



Participants had better sorted sequences for replayed routes, suggesting **better temporal order memory**

## Next steps

Future studies will investigate the effect of visual perspective of replayed cues (e.g. **self vs. other**) on spatial memory

We are also interested in looking at the **changes in neural representation** that underlie these behavioural changes

These results will inform the design of a **portable, non-invasive, and inexpensive intervention to mitigate age-related spatial disorientation**

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