Allocentric visuomotor processing is particularly sensitive to cognitive decline: evidence from the iReach iPad app in prodromal and clinical Alzheimer's Disease

Annie Warman³, Alexandra G. Mitchell³, Elise Kenning³, Laura Williamson³, Rebecca Shapland³, Emma Harris³, Niamh Parkinson³, Michael Hornberger³, Robert D. McIntosh³, Fraser W. Smith³, Suvankar Pat³, Stéphanie Rossit³

³University of East Anglia; ³Aarhus University; ³University of Edinburgh

INTRODUCTION

• The vulnerability of the medial temporal cortex to atrophy has long been thought to be a significant biomarker of Alzheimer's Disease (AD)⁴.
• More recently, the posterior parietal cortex (PPC) has been highlighted as one of the earliest brain regions to show signs of degeneration in AD⁵.
• The PPC is part of the dorsal visual stream⁶ 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 regions⁷ seem additionally required for movements that are not target-directed, but are programmed based on visual information in allocentric coordinates⁸,⁹.

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).

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 RTs⁸ using our iReach iPad app.
• Increased MT and AE in the clinical group indicates that cognitive decline results in an overall deficit in visuomotor control⁹.
• 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: