A multimodal digital biomarker of functional deficits in early stage of Alzheimer's disease

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

GOAL OF THE RADAR-AD STUDY

Identification of individual or combinations of Remote Monitoring Technologies (RMTs) that can be effectively used for early detection of Alzheimer's Disease

RESEARCH QUESTIONS

- How accurately do RMTs help identify functional deficits in early stages of AD ?
- Can combining multiple RMTs enhance their performance in detecting functional deficits across all syndromic stages of AD ?

STUDY DESIGN

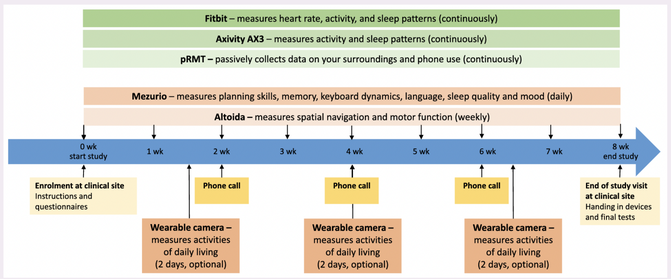

Figure 1. Study design

PARTICIPANTS

GROUP	AMYLOID	CDR	MMSE	N	Female n(%)	Age	Education years
Healthy control	Negative	0	>=28	69	34 (54%)	67 (8)	15 (4)
Preclinical AD	Positive	0	>=27	39	17 (68%)	71 (6)	16 (3)
Prodromal AD	Positive	0.5	24 - 26	65	13 (37%)	70 (8)	15 (5)
Mild to moderate AD	Positive	>=1	18 - 23	56	12 (44%)	70 (9)	14 (4)

ANALYTICS PIPELINE

Employed machine learning (ML) pipeline to assess performance in binary classification tasks (HC vs. PreAD, HC vs. ProAD, HC vs. MildAD, PreAD vs. ProAD, and ProAD vs.MildAD).

Algorithms used: XGBoost

Performance estimation: repeated nested cross-validation (see Figure 2)

Feature used: Demographics: age, sex, education; **RMT:** Altoida, Fibit, Axivity, Mezurio speech tasks, Gait assessments; **IADL:** Instrumental activities of daily living; **NP:** Neuropsychological tests

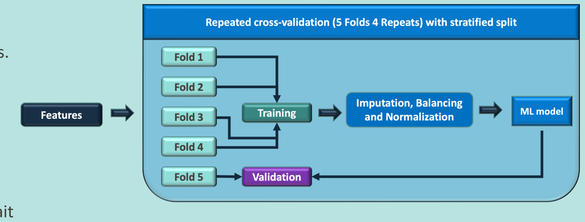

Figure 2. Analytics pipeline

RESULTS & CONCLUSIONS

- Among the RMTs, Altoida distinguishes PreAD from HC with a mean AUC of 0.60 and ProAD from HC with a mean AUC of 0.71. In addition, Altoida does distinguish PreAD from ProAD with a mean AUC of 0.77.
- Combining RMTs does increase the discriminative ability of distinguishing PreAD from HC (0.78 (combined RMTs) vs 0.71 (Altoida))
- Addition of IADL and NP data streams to RMTs increase the discriminative ability to distinguish ProAD and MildAD from HC.

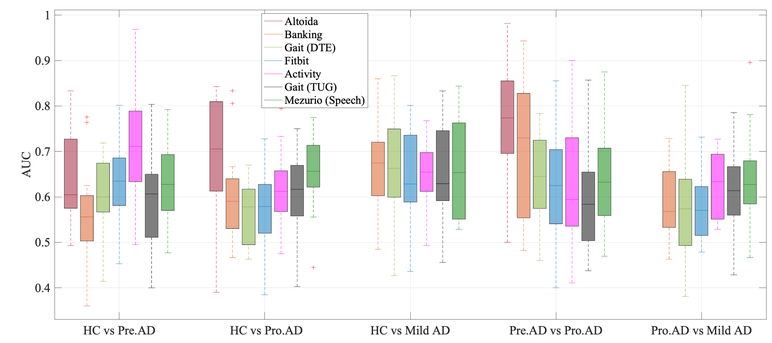

Figure 3. Discrimination ability (Area under the ROC) for different RMTs

CONCLUSIONS

- Our results highlight the advantage of combining RMTs to identify functional deficits in the early stage of AD.
- In particular, in prodromal and mild AD patients, a combined signal shows much more strength compared to individual tests.
- Future research should focus on further fine graining algorithms

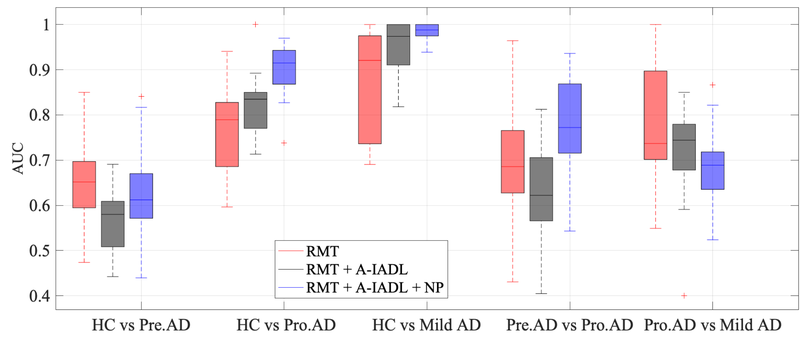

Figure 4. Discrimination ability (Area under the ROC) for multimodal combination of RMTs

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