

Characterizing Depressive Symptom Fluctuations using Automated Speech Assessment: a Remote Feasibility Study

Submitter Danielle DeSouza

Affiliation Winterlight Labs

SUBMISSION DETAILS

I agree to provide poster pdf for attendee download. Yes

Poster PDF for download <blank>

What is the Methodological Question Being Addressed? What is the feasibility of using an app to collect daily speech/voice samples remotely, and how do fluctuations in speech/voice map onto depression symptoms?

Introduction Mood symptoms are heterogeneous and fluctuate over time. Previous research has shown that individuals with major depression can be categorized into distinct classes based on how symptoms fluctuate. One barrier to understanding fluctuating symptoms is that repeated clinical assessments are not always feasible and can be burdensome to complete. To overcome this limitation, there has been a growing interest in the use of automated speech assessments to objectively characterize mood symptoms in psychiatric disorders. Speech assessments can be completed remotely, at high-frequency, and are low patient burden. The goal of the current study was to determine the feasibility of remotely collecting daily speech and mood data over a period of one month and to characterize speech fluctuations in the context of depression symptoms.

Methods Daily assessments of speech and mood were completed remotely over a period of one month. Audio recordings in response to an open-ended question asking how participants were feeling were obtained using a speech app and analyzed using signal and natural language processing to derive >500 acoustic and linguistic measures. Daily mood symptoms were separately collected using electronic patient-reported outcome scales, however, for the purpose of this study we have focused on depression symptoms using a 9-item questionnaire based on the Patient Health Questionnaire-9 (PHQ-9). Within-subject variations and relationships between daily speech and depression measures were characterized by plotting mean residual scores, derived for each participant by subtracting individual means from all time points from each daily score. Spearman correlations between speech and depression measures were assessed using data pooled across all time points, and additionally, repeated measures correlations were used to investigate within-individual associations over the daily sessions using the rmcrr R package.

Results Sixteen community-dwelling individuals (5 M, 11 F, mean age \pm SD= 30.75 \pm 9.28) participated in the study, providing approximately 380 audio samples (79% compliance) and 400 mood assessments (83% compliance) over the course of the study. Mean depression scores were 13.07 \pm 9.43. Residual plots confirmed both within- and between-subject variability in depression scores. Significant correlations ($p < 0.0001$, Bonferroni corrected) between speech and depression measures were observed with the strongest correlations being with sentiment valence ($r = -0.50$),

sentiment dominance ($r = -0.40$), and speech rate ($r = -0.33$), indicating moderate to strong relationships. Importantly, intra-individual associations between these three speech features and depression scores over the one month period were also observed ($p < 0.001$).

Conclusion This study supports the feasibility of high-frequency remote speech assessment as a means to understand fluctuating depression symptoms. Speech measures of particular interest in the context of depression include sentiment valence, sentiment dominance, and speech rate. Future studies on larger clinical samples are warranted to determine how speech may potentially inform symptom fluctuations in the context of symptom remission and/or relapse.

Co-Authors

* Presenting Author

First Name	Last Name	Affiliation
Danielle *	DeSouza *	Winterlight Labs
Melisa	Gumus	Winterlight Labs
Celia	Fidalgo	Winterlight Labs
Bill	Simpson	Winterlight Labs
Jessica	Robin	Winterlight Labs

Keywords

Keywords
speech
depression
remote assessment
language
mood

Guidelines I have read and understand the Poster Guidelines

Disclosures One or more authors report potential conflicts which are described in the program.

Related Tables and Supporting Materials <blank>