



Prognostic Signals in Speech: Digital Language Markers Show Greater Prognostic Performance than Neuropsychological Scores in Early-Onset Alzheimer's Disease



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BACKGROUND

Following diagnosis of Alzheimer's disease (AD), patients and families face profound uncertainty. Currently there are no methods to effectively determine AD trajectory.

Here, we aim to use baseline speech samples to predict the future of AD.



METHODS

Speech data from the Longitudinal Early-onset Alzheimer's Disease Study (LEADS):

97 patients with confirmed AD pathology provided speech samples on the Craft Story Recall Test.

Various digital speech and language features were extracted from samples.

XGBoost classifier was used to predict fast decline defined as CDR-SB $\Delta > 3.5$.

	Slow Decliners (n=48)	Fast Decliners (n=49)
Age	59.9 $\pm$ 3.6	58.1 $\pm$ 3.9
Education	15.7 $\pm$ 2.3	15.3 $\pm$ 2.6
Baseline CDR-SB	0.59 $\pm$ 0.22	0.70 $\pm$ 0.24
Annualized Δ CDR-SB	1.97 $\pm$ 0.93	5.16 $\pm$ 1.61

Table. Clinical and demographic information of participants

RESULTS

Digital language markers outperformed neuropsychological testing.

- Immediate Recall AUC = 0.93
- Delayed Recall AUC = 0.74
- Neuropsychological domains: 0.41–0.71

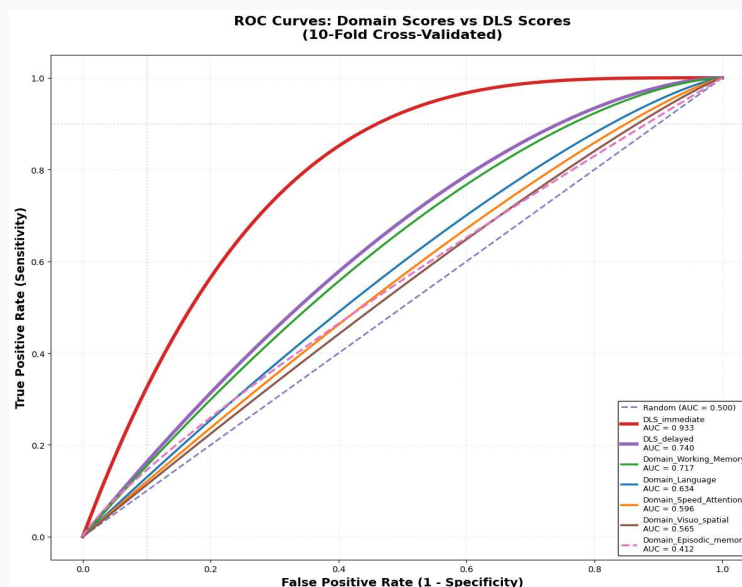


Figure. The ROC curves of various prognostic models

CONCLUSIONS

Brief connected speech from memory recall captures powerful prognostic signals not visible in standard neuropsychological summary scores, enabling personalized prognosis, better trial design & care in EOAD.