

Differentiating primary and secondary expressive negative symptoms for remote digital trials using a multimodal dialogue platform

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SUBMISSION DETAILS

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Methodological Issue Being Addressed Primary expressive negative symptoms (PENS) such as alogia, anhedonia and social withdrawal are cardinal features of schizophrenia and are persistent through a patient's lifetime. Pharmacological side effects of antipsychotic treatment in schizophrenia also cause secondary expressive negative symptoms (SENS) that bear a resemblance to symptoms in Parkinson's disease (PD), such as reduced facial expression, bradykinesia and impaired speech. Clinically, PENS and SENS are indistinguishable, but SENS can be ameliorated through correct identification and timely treatment. A delay in identification of SENS features can result in those new symptoms becoming permanent, significantly reducing communication effectiveness for people with schizophrenia. An objective remote patient monitoring (RPM) tool that can distinguish between primary and secondary expressive negative symptoms more reliably than subjective rating scales can therefore be very useful for screening applications in digital clinical trials.

Introduction Here we ask the following research question: Can automatically-extracted speech and facial metrics through a dialogue-based remote patient monitoring platform differentiate between presentations of primary and secondary expressive negative symptoms, beyond any differences relative to healthy control participants?

Methods The data used in this paper was derived from two ongoing studies in collaboration with the Nathan Kline Institute for Psychiatric Research and Purdue University. Both studies were approved by the institutional review boards at the respective institutes. Data from 48 people with schizophrenia (pSz) and primary expressive negative symptoms, 49 people with Parkinson's disease (pPD) -- a proxy cohort for secondary expressive negative symptoms because of the large overlap in clinical presentation -- and 92 healthy controls was included in the study. Audiovisual data was collected via a multimodal dialogue-based remote patient monitoring platform. A virtual agent engaged participants in structured speaking exercises and the platform automatically extracted objective speech and facial metrics through these exercises. Although pSz were on antipsychotic medication, they did not exhibit severe extrapyramidal symptoms / SENS as assessed by the Simpson-Angus Rating Scale (SAS) and the Abnormal Involuntary Movement Scale (AIMS).

Results People with PENS, i.e. pSz, exhibited lower range and velocity of facial motion, slower rate of speaking and poorer voice quality than people with SENS, i.e. pPD, over and above any differences from healthy controls. A logistic regression classifier performed well in classifying people with PENS and SENS based on speech metrics (AUC = 0.87) and facial metrics (AUC = 0.84) alone, but the performance improved when a combination of speech and facial metrics was used

(AUC = 0.93).

Conclusion We find that speech and facial metrics automatically extracted through a dialogue-based RPM platform are useful in distinguishing between PENS and SENS in digital clinical trials, over and above any differences from healthy controls. This paper serves as proof of concept to develop digital phenotypes for primary and secondary expressive negative symptoms in schizophrenia, allowing for timely identification and treatment.

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Guidelines I have read and understand the Poster Guidelines

Disclosures if applicable Authors HK, MN, VaR, OR, JL and ViR were salaried employees of Modality.AI, Inc. when this study was conducted and also hold stock options in the company.