

Lexical and acoustic features in the AD spectrum: a Korean case study

Sung-Woo Kim¹, Junhyuk Louis Kwak², Yejin Kim¹, Seohee Kim¹, Mark Liberman², Min Seok Baek¹, Sunghye Cho²

(1) Department of Neurology, Yonsei University Wonju College of Medicine, Wonju, Korea; (2) Linguistic Data Consortium, University of Pennsylvania, Philadelphia, USA

Introduction

- Prior research has demonstrated that examining speech production provides significant potential for identifying neurodegenerative disease markers, particularly AD and MCI.
- However, studies examining individuals with β -amyloid positivity and/or speakers of languages other than English remain relatively rare, raising concerns about the generalizability of speech and language markers.
- This study addresses the gap.

Methods

- Patients with MCI (n=32) or AD (n=29) and healthy older adults (n=53) completed a brief speech collection protocol. (Table 1)
- β -amyloid positivity was confirmed via visual assessment of ¹⁸F-Florbetaben PET in all patients.
- The groups did not differ in demographic characteristics.
- Among the HC group, 10 participants were β -amyloid positive (HC+), and 43 were negative (HC-).
- Recordings were transcribed using ASR and manually corrected by annotators.
- We extracted lexical (e.g., counts of part-of-speech categories/100words) and acoustic features (e.g., harmonic-to-noise ratio (HNR)) from a picture description task.
- Groups were compared using ANOVA models with post-hoc Tukey's HSD corrections.
- Exploratory analyses compared HC+ and HC- participants.

	HC (N=53)	MCI+ (N=32)	DEM+ (N=29)	p value
Sex				0.281
F	31 (58.5%)	17 (53.1%)	21 (72.4%)	
M	22 (41.5%)	15 (46.9%)	8 (27.6%)	
Age				0.077
Mean (SD)	74.1 (6.2)	77.1 (5.6)	74.2 (7.2)	
Range	60.0 - 87.0	65.0 - 86.0	56.0 - 85.0	
Education				0.109
Mean (SD)	8.8 (3.8)	10.8 (4.3)	9.0 (4.9)	
Range	0.0 - 16.0	2.0 - 20.0	0.0 - 23.0	
MMSE				< 0.001
Mean (SD)	N/A	24.4 (4.0)	19.0 (3.5)	
Range		14.0 - 30.0	12.0 - 26.0	
CDR_SB				< 0.001
Mean (SD)	N/A	4.1 (2.1)	7.8 (3.1)	
Range		0.5 - 11.0	2.0 - 12.0	

Table 1. Acoustic and lexical features with significant group differences.

Results

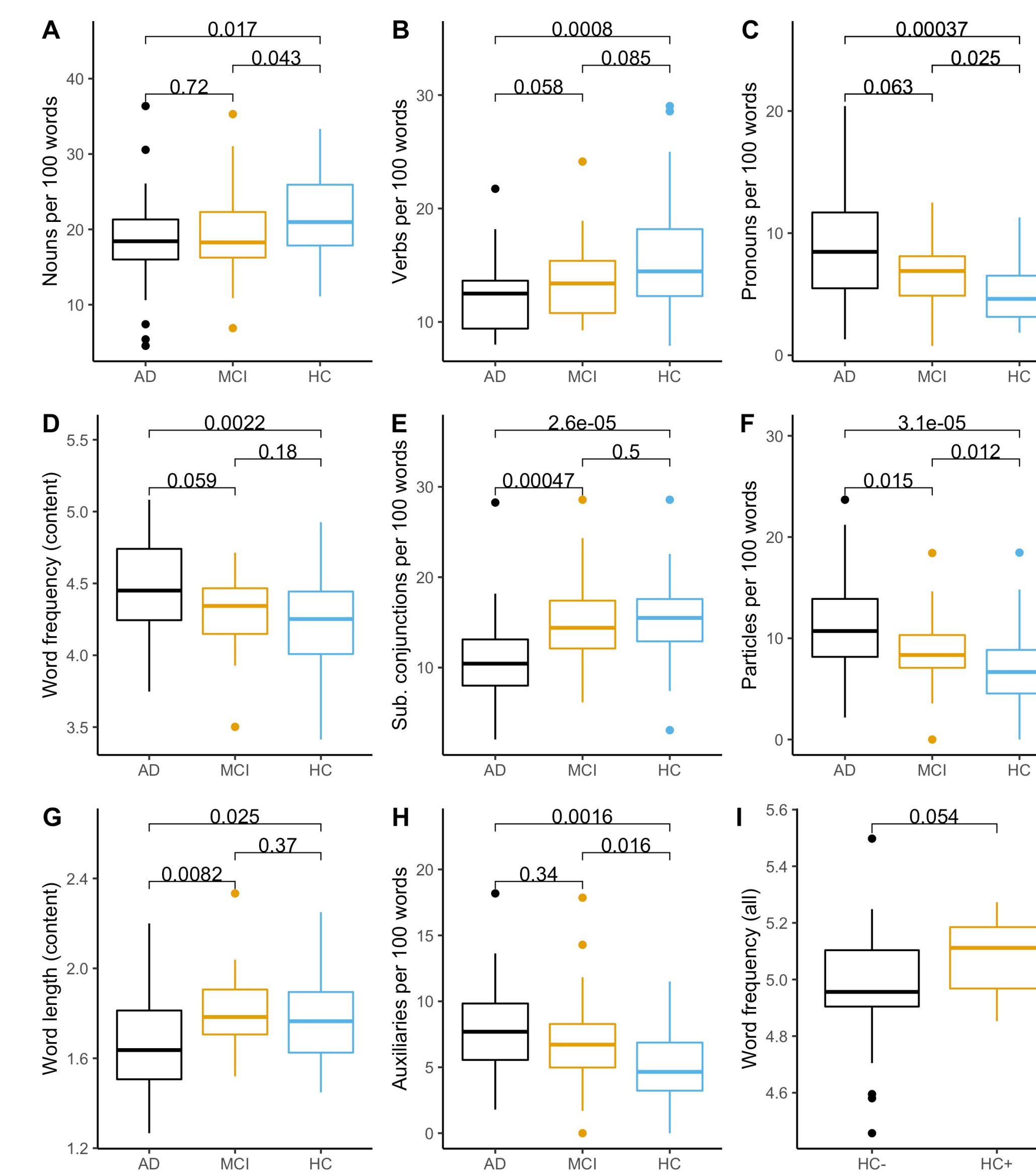


Figure 1. Lexical features with significant group differences.

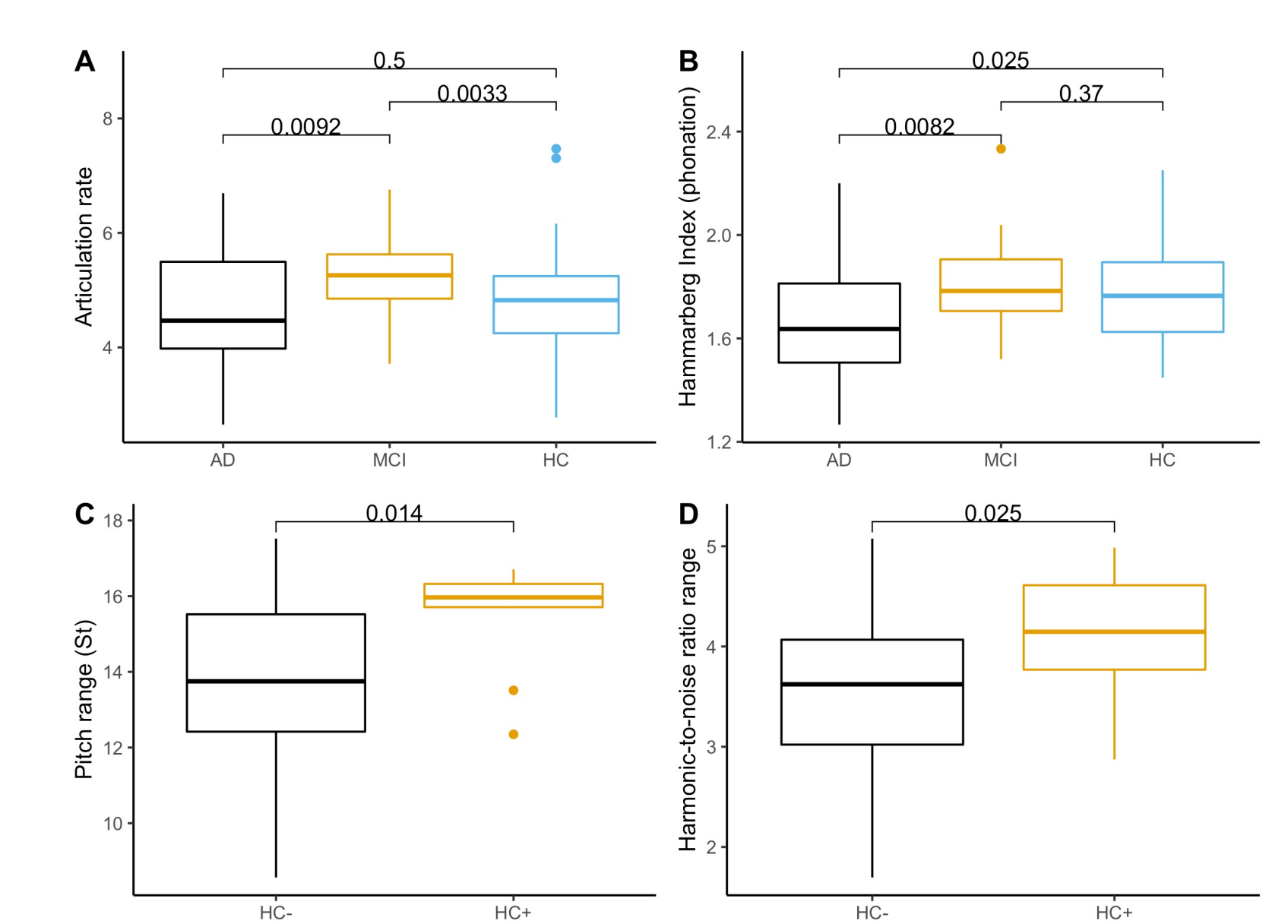


Figure 2. Acoustic features with significant group differences.

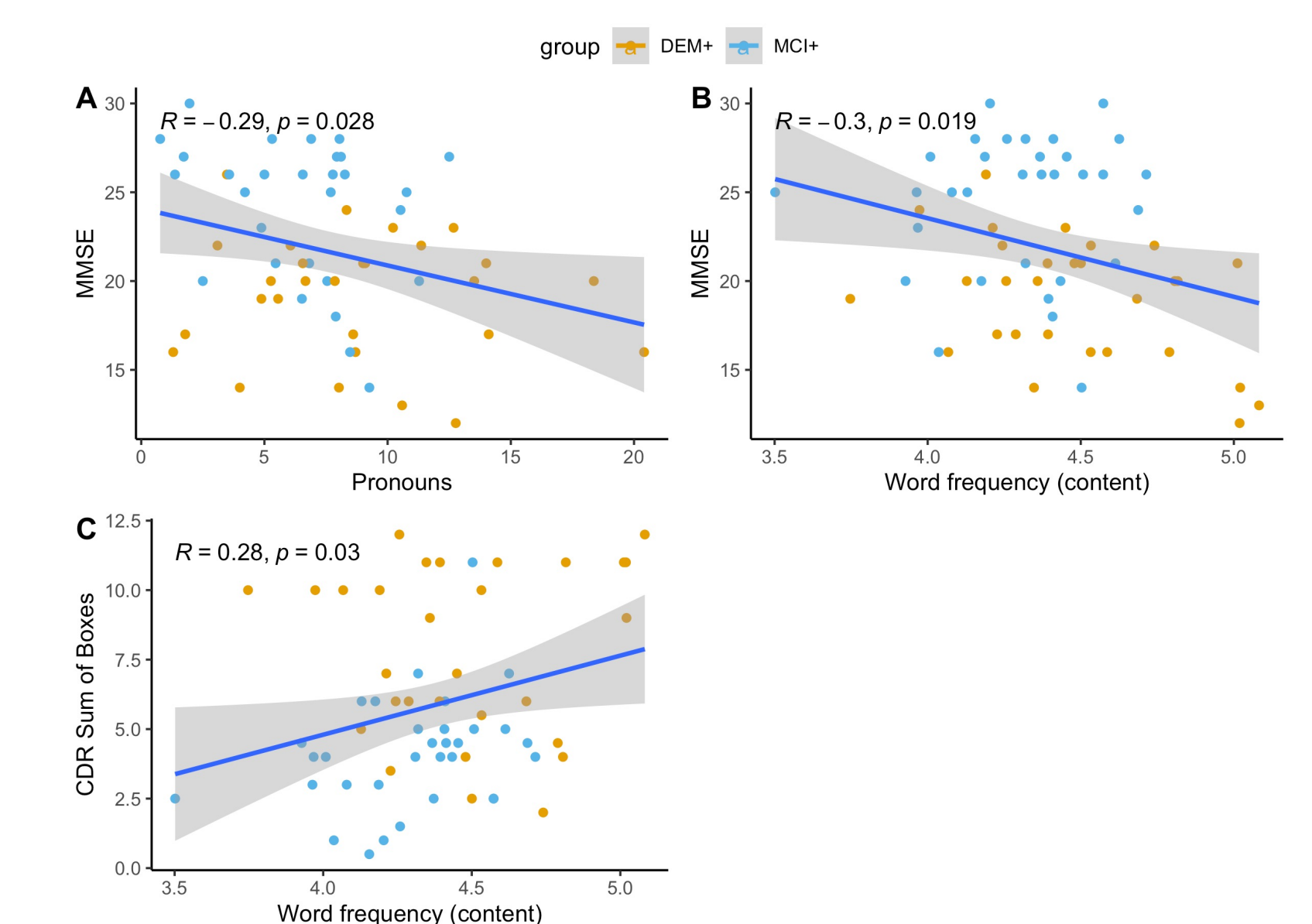


Figure 3. Significant associations with clinical assessment scores.

Discussion & Conclusion

- This study replicates prior findings, supporting the robustness of speech-based markers in AD.
- Moreover, our exploratory analyses found significant differences between HC+ and HC- and highlight the potential of natural speech as an early screening tool for underlying neuropathology.

Acknowledgment

- We deeply thank the participants and their family members who participated in this research, as well as students and administrative staff at the Wonju Severance Hospital and Linguistic Data Consortium.
- This study was funded by the Alzheimer's Association (AARF-21-851126) to SC.