Computational speech & language features for within- & between-subject symptom characterization in first-episode psychosis

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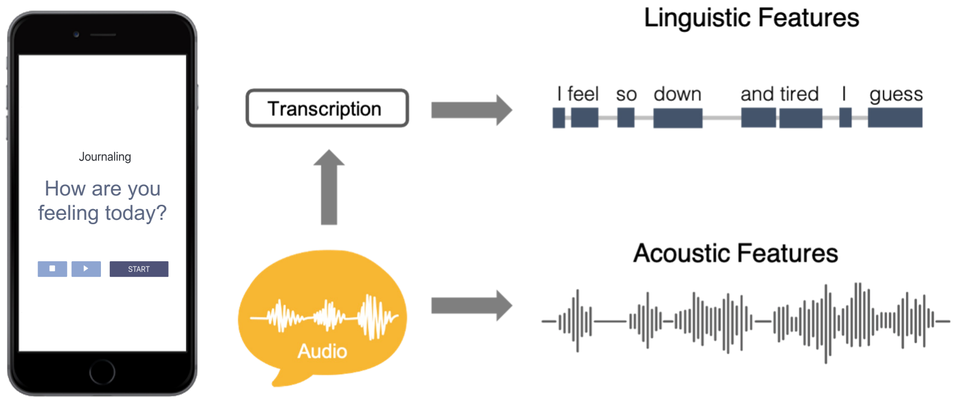
Background

- Alterations in speech and language are evident in psychotic disorders, reflecting positive, negative, and cognitive symptoms.
- Speech assessment and analysis using computerized approaches may help to enhance clinical care by providing objective and easy-to-deploy symptom screening and monitoring.
- These approaches may be particularly useful in first-episode populations, where monitoring symptom exacerbations is crucial for timely intervention and relapse prevention.
- However, it remains unclear whether similar speech & language characteristics are sensitive to symptom severity differences *between* vs. *within* individuals.
- ***Objective**: In the current study, we compared between-subject and within-subject associations between speech and symptom severity in a longitudinal study of first-episode psychosis.*

Methods

- **Participants:** 43 first-episode psychosis outpatients
- **Clinical assessments:** Brief Psychiatric Rating Scale (BPRS), Scale for the Assessment of Negative Symptoms (SANS)
- **Speech tasks (Winterlight Assessment App):** Journaling, Picture Description, Paragraph Reading
- **Visits:** Baseline, 3mo, 6mo, 9mo, 12mo
- **Speech features:** 74 core acoustic and linguistic features extracted for each participant from transcribed speech recordings.



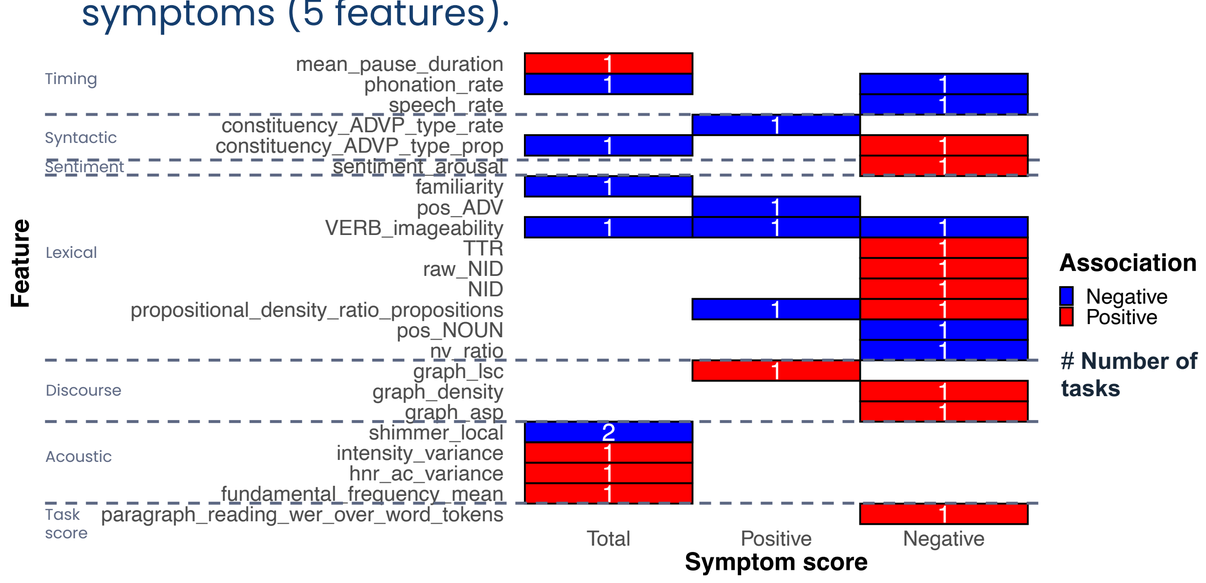
- **Analyses:** Associations between speech features and symptom severity (BPRS Total, BPRS Positive, SANS Total) were examined with linear mixed-effects models controlling for demographic characteristics (age and gender).
- Between-subject effects were estimated using participants' subject-level mean across visits.
- Within-subject effects were estimated using participants' visit-specific deviations from their subject-level mean.

Participant characteristics

Age (*M*, *SD*)	26.4 (5.1)
Gender (n)	Women = 22, Men = 21
DSM-5 diagnosis (n)	16 bipolar I, 1 bipolar II, 11 schizophrenia, 5 schizoaffective, 1 schizophreniform, 9 unspecified
BPRS Total (*M*, *SD*)	30.1 (8.3)
BPRS Positive (*M*, *SD*)	5.9 (2.9)
SANS Total (*M*, *SD*)	10.9 (11.2)

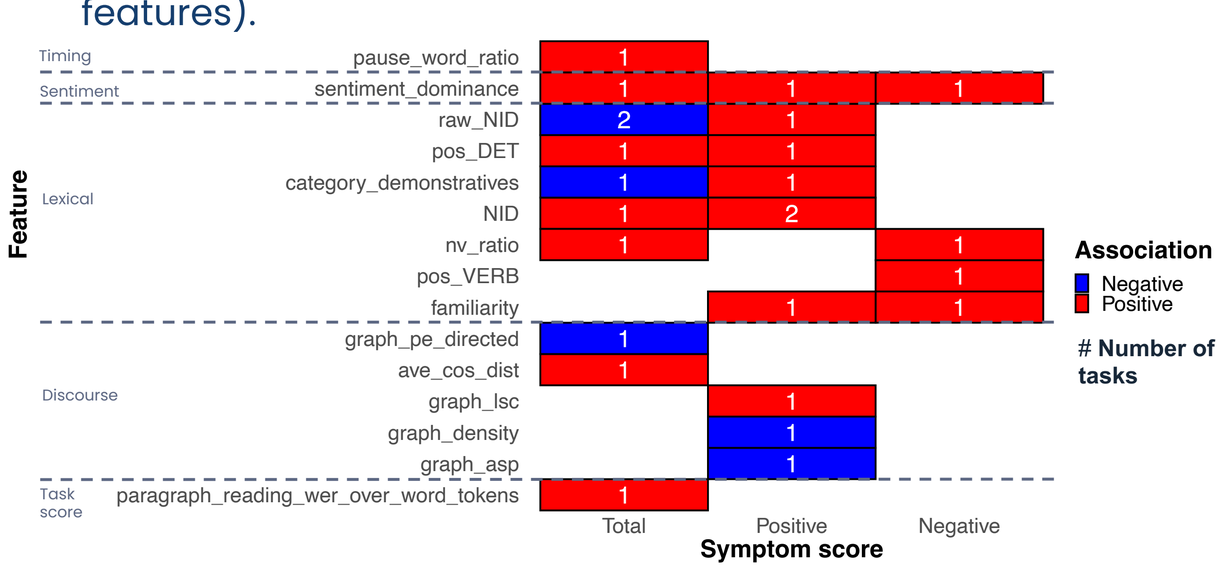
Results: Between-subject associations

- 23 features were significantly associated with symptom severity differences between participants.
- Most associations were with negative symptoms (14 features), followed by global symptoms (9 features), and positive symptoms (5 features).



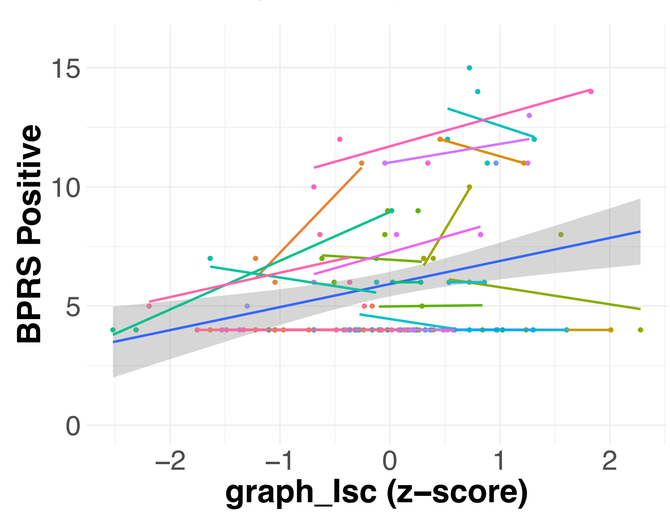
Results: Within-subject associations

- 15 features were associated with symptom severity changes within participants.
- Most associations were with global (10 features) and positive (9 features) symptoms, followed by negative symptoms (4 features).



Results: consistent between- and within-subject associations

- Only one feature had the same relationship with symptom severity when examined *between* and *within* participants: greater speech graph connectivity during the journaling task was associated with greater positive symptom severity.



Conclusions

- Computational speech features are sensitive to symptom severity in first-episode psychosis. Although similar feature categories showed associations with symptom severity between and within subjects, there was little overlap in specific features, suggesting different features may be more appropriate for screening vs. monitoring applications.

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