# Latency distributions in speech during structured psychiatric interviews of patients with bipolar depression: automated speech analysis may provide a simple cognitive biomarker

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**Methodological Issue Being Addressed** Can we extract an objective measure of psychomotor slowing from latency-to-respond to questions during a structured clinical interview?

**Introduction** Cognitive assessments are often used as secondary endpoints but can be costly and burdensome to perform in CNS clinical trials employing multiple outcome measures, several of which may require clinician-administered scales to be performed utilizing a structured psychiatric interview. Here we sought to take advantage of the standardized nature of the structured interview, and utilize automated speech analysis of the recorded interview to derive a measure of psychomotor slowing, and depression severity, based on patient response-time latencies.

**Methods** Speech data was obtained from 274 subjects with a diagnosis of bipolar I depression enrolled in a randomized, double-blind, 6-week Phase 2 clinical trial. Fully automated speech analysis was carried-out on a total of 1,369 available audio recordings of structured Montgomery–Åsberg Depression Rating Scale (MADRS) interviews at Baseline, and across up to 6 weeks of study treatment. Automated speech analytics extracted pause-related parameters during the interviews. In this work, we focused on distributions in speech-latencies between the rater's question and the subject's answer. Speech-latency distributions, from individual subjects, obtained during each interview session were plotted in order to examine their shape for eventual modeling.

**Results** Individual subjects' speech-latency distributions were successfully constructed for all 1,369 interviews. The mean (SD) number of speech-latencies that occurred per interview was 61 (25); 90% of interviews produced between 24 and 104 measurable speech-latencies. Speech-latency distributions for individual subject-interviews were right-skewed with values for mode, median, and mean of 0.74, 1.4, 1.9 seconds (0.8, 0.70, 1.0 sd), respectively. Speech-latency distributions exhibited a 0.5 second slowing (effect size, 0.6) between sessions during remission (MADRS ≤12) compared to not in remission (MADRS >12).

**Conclusion** The present findings reveal that neurophysiological speech parameters with face-validity can be derived from audio recordings of psychiatric interviews without the added patient burden of a dedicated neuropsychological test. The integration of these measures into traditional clinical interviews may potentially serve as cognitive biomarkers, with potential relationships to functional status, holding valuable insight into a person's cognitive function and

wider mental and physical well-being. Measures of speech slowing might be included as secondary outcome measures in analysis plans of future clinical trial protocols evaluating novel treatments for depression.

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## Keywords


| Keywords |
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| speech |
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**Disclosures** Drs. Hopkins, Ogirala, Tomioka, Piacentino, Milanovic, Szabo, and Koblan are employees of Sunovion Pharmaceuticals, Inc. Drs. Rodriguez, Kirkpatrick, and Cohen report no additional conflicts of interest beyond funding for this project by Sunovion Pharmaceuticals Inc. Dr. Opler is an employee of WCG Clinical Inc, which has a contract with Sunovion.

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