

Task-Based Speech Recorded During Neuropsychological Testing Accurately Differentiates Mild Cognitive Impairment



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INTRODUCTION

- Interventions for dementia are more effective when implemented during preclinical or mild cognitive impairment (MCI) stages.
- Speech features differ by cognitive diagnosis, as there are subtle changes in language prior to cognitive impairment.
- Studies are needed to determine whether speech features also differentiate earlier cognitive changes during MCI.**

METHODS

- Sample:** Boston University Alzheimer's Disease Research Center participants with speech data and either MCI or unimpaired cognitive function
- Speech Features:** audio recordings of cognitive testing were processed to generate acoustic speech features
- Outcome:** MCI (amnesic or non-amnesic) versus unimpaired cognitive function
- Statistical Analysis:** (1) LASSO models identified speech features associated with MCI status, (2) selected features weighted and combined to generate composite speech score, (3) logistic regression models estimated odds of MCI status per 0.01-points higher acoustic score, (4) model accuracy estimated using AUC, (5) differences by MCI sub-type examined

RESULTS

Table 1. Sample Characteristics Overall and by MCI Status

	Overall (n=300)	No MCI (n=225)	MCI (n=75)
Age (years), mean (SD)	70.0 (10.5)	69.2 (10.0)	72.3 (11.7)
Female, N (%)	191 (64%)	144 (64%)	47 (63%)
White race, N (%)	247 (82%)	197 (88%)	50 (67%)
College education, N (%)	280 (93%)	215 (96%)	65 (87%)
Comorbidities (#), mean (SD)	1.04 (1.00)	0.94 (0.95)	1.35 (1.07)
Depressive symptoms, N (%)	30 (10%)	20 (9%)	10 (14%)
APOE-ε4, N (%)	62 (29%)	44 (27%)	18 (34%)

Figure 1. Discrimination of MCI Status by Speech Score

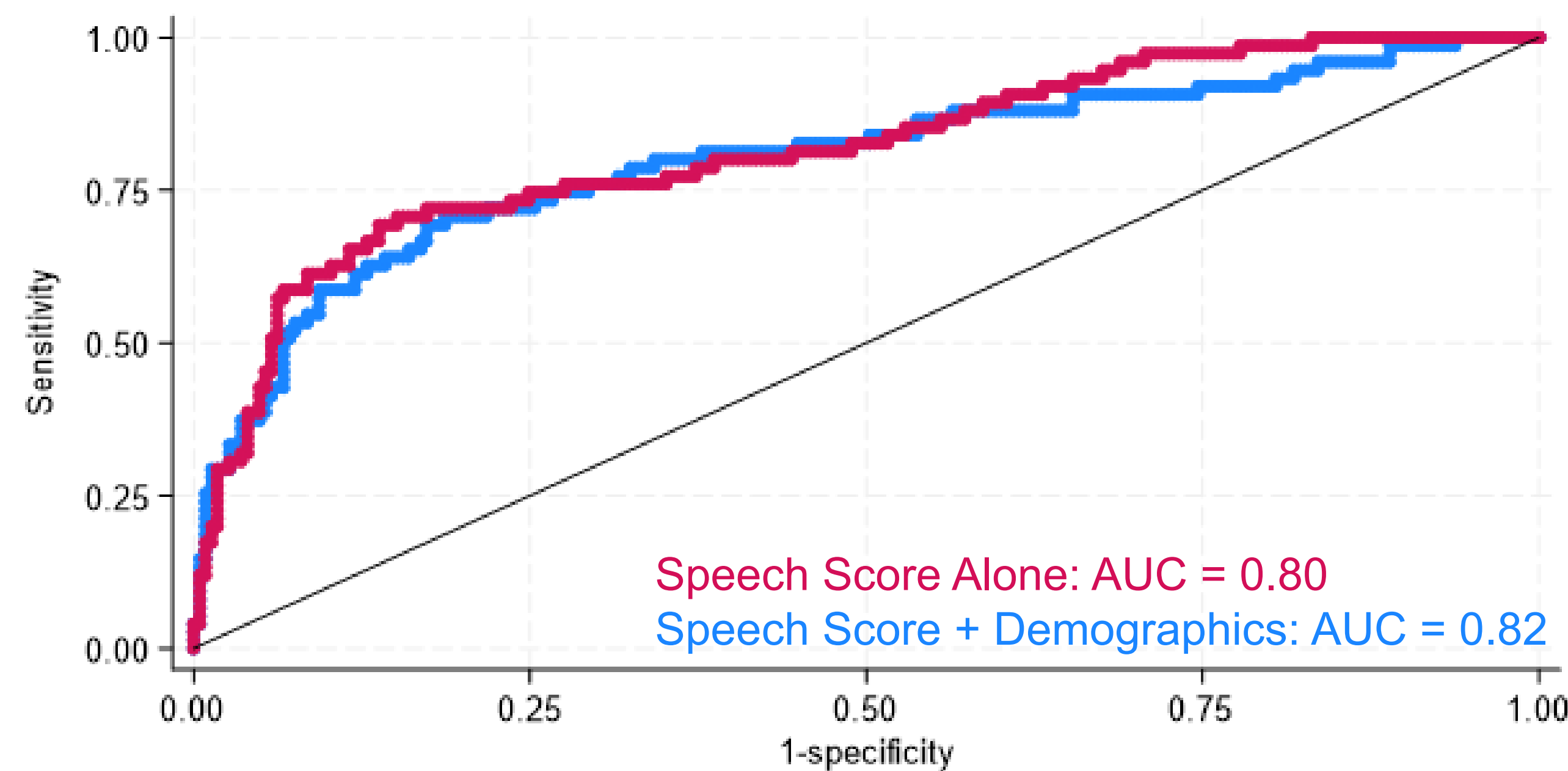
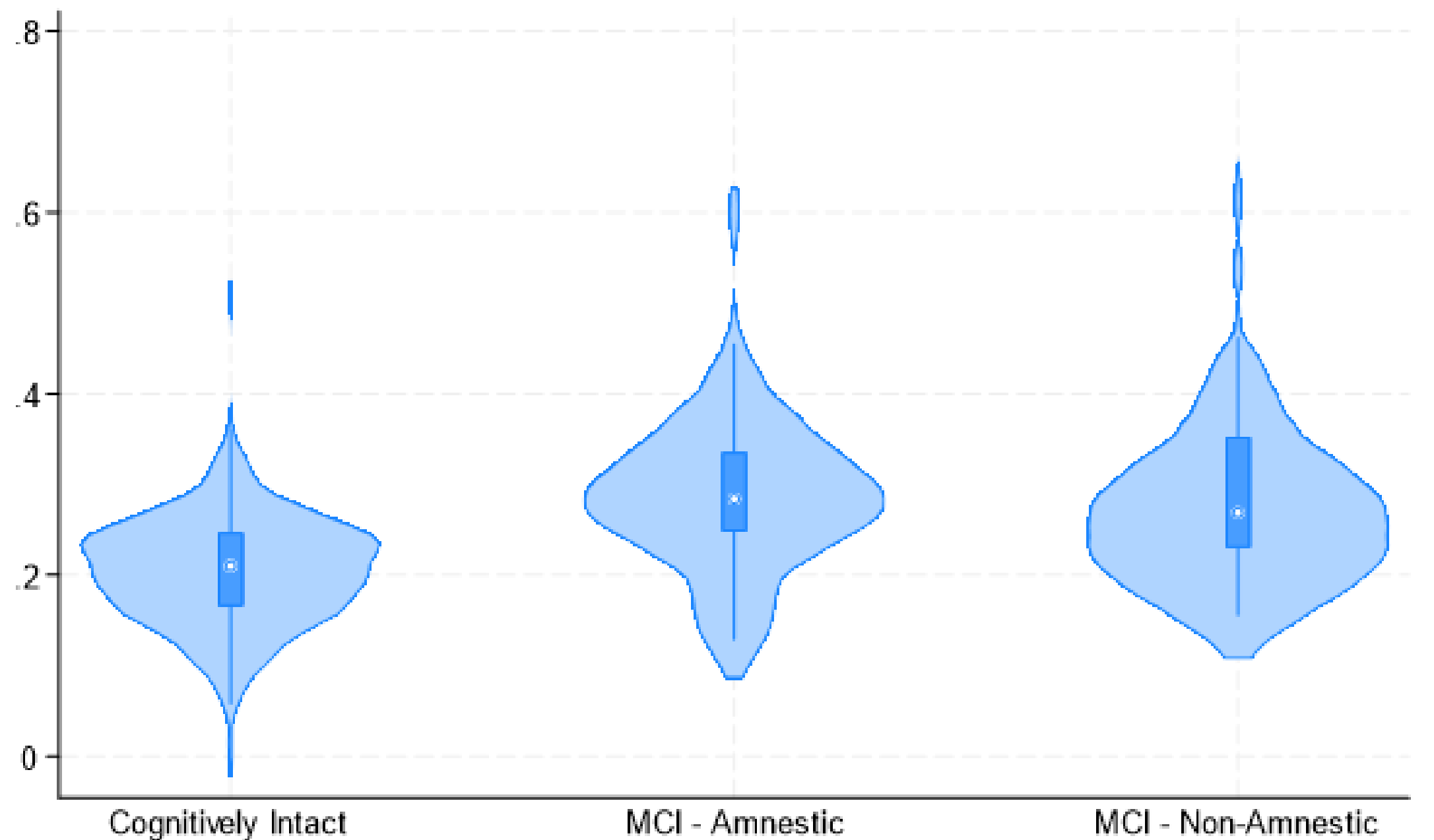


Table 2. Associations Between Speech Score and MCI Status

	Odds Ratio (95% CI)	P-Value
Model 1	1.19 (1.13, 1.26)	< 0.001
Model 2	1.19 (1.12, 1.26)	< 0.001
Model 3	1.21 (1.14, 1.28)	< 0.001
Model 4	1.18 (1.10, 1.26)	< 0.001

Model 1: unadjusted; Model 2: adjusted for age, sex, race, education, living situation, and comorbidity score; Model 3: additionally adjusted for depressive symptoms (N=294); Model 4: additionally adjusted for APOE-ε4 status (N=215)

Figure 2. Differences in Speech Score by MCI Sub-Type



CONCLUSIONS

- A data-driven composite score of acoustic speech features accurately differentiated concurrent MCI status among a clinical sample of middle aged and older adults.
- This score was similar between amnesic and non-amnesic MCI sub-types, suggesting that further refinement is needed to disentangle MCI disease heterogeneity.
- Future studies are needed to validate this score in external cohorts and determine whether acoustic speech features predict the risk of transitioning to MCI.

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