Language and Psychosis: Tightening the Association

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This special issue of DISCOURSE in Psychosis focuses on the role of language in psychosis, including the relationships between formal thought disorder and conceptual disorganization, with speech and language markers and the neural mechanisms underlying these features in psychosis. It also covers the application of computational techniques in the study of language in psychosis, as well as the potential for using speech and language data for digital phenotyping in psychiatry.

Key words: discourse/artificial intelligence/clinical trials/phenomenology/psychopathology/linguistics/psycholinguistics

Introduction

A historically well-grounded notion of psychosis is that it is a thought disorder ("loosening of association") expressed via speech and other communicative behaviors. Nevertheless, the idea that places speech and language at the core of the concept of psychosis has yet to be fully harnessed for clinical benefit. Newer quantitative methods of speech assessment and analysis have been the primary drivers of the recent growth in studies of speech and language in psychosis over the last decade. These new data-driven techniques promise a level of objectivity and sensitivity that clinical rating approaches lack.[1] Automated assessment and analysis of speech, through computational phenotyping or Natural Language Processing (NLP), has provided unprecedented granularity to studying language aberrations. Combined with advanced machine learning approaches, NLP and speech processing technologies have injected a great deal of enthusiasm[2] for offering measurement-based care in an era of digital health. The growing field of computational psychiatry also provides a well-laid bridge between neuroscience and behavior, offering new opportunities to uncover neural mechanisms behind deviant language in psychosis. Language-related measurements are now seen as a key data class for digital phenotyping in psychiatry. Since speech and language are the closest reflection of thoughts, ongoing research now focuses on harnessing these new approaches to address longstanding issues including better diagnostic methods, better symptom tracking, and prognostic use.[1–3] The time is ripe to organize ourselves in the field of schizophrenia research to utilize the growing momentum and methodological diversity. Given this backdrop, we introduce this special issue from Diverse International Scientific Consortium for Research in Thought, Language, and Communication in Psychosis (DISCOURSE in Psychosis) to all multidisciplinary researchers with a shared interest in language as an object of study in psychosis.

This issue begins with studies that attempt to relate established concepts of "formal thought disorder" and "conceptual disorganization" to granular outputs of computational phenotyping. Tang et al[4] report a 3-factor structure of quantitative speech variables, drawing parallels with formal thought disorder (FTD), but notably in a cross-diagnostic sample. The cross-diagnostic approach also reveals distinct neural correlates of thought disorder (Maderthaner et al[5]). Limongi et al[6] pursue the neural correlates using a computational psychiatry approach: they first show that "disorganization" is a latent construct that can be modeled using automated measures in

a generative framework (active inference), and then link this to neural dysconnectivity (in the salience network) among patients experiencing first-episode psychosis.

On the diagnostics/classification front, various components of speech and language show merit as markers of psychotic disorders. While examining *acoustics* alone is unlikely to yield a universally applicable profile for schizophrenia (Parola et al[7]), focusing on the *semantic* relationships among the concepts that people talk about (entities) may provide incremental information relevant to illness stage and symptom burden (Nettekoven et al[8]). Despite the higher density of entities, they take longer to recur in speech samples from patients with schizophrenia (Palominos et al[9]). Combining semantic and acoustic features from the same speech samples enhances our ability to characterize schizophrenia (Voppel et al[10]) while anomalies in *syntactic* structure capture sex-specific differences among patients (Ciampelli et al[11]). Language variables that reflect the conceptualization of speech (including *sentiment* analysis) go beyond identifying schizophrenia from bipolar disorder; they also explain significant inter-individual differences in neurocognitive scores, functional competency, and social skills among patients (Voleti et al[12]). These studies provide us with the means to harness the prowess of computerized speech analysis, while calling for concerted efforts to build benchmark clinical datasets capturing the cross-linguistic and sociodemographic diversity[13] in human language.

Large-scale utilization of language analysis has the power to transform psychosis research by enriching phenomenology, improving cultural and economic inclusivity, and leveraging state-of-art informatics to study lifetime trajectories of psychotic disorders. As highlighted in this issue, the cogent use of automation and machine learning methods together can provide new, noninvasive markers for more precise psychopathology, positioning language analysis as one of the most promising objective tools for psychosis research. Key challenges for using these for clinical care include identifying common assessment/analysis frameworks, addressing unique confounds in this field (eg, differences in spoken language, interview context),[14] engaging with patients' needs and preferences, and supporting a proactive data-sharing policy.[15]

After several decades of interest and intent, the time is now ripe to overcome these challenges and conduct large-scale international studies that return language to its rightful place—at the core of assessing and treating psychosis. The ultimate goal of this endeavor is to discover better treatments and improve long-term outcomes. This requires rigorous mechanistic work to understand the causal pathways behind language disruptions, in order to identify therapeutic targets that can alleviate them. With determination, ingenuity and collective effort, we can unlock the true potential of this exciting field and pave the way for a brighter future for patients and families.

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