

Investigating Conversational Speech Latency as a Marker of Cognitive and Temporal Processing During Picture Description Tasks across CNS Conditions

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What is the Methodological Issue Being Addressed? The analytical and clinical validity of automated conversational speech latency as a marker of altered cognitive and psychomotor processing across different clinical populations remains unclear.

Introduction Speech latency in conversational interaction reflects multiple underlying cognitive processes, including response planning, lexical selection and retrieval, executive control, temporal prediction and interpersonal turn-taking. We investigated whether speech latency is sensitive to schizophrenia, depression and mild cognitive impairment (MCI).

Methods A Whisper-based pipeline was used to estimate speech latency—the delay between a prompt and verbal response—from picture-description recordings collected remotely via the Modality dialog-based assessment platform. Automated measures were compared with manual annotations and evaluated across schizophrenia (72 patients and 103 controls), depression (320 participants) and MCI (100 patients and 100 controls) cohorts.

Results In schizophrenia, speech latency discriminated patients from controls (Mann-Whitney U test; Glass' Delta = 0.90, $p < 0.001$) and correlated with PANSS Negative scores (Spearman's $\rho = 0.31$, $p < .001$), BNSS Total ($\rho = 0.22$, $p = 0.019$) and with the Expressive subdomain, which captures blunted affect and alogia ($\rho = 0.20$, $p = 0.028$). In depression, latency was not associated with PHQ-8 severity but differentiated participants with severe depression who were on or off medication (Glass' Delta = 0.98, $p = 0.013$). In MCI, latency did not significantly differentiate patients from controls. Across cohorts, automated measures showed good agreement with manual annotations ($\rho = 0.53$ for schizophrenia, $\rho = 0.64$ for depression, $\rho = 0.80$ for MCI), although effect sizes were generally underestimated.

Conclusion Conversational speech latency may be a condition-sensitive marker of altered cognitive and psychomotor processing rather than a universal psychiatric biomarker. Automated extraction is feasible, but its utility depends on sufficient temporal precision to detect clinically meaningful effects.

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Keywords

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conversational speech latency
cognitive processing
schizophrenia
depression
mild cognitive impairment

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