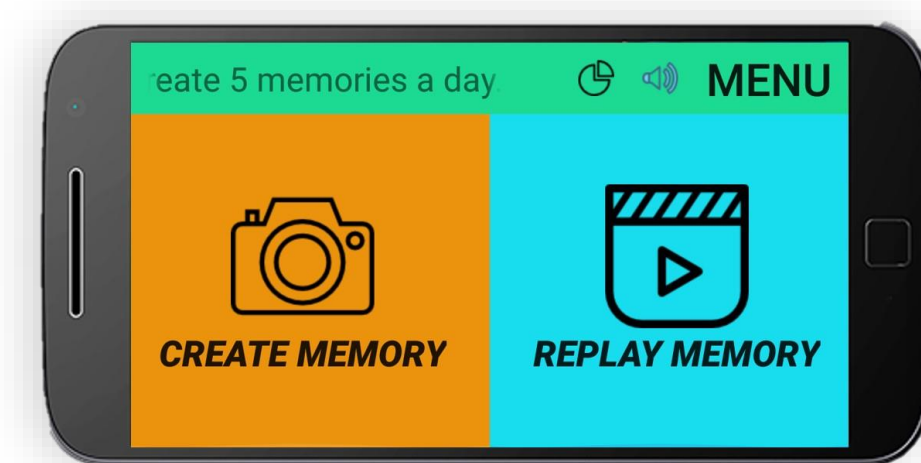


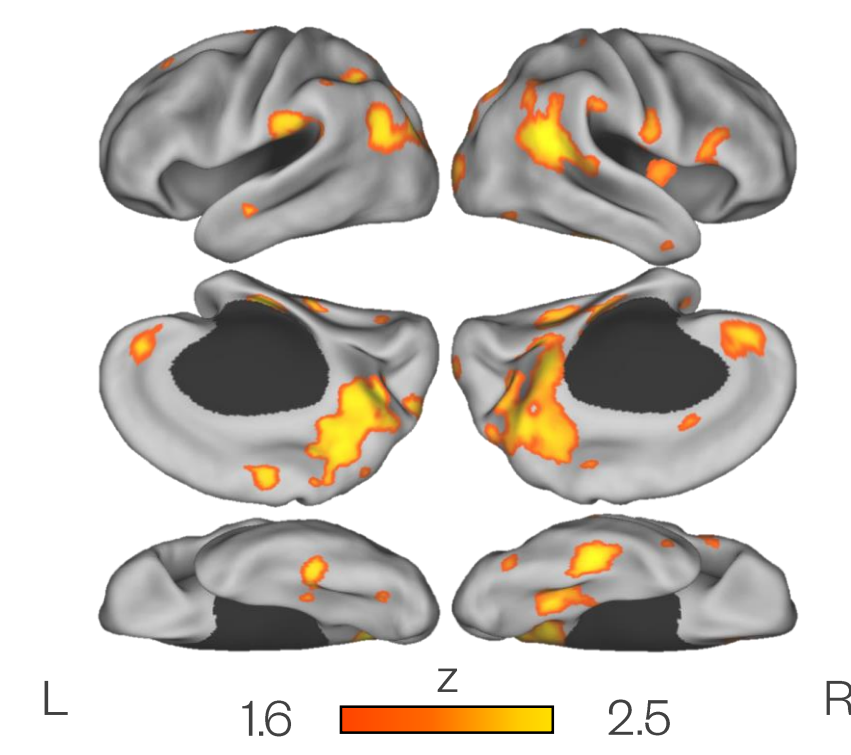
Replay of novel spatial routes improves navigation in older adults

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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**¹



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**²



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^{3,4}

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

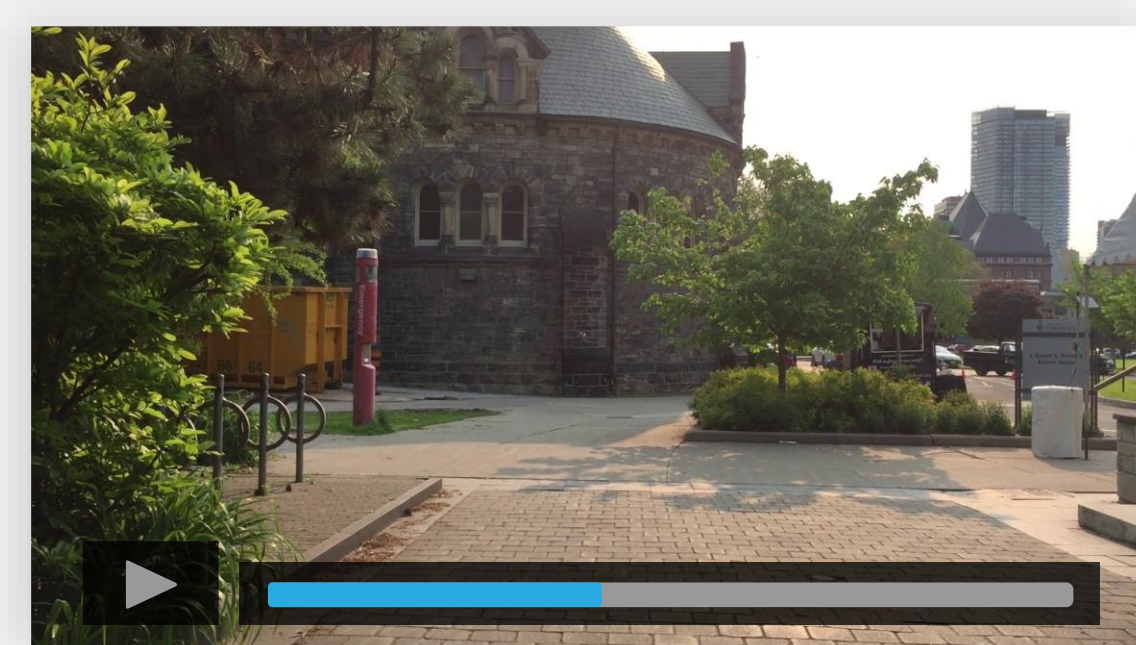
We used a **within-subjects design** where participants were assigned to either a **replayed or non-replayed condition** during each session – routes across sessions were non-overlapping

1 Encoding



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

2 Replay



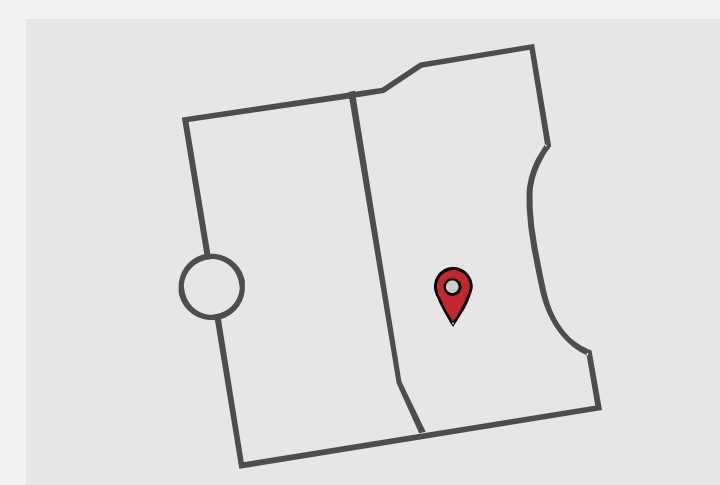
Participants in the replayed condition watched speeded video cues of the routes online

3 Test

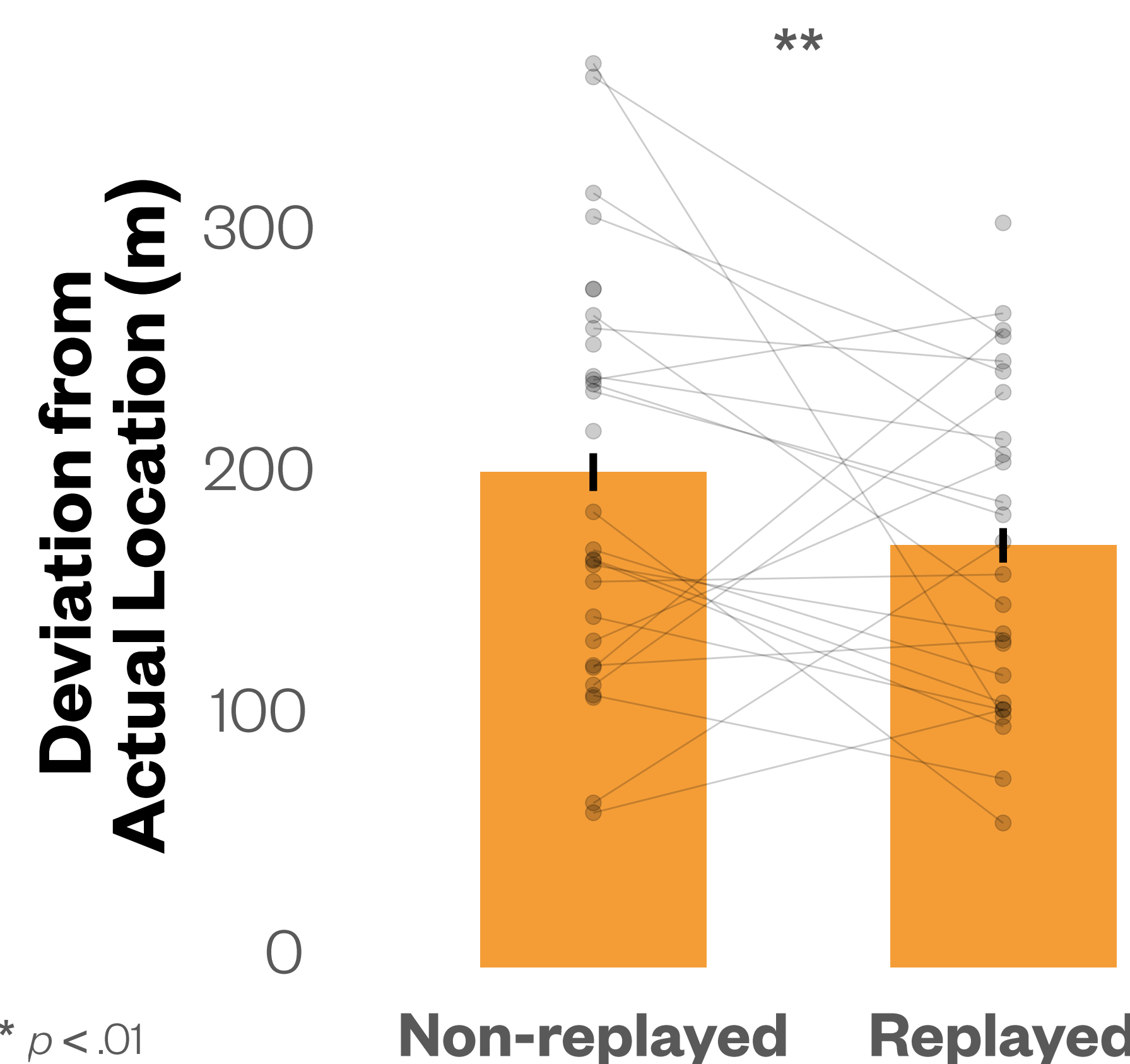


All participants returned to the lab two days after the tour to assess spatial memory for the routes

Vector mapping

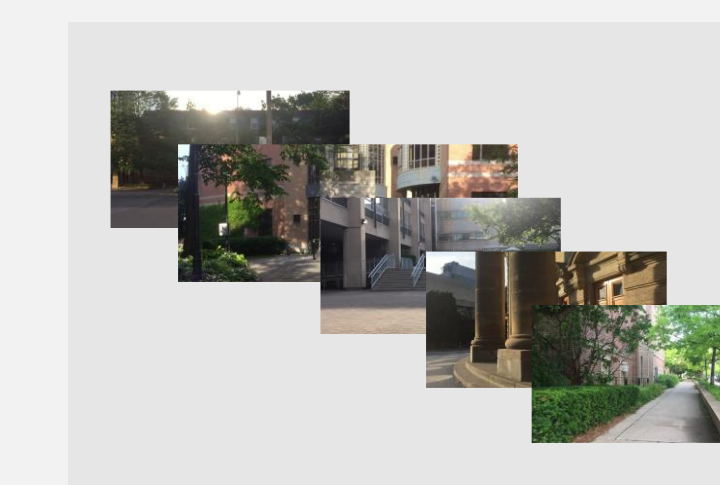


Participants are shown the outline of a map and are asked to pinpoint locations they encountered along the route

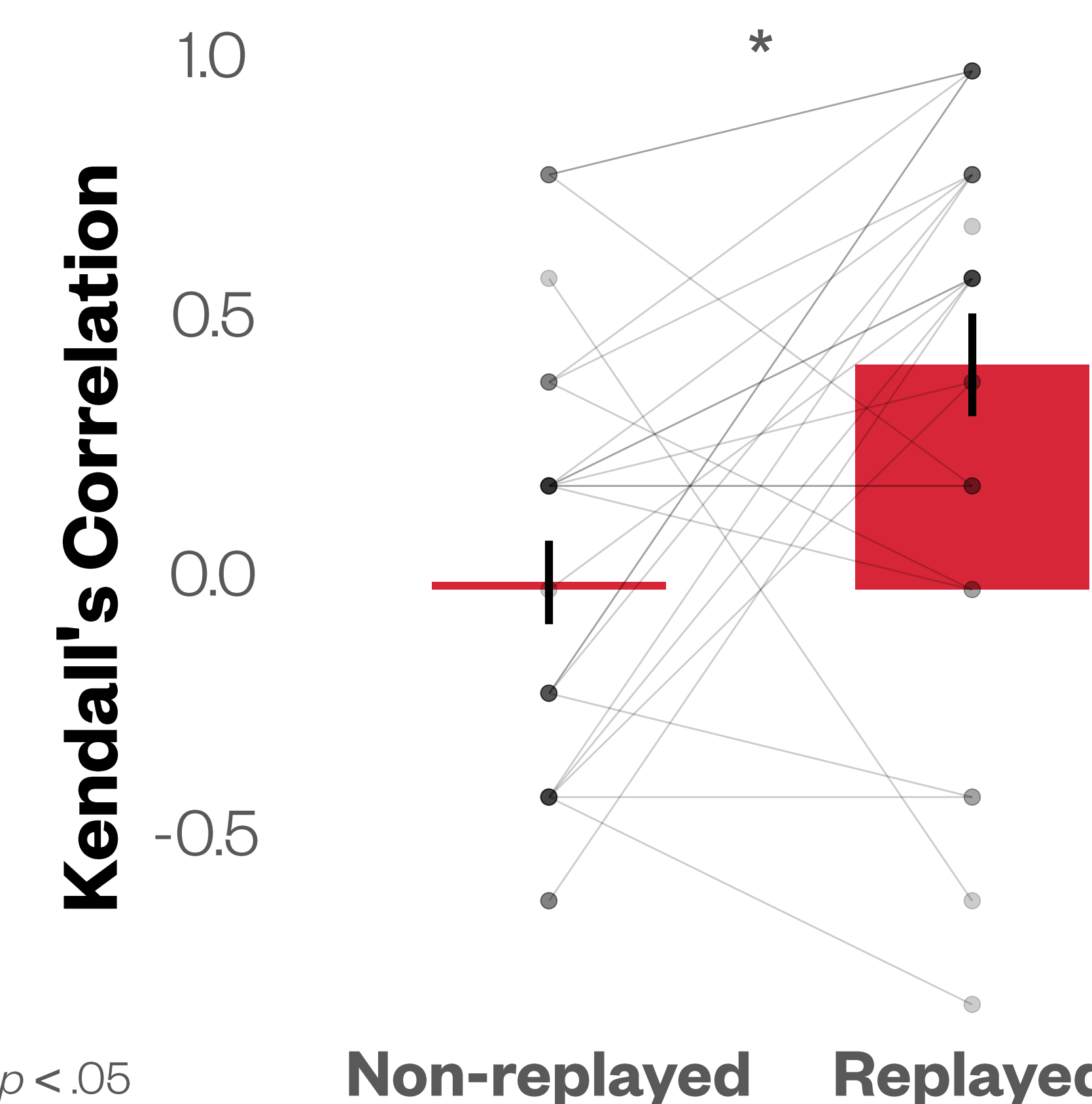


Participants had a smaller average error for locations on replayed routes, suggesting **better allocentric memory**

Landmark sequencing

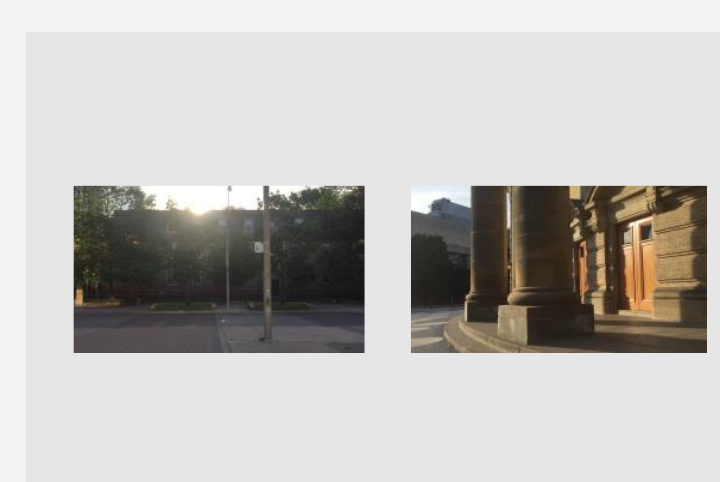


Participants are shown buildings they navigated between and are asked to organize them in sequential order



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

Route description



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

e.g. "...at the end of that narrow street, it opened up to a roundabout type of area with a building at the North side and you turn right, so we started going South around our roundabout and a few minutes in the walk you'll reach Convocation Hall."

Scoring for data from the route description task is still underway and will be scored for accuracy, episodic richness^{5,6}, and temporal order⁷

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**

References

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