Multimodal AI Based Facial and Acoustic Biomarkers of Negative Symptoms in Schizophrenia

Submission ID 3000471

SUBMISSION DETAILS

What is the Methodological Question Being Addressed? Can negative symptoms in schizophrenia be meaningfully measured using AI-enabled vocal and facial analysis?

Introduction Negative symptoms are a transdiagnostic feature of mental illness. Current methods of assessing negative symptoms depend on verbal report (clinical interview) from patients and caregivers/informants. These verbal reports lack a systematic and efficient way of incorporating behavioral and biometric observations that are strong indicators of negative symptoms and can be insensitive to change in treatment, subjective, requires extensive training and subject to cultural disparities. Speech behaviors and facial movements can inform clinicians about negative symptoms and include monotone and monosyllabic speech, few gestures, pausing, speech rates, speed of movement of certain facial areas. Facial and speech changes in negative symptom patients are difficult to track and quantify with conventional techniques. A rising number of conversational agents or chatbots are equipped with artificial intelligence (AI) architecture. Can negative symptoms in schizophrenia be meaningfully measured using AI-enabled vocal and facial analysis?

Methods We assessed 20 inpatients at a psychiatric facility in New York, NY. At the first visit, the following instruments were administered (in the same order), including a sociodemographic and clinical questionnaire, AI vocal/speech software, PANSS, BNSS, CDSS, CGI-S, AIMS, SAS, BARS: each patient wase rated twice by the same clinician within a one week period in order to assess for test-retest reliability. The second visit included the AI vocal/speech software, PANSS, BNSS, CDSS, AIMS, SAS, BARS, CGI-S and CGI-I (severity of illness, improvement, and degree of change). For the AI software, participants were each provided a valence-neutral sentence to read; participants then be engaged in free speech where they were asked open ended probes designed to be emotionally-ambiguous in valence and content (e.g., tell me about yourself?). Concurrent, convergent, divergent and discriminative validity were assessed, along with user experience as measured by the SUTAQ (Service User Technology Assessment Questionnaire).

Results 20 individuals (age 41.21 (SD=10.22) with schizophrenia were enrolled. Session duration for the AI software was a mean f 8:36 min (min = 5:01 min, max = 13:35 min). Significant correlations were observed between PANSS Motor Retardation and the AI software speaking rate ($r = -0.787$, $p = 0.020$) and average jaw acceleration ($r = -0.827$, $p = 0.011$), PANSS Active Social Avoidance and diadochokinetic syllable alternating motion rate (DDK-AMR) ($r = -0.850$, $p = 0.007$), PANSS Marder Negative symptom score and speaking rater ($r = -0.851$, $p = 0.007$), BNSS Avolition Internal Experience and articulation/loudness ($r = -0.818$, $p = 0.038$), BNSS Blunted Affect Vocal Expression, and Blunted Affect Expressive Gestures with the AI software speaking rate, articulation rate and DDK-AMR ($r > -0.800$, $p < 0.05$). Most participants (80%) reported satisfaction with the

program.

Conclusion Speech and facial AI technology showed significant correlations with symptoms of clinician based assessments and could aid in negative symptoms assessments. Given the diverse types of data sets, feature extraction, computational methodologies, and evaluation criteria available, AI software can improve diagnostic accuracy and allow remote monitoring. Additional testing on larger sample sizes, reproducibility, and generalizability of the software is warranted.

Co-Authors

* Presenting Author

First Name	Last Name	Affiliation
Anzalee *	Khan *	Manhattan Psychiatric Center; Nathan S. Kline Institute
Jean-Pierre	Lindenmayer	Manhattan Psychiatric Center; Nathan S. Kline Institute; New York University School of Medicine
Saqib	Basir	Manhattan Psychiatric Center
David	Paulter	Modality AI
David	Suendermann-Oeft	Modality AI
Ramanarayanan	Ramanarayanan	Modality AI
Beverly	Insel	Manhattan Psychiatric Center
Christian	Yavorsky	Valis Biosciences, Inc.
Mohan	Parak	Manhattan Psychiatric Center; Nathan S. Kline Institute

Keywords

Keywords
Negative symptoms
Schizophrenia
Artificial Intelligence

Guidelines I have read and understand the Poster Guidelines

Disclosures if applicable <blank>

Related tables <blank>