REALISTIC LANDMARK SYMBOLS ON A MAP PROVIDE IMPLICIT, BUT NOT EXPLICIT, BENEFITS DURING SPATIAL NAVIGATION

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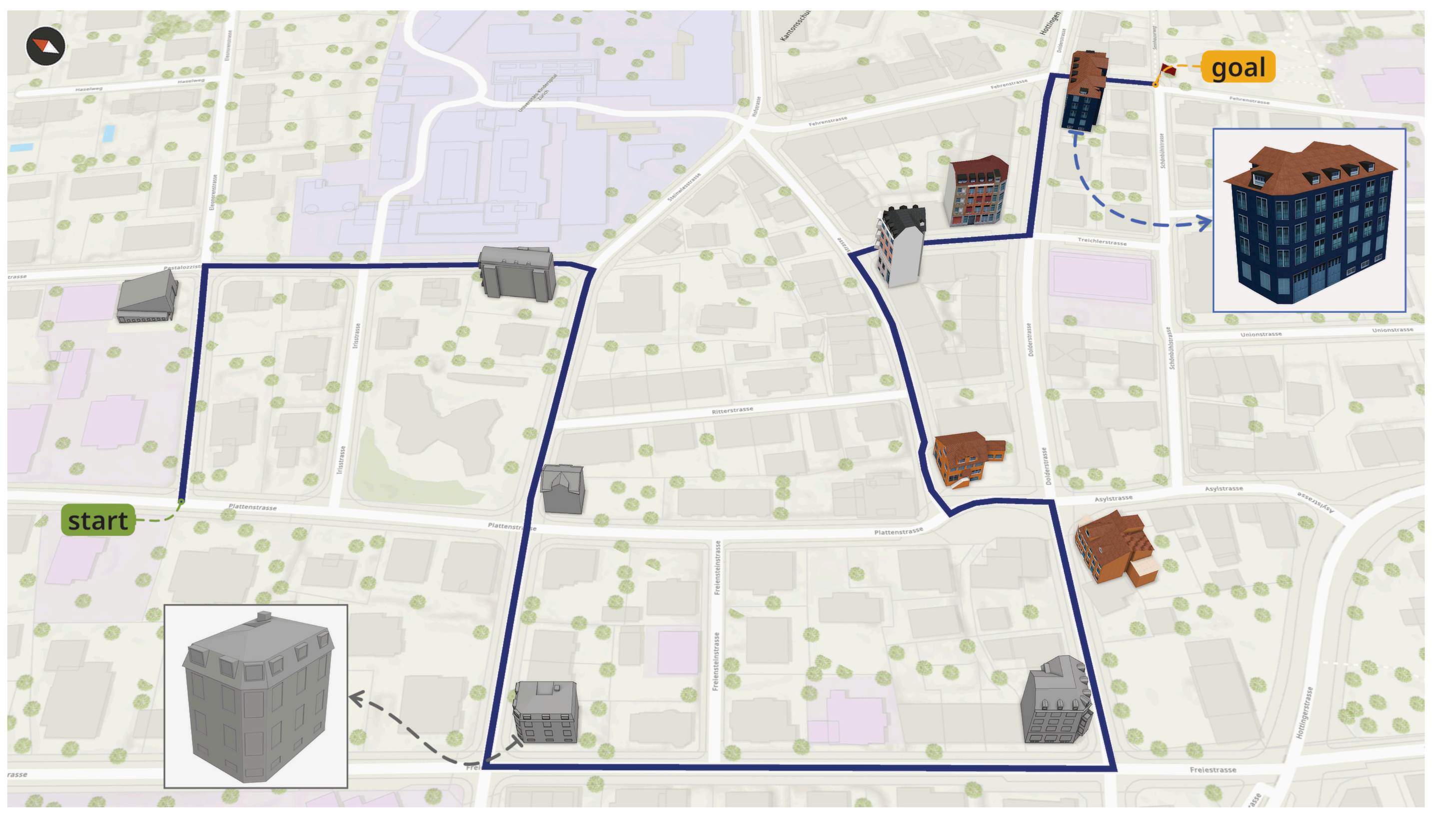
INTRODUCTION

- Using **landmarks** to improve the effectiveness of **mobile maps** and to increase **spatial learning** is a common recommendation [1].
- However, less is known about **how landmark symbols should be designed,** or about the **mechanisms behind landmark supported map use**.
- In this study, we compared **abstract 3D landmark symbols** on a map with **realistic 3D landmark symbols** on a range of navigation and spatial learning outcomes [2, 3].
- We also examined **eye-movements** and **EEG** to understand the impact of realistic landmark symbols on **processing demands** and **allocation of attention** during **map-assisted navigation** [2,4].

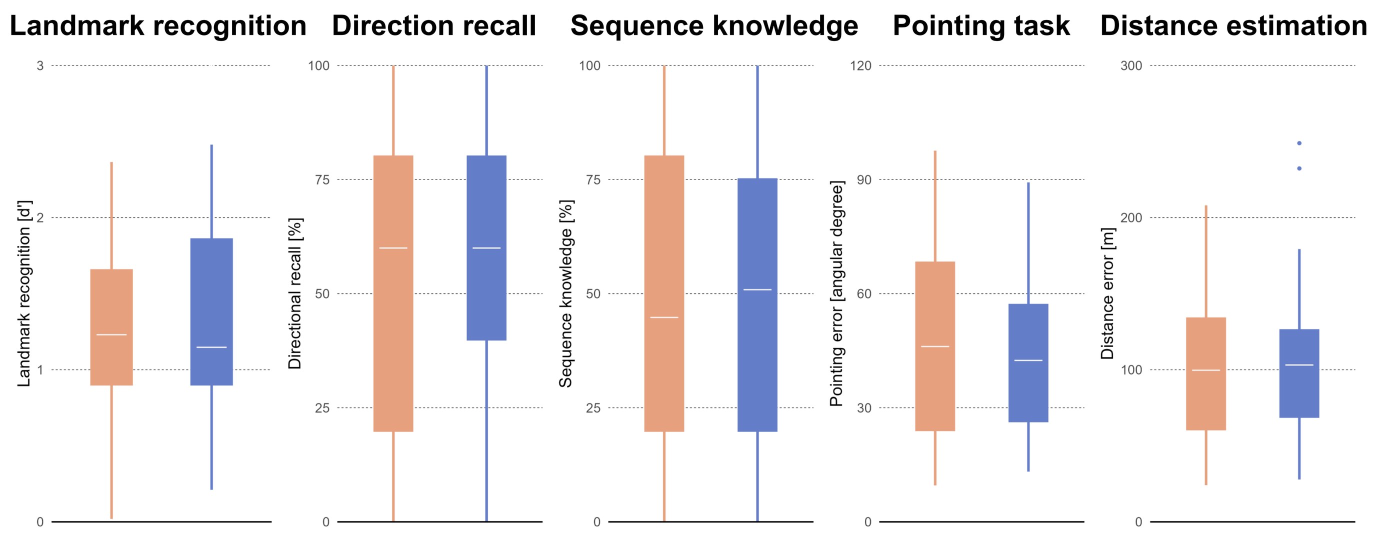
METHODS

- **46 participants** navigated a **real world route** guided by a **mobile map** featuring landmark information displayed on a tablet.
- Participants could interact with the map including the ability to zoom, rotate, and pan the display. Half of the 3D landmark symbols were **abstract** and half were **realistic.**
- After the route, we administered tests of **landmark recognition, directional recall, sequence knowledge, distance estimation**, and **pointing judgements.**
- During navigation. we recorded mobile 64 channel **EEG** (BrainProducts) and eye-movements with a mobile **eye-tracker** (PupilLaps).
- **EEG** data was analysed using the **BeMoBIL pipeline** [5] and coregistered eye-tracking data was processed using the **EYE-EEG toolbox** [6].
- **Spatial abilities** were measured using the **Questionnaire on Spatial Strategies** [7].

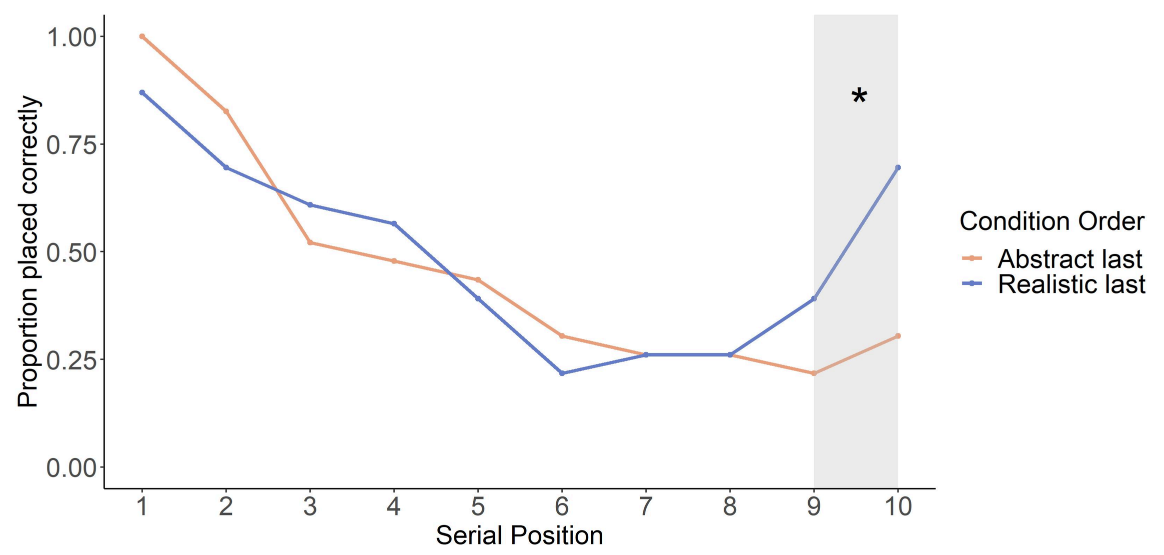


RESULTS

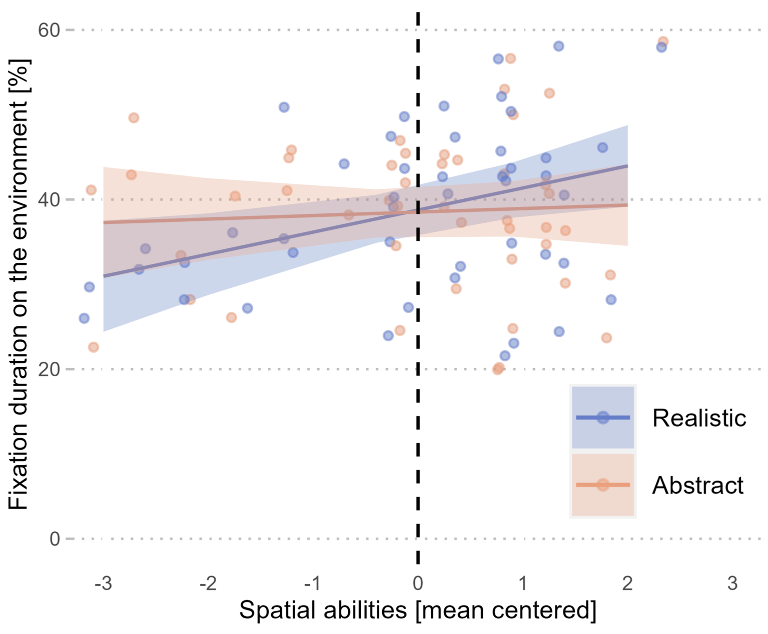
Acquired spatial knowledge was similar across conditions.



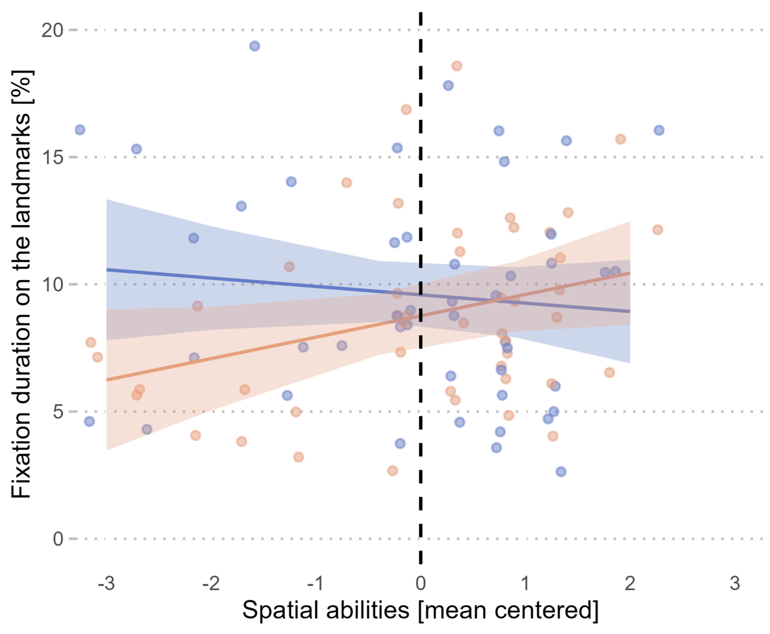
Recency effects in sequence knowledge were observed for realistic landmarks but not for abstract landmarks.



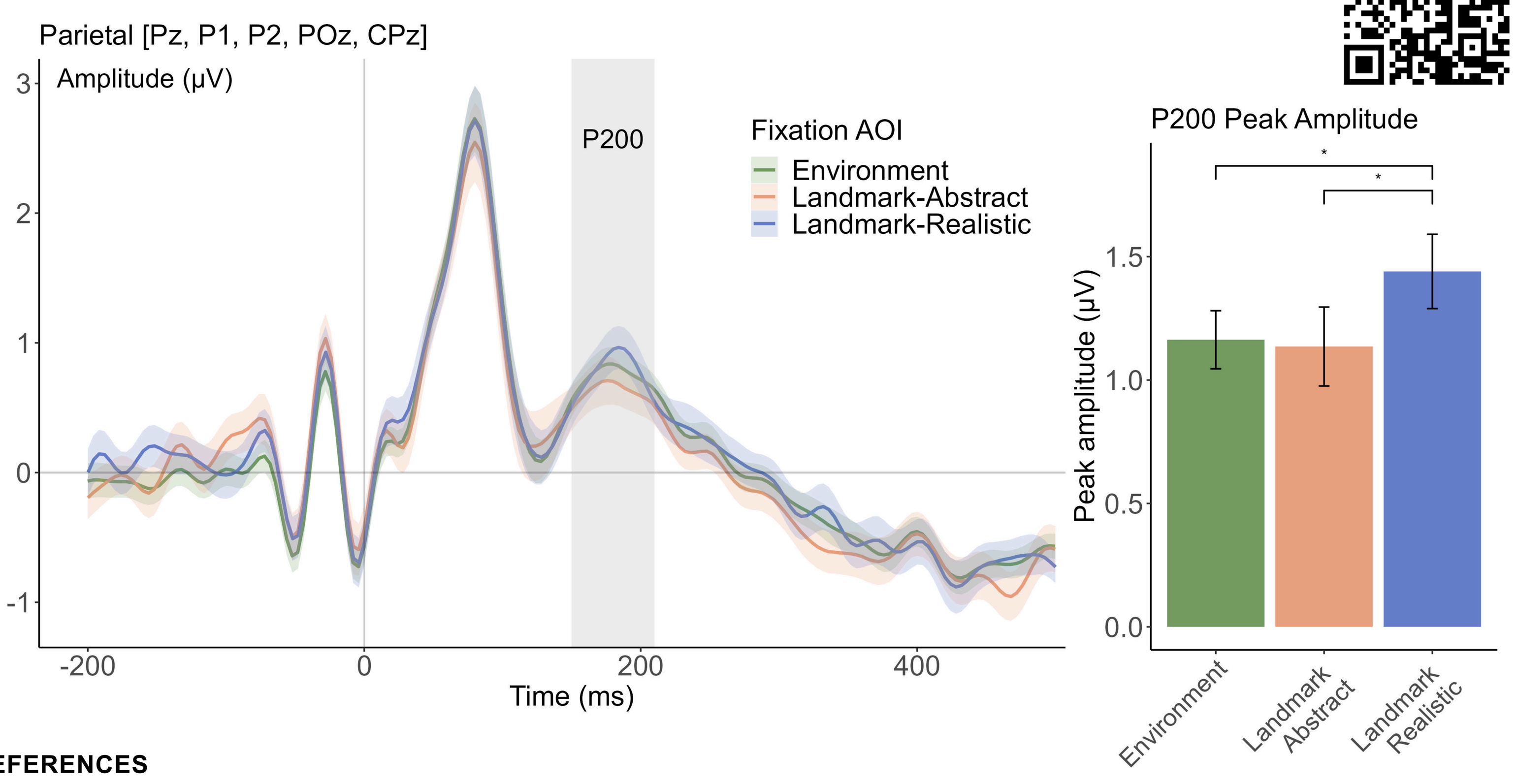
Participants with higher spatial abilities attended more to the environment in general along portions of the routes where the map had realistic landmarks.



Participants with lower spatial abilities attended more to landmarks in the environment that were displayed on the map realistically.



Fixation related potentials revealed enhanced P200 amplitudes when fixating landmarks in the real world that featured as realistic symbols on the map. This suggests an enhanced matching of the currently perceived landmark to that stored in working memory from the map.



CONCLUSION & OUTLOOK

- More **realistically designed landmark symbols** on mobile maps **influenced** the users **visual attention** and **prerceptual processing**.
- **Visual attention** was directed towards the **environment** and **important landmarks**.
- **Landmarks** perceived in the environment were **matched** better to those **stored in memory from the map**.
- **Facilitation** of **neural** and **oculomotor engagement** with navigation **did not improve spatial knowleldge** acquisition
- Our **follow-up study** examines whether **long-term memory** for the acquired **spatial knowledge** is affected by these differences during encoding as a result of map visualisation condition.

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