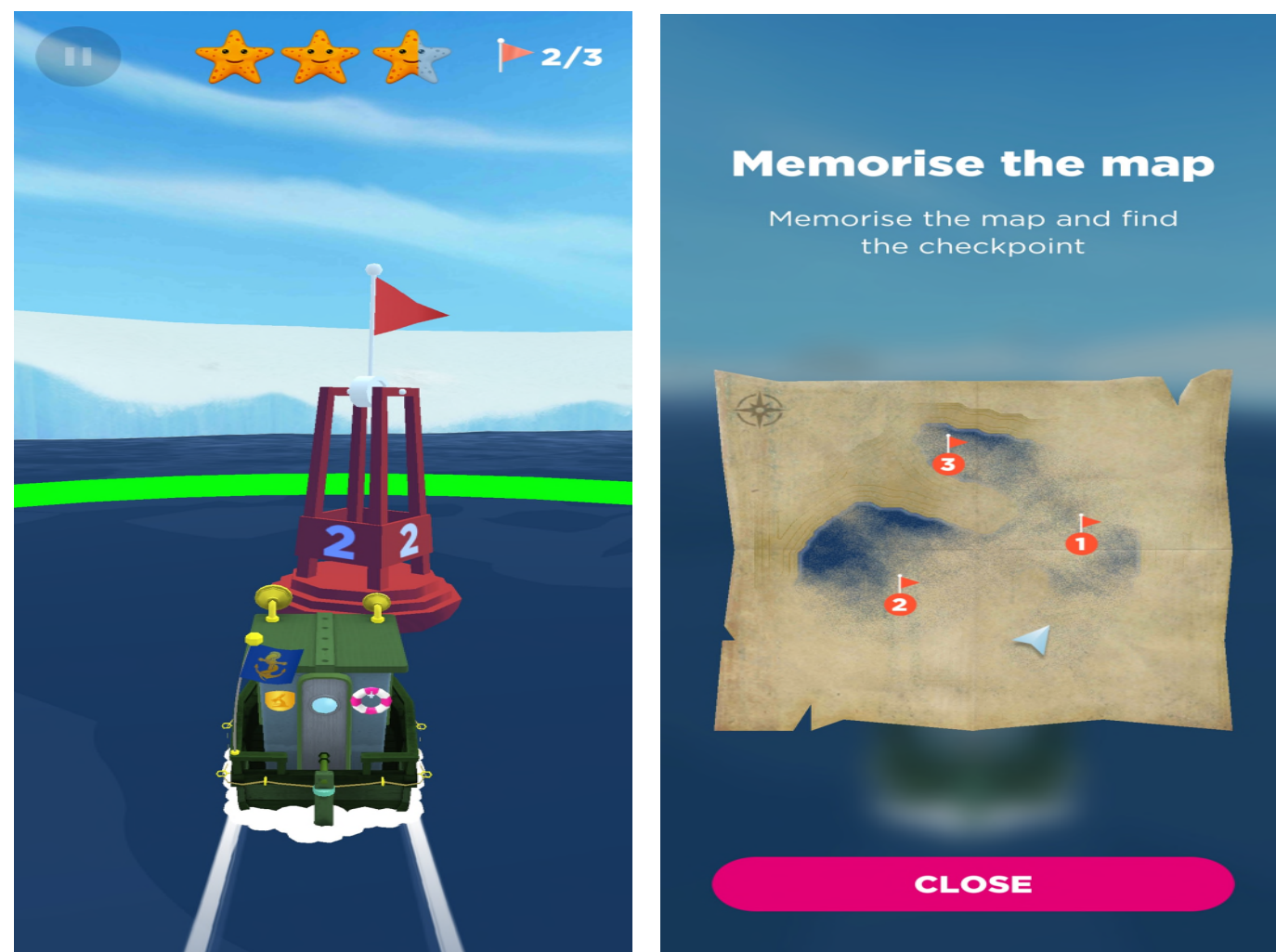


Background and Purpose

- Digital navigation tasks have been found sensitive to early Alzheimer's disease (AD)-related cognitive changes. Sea Hero Quest (SHQ) is a mobile-app game that measures spatial navigation performance.



- This study aims to explore the association between digital navigation skills with amyloid pathology, and whether this association is mediated by gait speed and walking activity.

Methods

- Data from the Deep and Frequent Phenotyping observational study (n = 67) of adults aged ≥60 years.
- Participants completed Sea Hero Quest (SHQ) alongside clinical, cognitive, behavioural, gait, and biomarker assessments.
- Wayfinding performance was assessed using trajectory length.
- Wayfinding scores from Levels 6–8 were normalised to baseline gaming ability (Levels 1–2)
- Gait outcomes were obtained from a 7-day continuous wearable accelerometer assessment.

Results

- Sample included 53 amyloid-positive and 14 amyloid-negative cognitively unimpaired participants confirmed by PET or CSF).
- Amyloid-positive participants demonstrated significantly worse navigation performance compared with amyloid-negative participants (.06 vs -.35, p=.04, Figure 1).

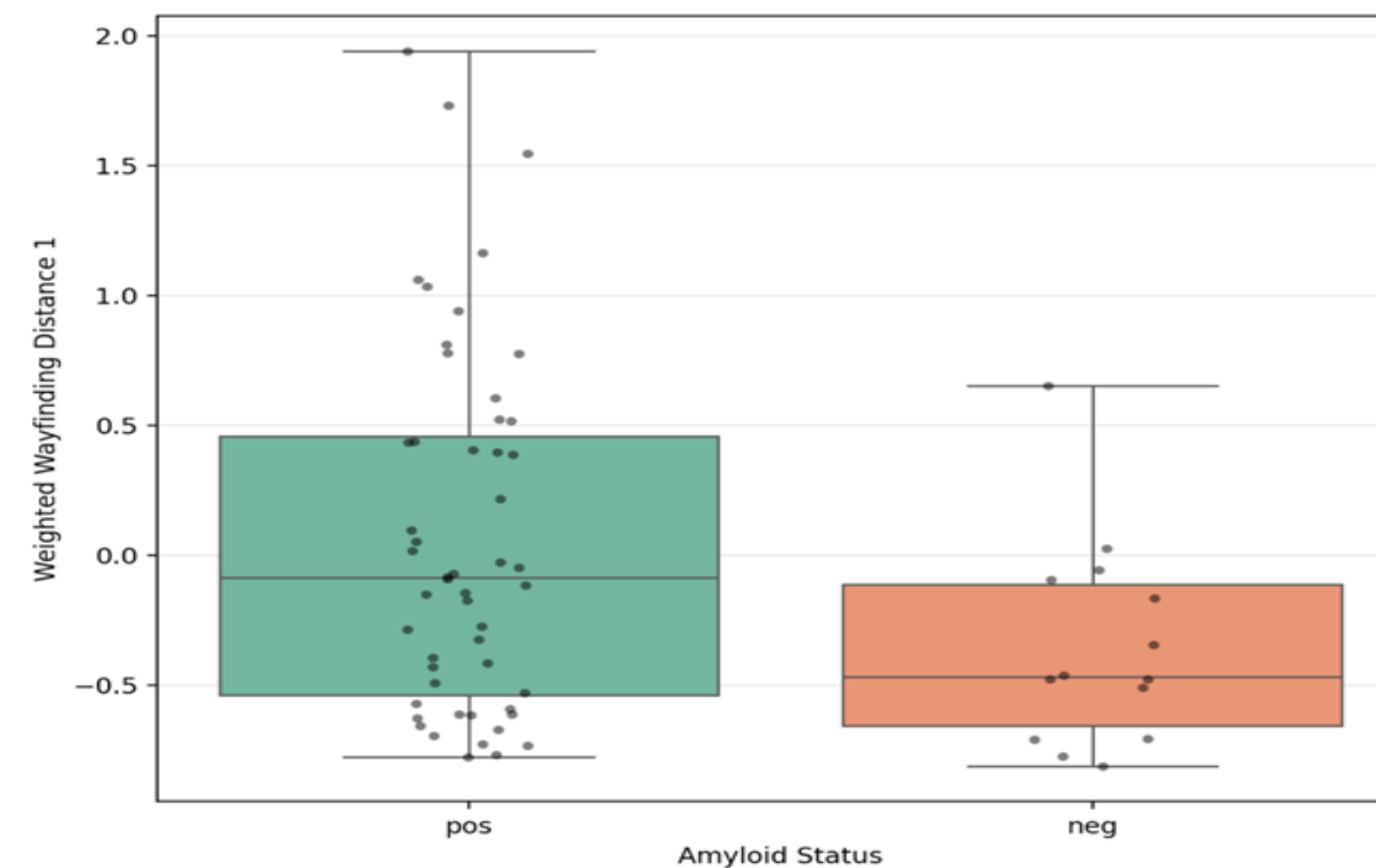


Fig 1. Wayfinding distance according to amyloid status

- None of the walking activity (daily step count and walking bout length) or gait (speed) measures showed a significant mediation effect (p>.05), indicating that the association between navigation performance and amyloid pathology was independent of these factors (Figure 2).

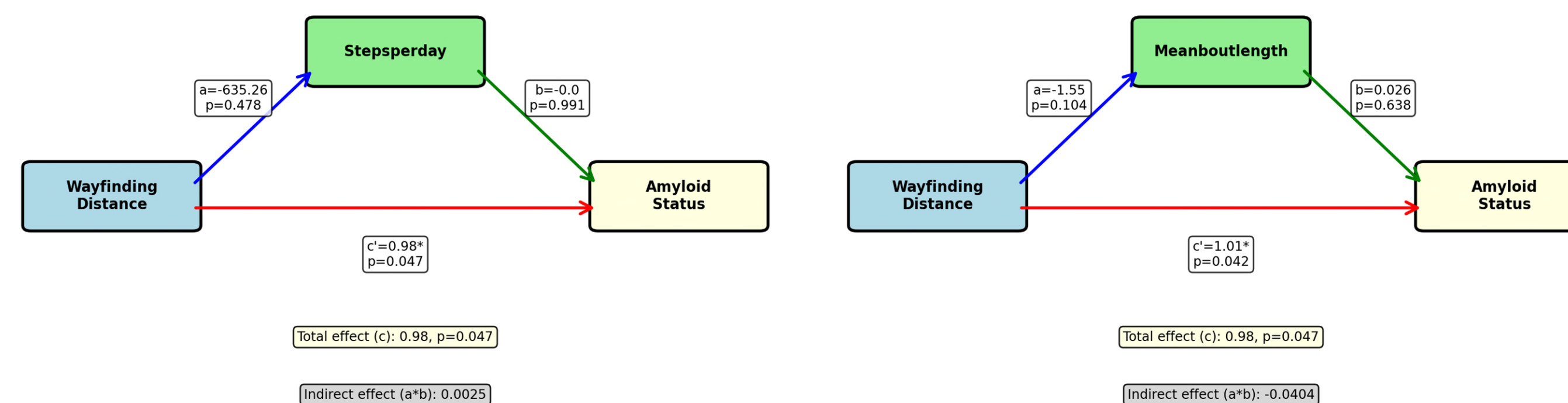


Fig 2. Mediation analysis of gait measures

- To assess additional predictive value, ROC analyses examined whether walking activity and gait speed improved amyloid detection beyond demographics (age, sex, education) and SHQ performance. Predictive accuracy increased from .86 (Model 1) to .89 (Model 3), but the difference was not significant (p = .57; Figure 3).

Discussion and Conclusion

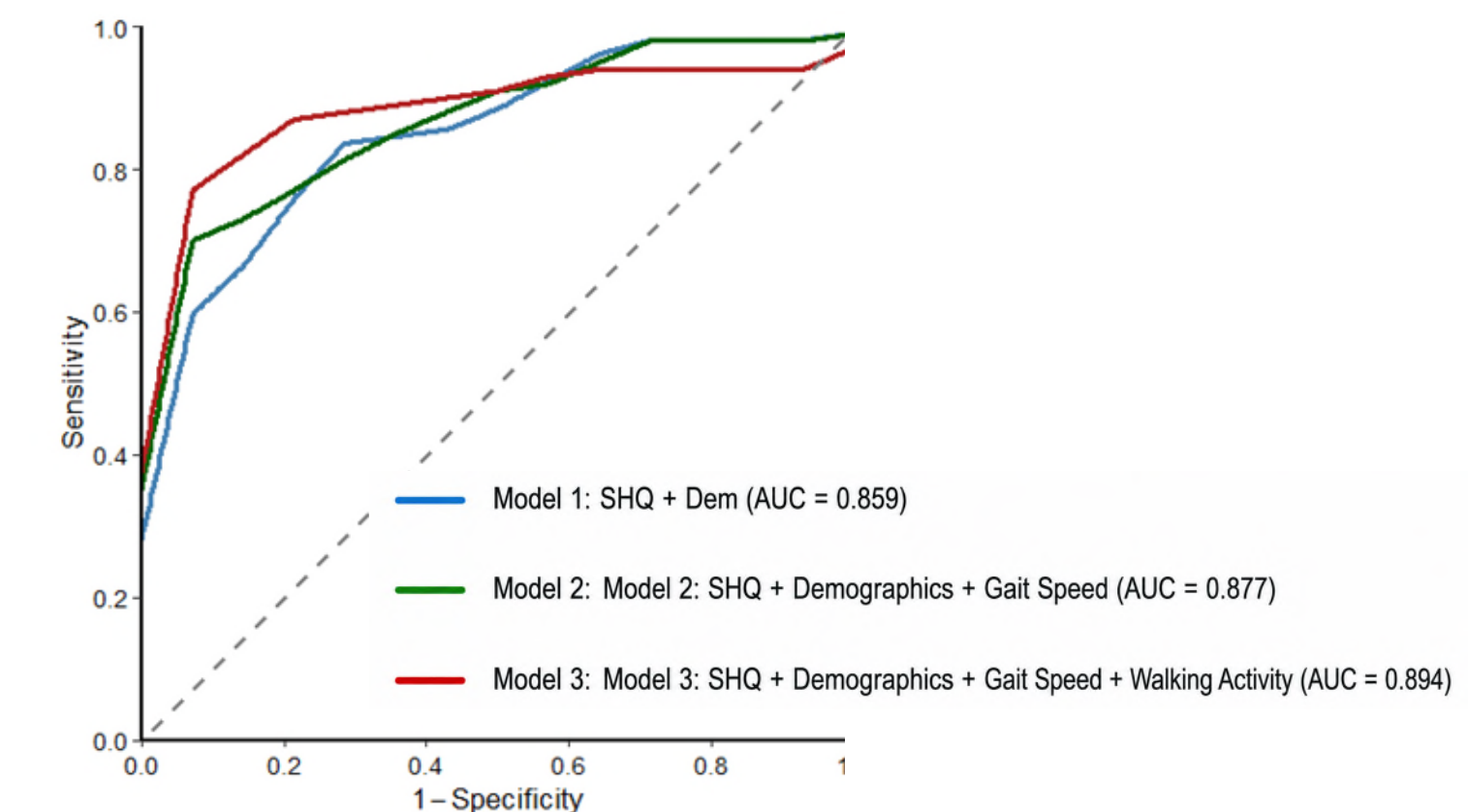
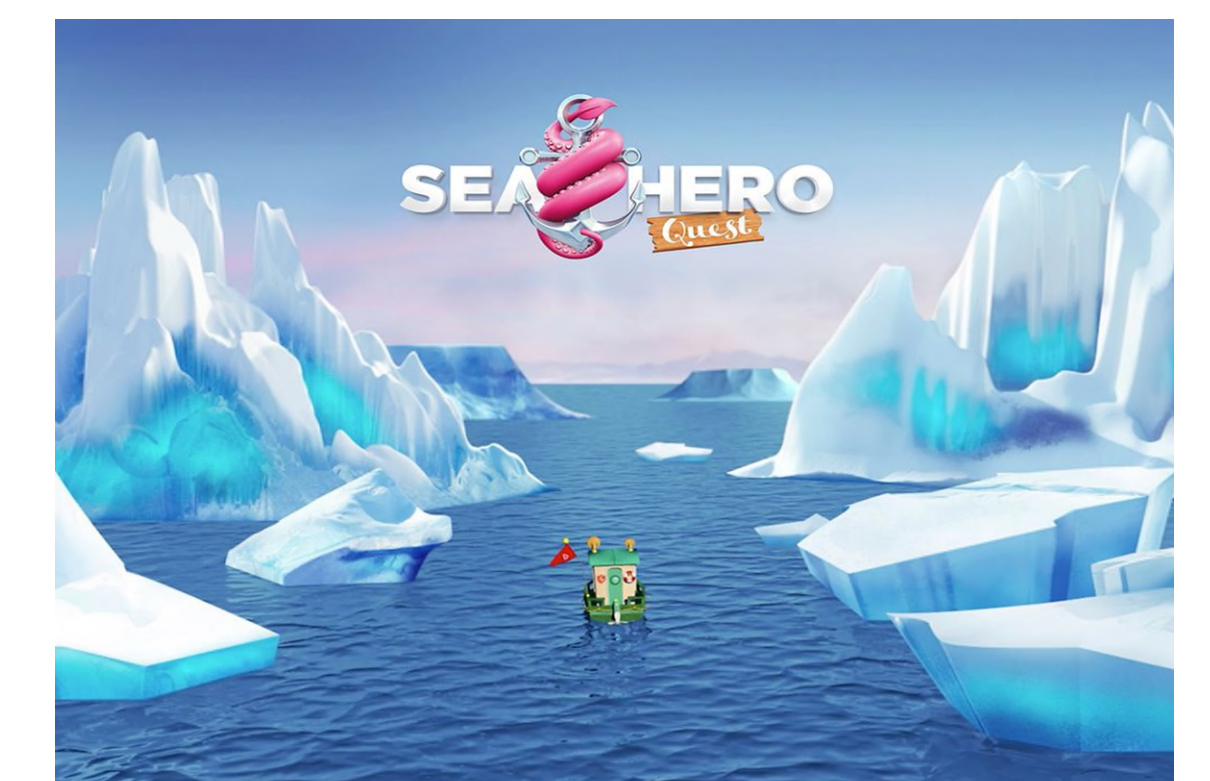


Fig 3. ROC curves showing prediction of amyloid positivity

- Game-based digital navigation ability is associated with amyloid pathology, independent of gait outcomes.
- These results highlight the potential of integrating digital navigation, gait, and demographic measures as scalable, low-burden tools for early detection of AD pathology.



References

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