

INTRODUCTION

- The vulnerability of the medial temporal cortex to atrophy has long been thought to be a significant biomarker of Alzheimer's Disease (AD)^[1].
- More recently, the **posterior parietal cortex (PPC)** has been highlighted as one of the **earliest brain regions to show signs of degeneration in AD**^[2].
- The **PPC** is part of the dorsal visual stream^[3] and is thought to be involved in movements programmed based on the position of the target with respect to the viewer in **egocentric coordinates**.
- Ventral visual stream** regions^[3] seem additionally required for movements that are not target-directed, but are programmed based on visual information in **allocentric coordinates**^[4,5].

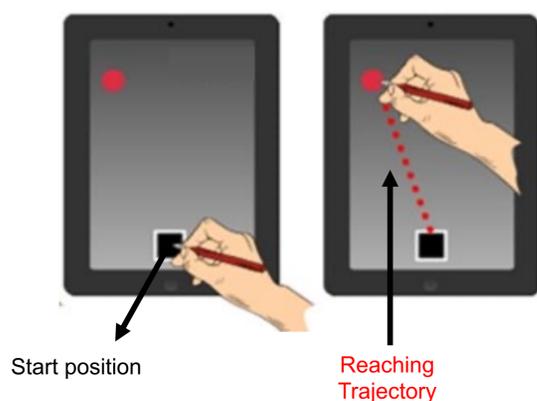
Aim

- To investigate egocentric and allocentric reaching in prodromal and clinical AD using our novel portable iReach iPad app.

METHOD

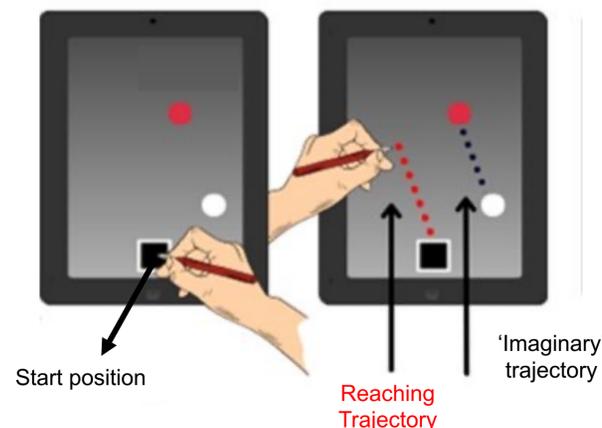
- Sample:** Healthy control group (N = 24, mean age = 65 ± 8.1 years), Prodromal and clinical AD group (N = 20 [8 aMCI, 12AD], mean age = 70 ± 8.6 years).

Egocentric task (40 trials)



Reaching towards the target (red dot) as quickly and accurately as possible

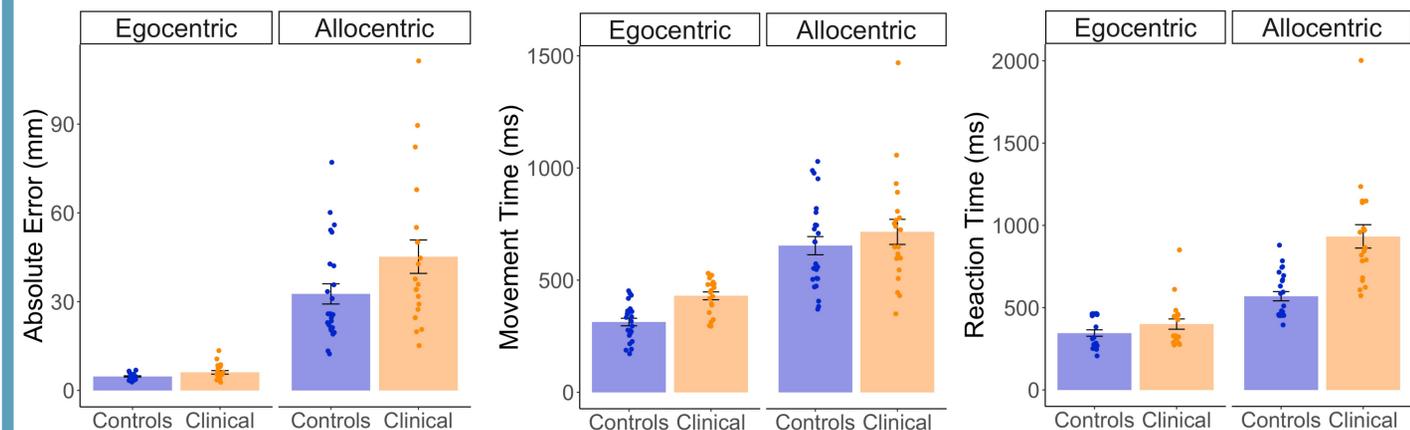
Allocentric task (40 trials)



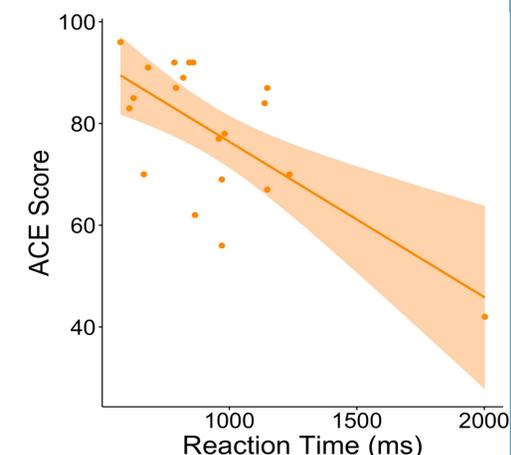
Reaching to mimic the distance and direction between a reference (white dot) and a target (red dot)

- Analysis:** Three 2 (Task) x 2 (Group) mixed ANOVAs were run on Reaction Time (RT), Movement Time (MT) and Absolute Error (AE)

RESULTS



- AE, MT and RT were higher for allocentric than egocentric reaching.
- The clinical group had significantly longer MT and higher AE compared to controls in both tasks.
- RT was significantly longer in the clinical group in the Allocentric task only.
- Total ACE-III score was negatively correlated with Allocentric RT ($r = -.683$).



DISCUSSION

- We replicated previous findings that allocentric reaching is accompanied by longer RTs^[5] using our iReach iPad app.
- Increased MT and AE in the clinical group indicates that cognitive decline results in an overall deficit in visuomotor control^[6].
- Allocentric RT seems particularly sensitive to cognitive decline, suggesting that programming actions in allocentric coordinates is impaired, even without memory or navigation task demands.
- Future research will test the iReach iPad app with other patient groups to determine its sensitivity to other clinical disorders involving PPC damage.

References:

- [1] Scheltens, P. et al. (1992). *Journal of Neurology, Neurosurgery & Psychiatry*, 55(10), 967-972. [2] Gordon, B. A., et al. (2018). *The Lancet Neurology*, 17(3), 241-250 [3] Milner, A. D., & Goodale, M. A. (1993). *Progress in brain research*, 95, 317-337. [4] Thaler, L., & Goodale, M. A. (2011). *Frontiers in human neuroscience*, 5, 92. [5] Thaler, L., & Goodale, M. A. (2011). *Journal of neurophysiology*, 105(2), 846-859. [6] Mitchell, A. G. et al. (2022). *Cortex*, 149, 29-43.