App-based augmented reality to assess cognitive impairment in early Alzheimer's disease

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Scan the QR code to learn more about the RADAR-AD study

BACKGROUND

Augmented reality (AR) apps merge real world with virtual experiences and can be used to remotely assess complex instrumental activities of daily living (**iADL**) that are affected early in Alzheimer's disease (AD).

AIM OF THE STUDY

- Compare standard clinical measures with an AR app (Altoida) to assess iADL that are related to memory and spatial navigation in early AD
- Feasibility in the home-setting

STUDY DESIGN

- In-clinic baseline: app-based tasks (digital score) were administered together with a standard neuropsychological assessment (cognitive score).
- At home: During 8 weeks, participants from the RADAR-AD furthermore used the app weekly at-home.

PARTICIPANTS

GROUP	AMYLOID	CDR	MMSE	N	Female n(%)	Age	Education years
Healthy control	Negative	0	>=28	63	34 (54%)	67 (8)	15 (4)
Preclinical AD	Positive	0	>=27	25	17 (68%)	69 (6)	15 (3)
Prodromal AD	Positive	0.5	24 - 26	35	13 (37%)	71 (8)	15 (4)
Mild to moderate AD	Positive	>=1	18 - 23	27	12 (44%)	69 (10)	13 (5)

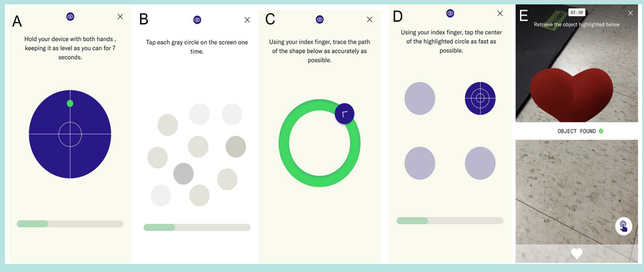

Fig 1. Screenshots of the motor tasks (A-D) and AR tasks (E).

DATA, RESULTS & CONCLUSIONS

- The digital score could significantly distinguish HC from preAD and proAD, and preAD from proAD, both with in-clinic and with at-home tests.
- Classification of the proAD group: the digital score (AUCclinc_visit = 0.84 [0.75-0.93], AUCat_home = 0.77 [0.61-0.93]) was as good as the cognitive score (AUC = 0.85 [0.0.78-0.93])
- Classification of the preAD group: the digital score (AUCclinc_visit = 0.66 [0.53-0.78], AUCat_home = 0.76 [0.61-0.91]) was superior to the cognitive score (AUC = 0.55 [0.42-0.68]).
- In-clinic and at-home tests were moderately correlated. Digital score and clinical cognitive score were highly associated. No learning effects found.

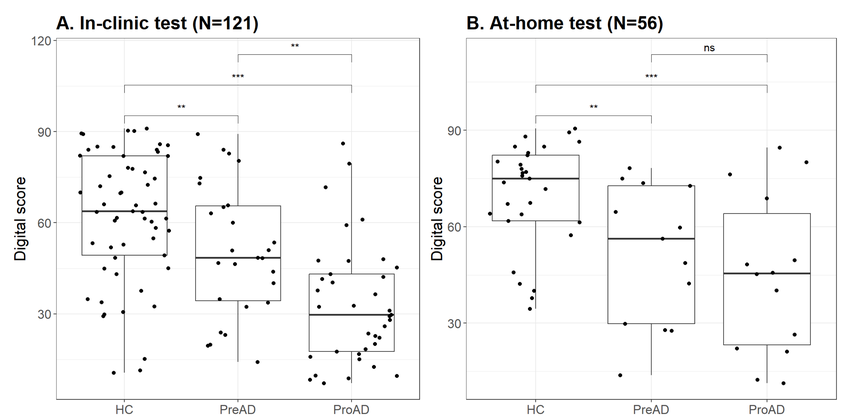

Fig 2. Digital scores per group. Each point represents the score of one participant. ** indicates p<0.01, *** indicates p<0.001, ns indicates not significant.

CONCLUSIONS

- The AR app is feasible in the home-setting.
- It could distinguish HC from otherwise healthy Aβ-positive individuals, which is currently not possible with standard cognitive tests.
- The app differentiated HC from proAD participants equally well as a neuropsychological assessment.
- Future research should focus on further fine graining algorithms

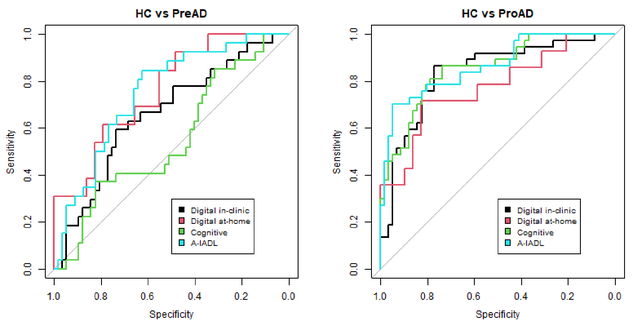

Fig 3. ROC curves for the digital in-clinic, digital at-home, cognitive, and A-IADL score. Abbreviations: A-IADL = Amsterdam instrumental activities of daily living, HC = healthy control, PreAD = Preclinical AD, ProAD = Prodromal AD.

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