Speech biomarkers in mood disorders: a cross-sectional study

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BACKGROUND: Natural Language Processing approaches based on speech seem to be promising to aid in the early identification of depression[1]. However, there is a lack of studies assessing mood disorders, including both bipolar disorder and major depressive disorder. Thus, this study aims to compare speech biomarkers between individuals with mood disorders and controls.

METHODS

Study design: Cross-sectional study.

Participants: Individuals between the ages of 18-60 years. Mood disorders were diagnosed based on the Mini International Neuropsychiatric Interview for DSM-5.

Speech assessment: The Winterlight Assessment (WLA) → Picture Description. Speech samples were analyzed using signal and natural language processing tools to extract a range of speech features (acoustic and linguistic).
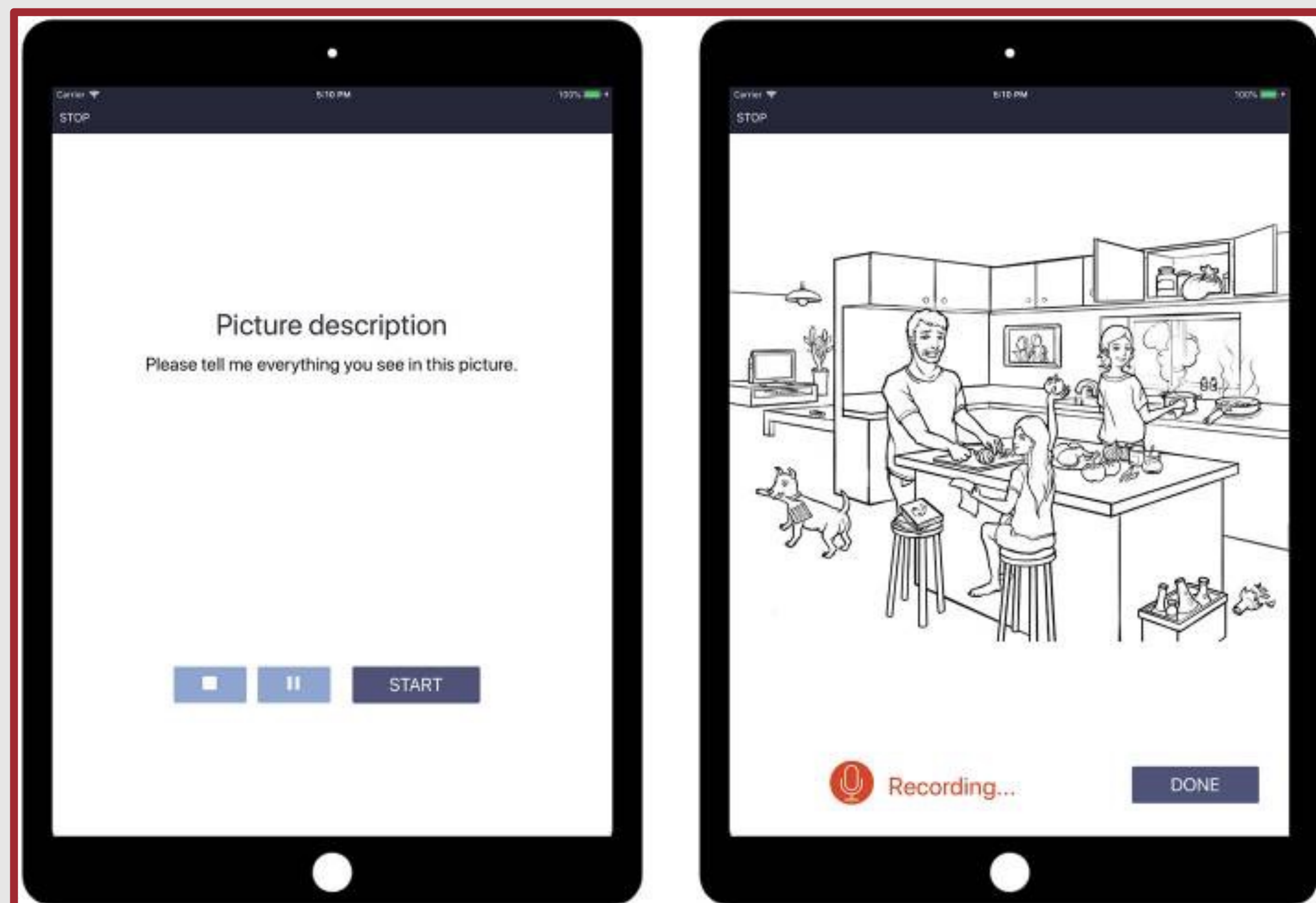
Figure 1: Layout of the picture description task, part of the Winterlight Assessment (WLA)[2].

CONCLUSION: Individuals with mood disorders presented slower speech, fewer function and action words, more content words and less voice variation, indicating that both acoustic and linguistic speech features are helpful to detect mood disorders.

RESULTS

Table 1: Demographic characteristics between groups.

Variables	Controls n= 353	Mood Disorders n= 53	p-value
Sex#			<0.001
Male	164 (46.5%)	10 (18.9%)	
Female	189 (53.5%)	43 (81.1%)	
Age*	33 (27 – 43)	30 (25 – 45.5)	0.560
Years of education*	16 (15 – 17)	17 (13 – 18)	0.314

*Data presented as median (interquartile range) / difference between groups tested using Mann-Whitney U test; #difference between groups tested using chi-squared test.
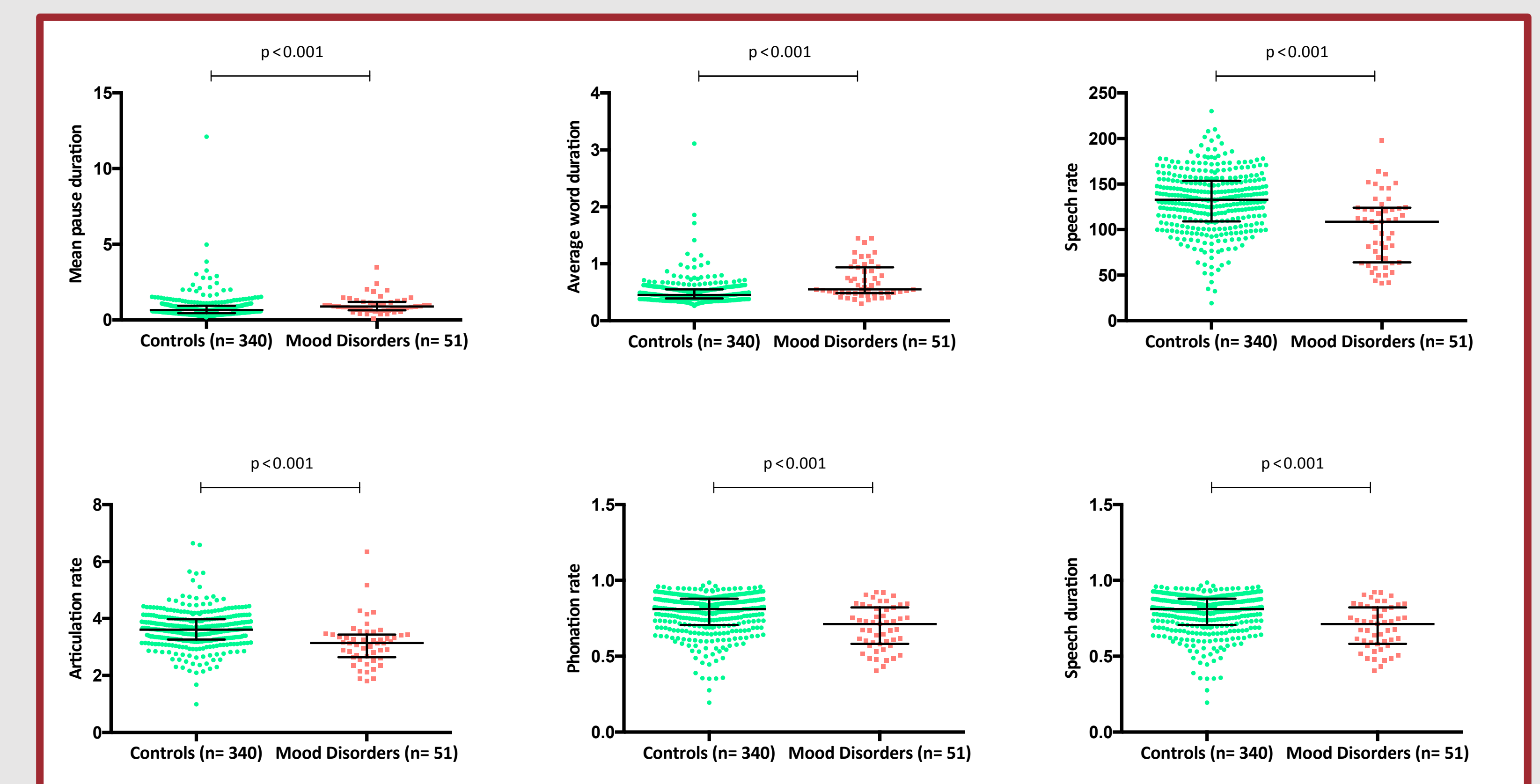
Figure 2: Speech patterns between groups. Data presented as median (interquartile range), and the difference between groups was tested using Mann-Whitney U test.

Individuals with mood disorders also presented:
- greater occurrence of nouns (p<0.001) and greater fundamental frequency median (p=0.021) as compared to controls
- lower occurrence of prepositions (p<0.001), adverbs (p<0.001), auxiliary words (p<0.001), pronouns (p=0.002), and verbs (p=0.007), as well as lower shimmer (p=0.001), and lower fundamental frequency variance (p<0.001) in comparison to controls

References: 1. DeSouza DD, Robin J, Gumus M, Yeung A. Natural Language Processing as an Emerging Tool to Detect Late-Life Depression. Front Psychiatry. 2021 Sep 6;12:719125.
2. Robin J, Xu M, Kaufman LD, Simpson W. Using Digital Speech Assessments to Detect Early Signs of Cognitive Impairment. Front Digit Health. 2021 Oct 27;3:749758.

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