Task-specific sensitivity of digital speech assessment to symptom severity in first-episode psychosis

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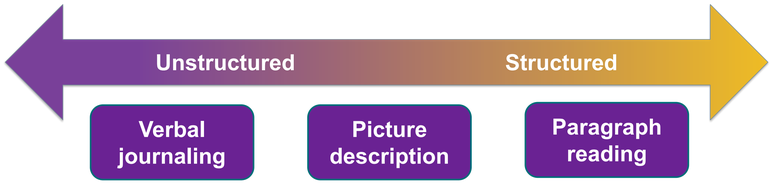
Background

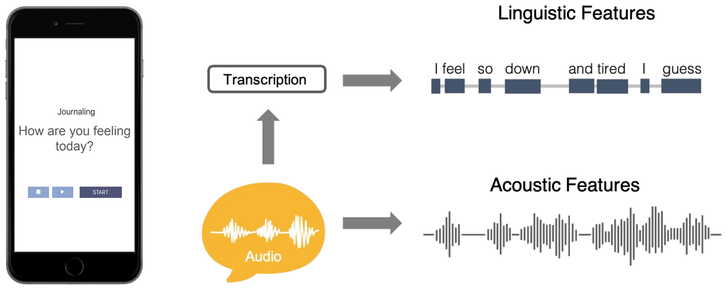
- Alterations in speech and languages are evident in psychotic disorders, reflecting symptoms of formal thought disorder, negative symptoms, and cognitive deficits.
- Computational speech assessment and analysis may enhance clinical care through objective and easy-to-deploy symptom monitoring, particularly in first-episode populations where relapse prediction is crucial for timely intervention.
- ***In the current study, we compared the sensitivity of different speech tasks (open-ended vs. structured) to symptom severity in first-episode psychosis.***

Methods

- 32 first-episode psychosis outpatients underwent clinical assessments and completed three speech tasks from the Winterlight assessment app.



- Participant audio recordings were analyzed using signal and natural language processing (NLP) to extract features capturing different properties of speech: acoustic, timing, lexical, syntactic, discourse, and semantic coherence.



- Associations between clinical scores (BPRS Total, BPRS Positive, SANS Total, SANS anhedonia/asociality, SANS avolition/apathy) and key speech features from each task (7-31 features per task) were examined using Spearman partial correlations adjusted for age and sex.

Participant characteristics

Age	26.43 years (4.91)
Gender	16 men, 16 women
Education	58% with college diploma or above
Diagnosis	15 BD, 10 SSD, 7 unspecified
BPRS Total	31.71 (10.98)
BPRS Positive	6.97 (4.36)
SANS Total	16.71 (15.34)
SANS Anhedonia/Asociality	6.85 (6.28)
SANS Avolition/Apathy	5.80 (5.29)

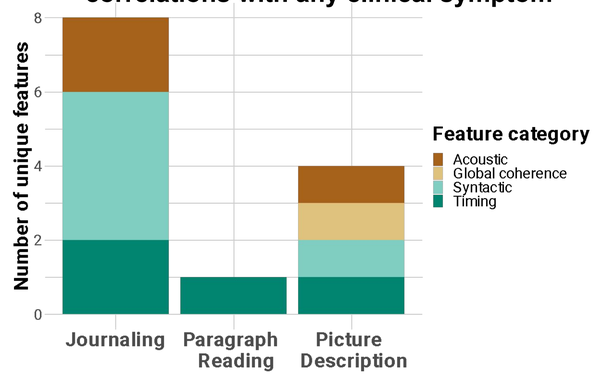
Note. Means and standard deviations are reported where relevant. BPRS = Brief Psychiatric Rating Scale; SANS = Scale for the Assessment of Negative Symptoms; BD = bipolar disorder; SSD = schizophrenia spectrum disorder.

Results

Computational speech features were associated with clinical symptom severity in first-episode psychosis.

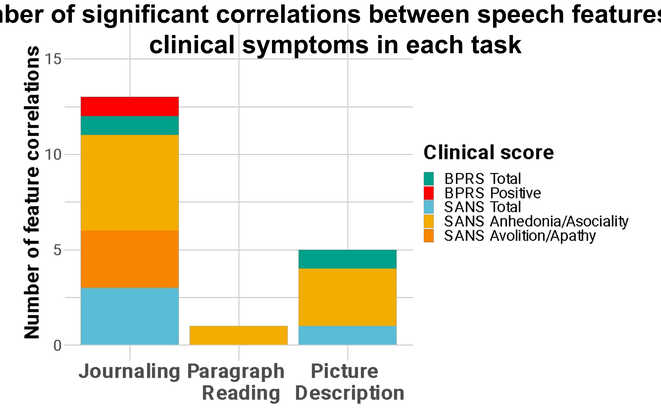
The journaling task was most sensitive to these associations (8/29 features), followed by picture description (4/31 features), and paragraph reading (1/7 features).

Number of unique features in each task showing significant correlations with any clinical symptom



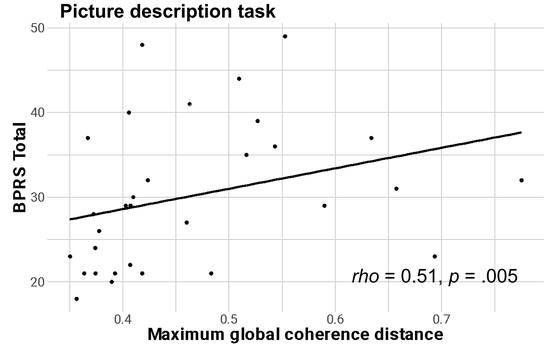
Results

Number of significant correlations between speech features and clinical symptoms in each task

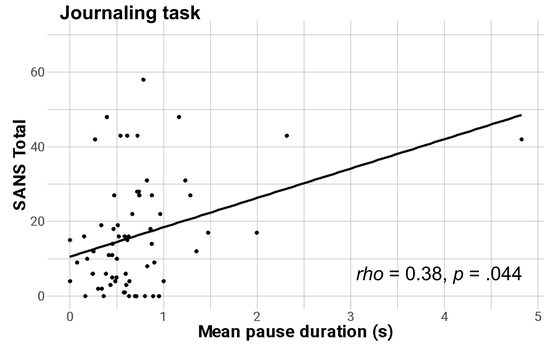


Example correlation results

Picture description task



Journaling task



Conclusions

- Speech features from computerized speech assessments are sensitive to multiple symptom domains in first-episode psychosis. However, more open-ended tasks appear most sensitive to these associations, for both acoustic and linguistic properties of speech.

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