Title: Perception and Interpretation of Prosody in Children with ASD: A Visual-World Paradigm

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Introduction: Spoken language conveys a wide range of information other than words or sentences, such as intonation, rhythm, stress. These features are collectively referred to as “prosody” and are an indispensable part of spoken language because it fulfills grammatical, semantic, and pragmatic functions. Atypical prosody has been frequently identified in individuals with ASD. These deficits tend to persist and affect long-term social communicative competence. Unfortunately, most research on prosody has primarily focused on expressive abilities. Receptive prosody remains poorly understood and no objective measure is available to assess receptive prosody in this population. This project aims to a) develop an eye-tracking paradigm to assess the perception of prosody in children with ASD, b) compare the perception and processing of specific prosodic cues across groups of typically developing (TD) children and children with ASD, and c) examine associations among the perception of prosody and broader social communication skills. Developing an objective measure of the perception of prosody is a key step in accurately identifying specific prosodic deficits and evaluating how they relate to social-communication deficits in ASD more broadly.

Method: Twenty-four typically developing children and twenty-four children with ASD between the age of 8 and 14 were recruited and participated in this study. Their ability to perceive and process a specific prosodic cue, contrastive pitch accent (CPA), is evaluated in two experimental tasks. The first task is an AX Discrimination Task designed as a control task to assess participants’ ability to discriminate phrases with or without contrastive pitch accent. The second task is an eye-tracking task adapted from the Visual World Paradigm and is designed to assess participants’ online processing of CPA. On each trial, they were instructed to look for specific items on an image while listening to sentences with manipulated prosody so that CPA was context-appropriate on half of the trials and context-inappropriate in the other half. Previous studies have shown that context-appropriate use of CPA accelerates participants’ visual search (i.e. “facilitative effect”) whereas context-inappropriate use of CPA delays one’s search (i.e. “garden-path” effect). To understand the functional impact of the perception of specific prosody cues, we also assessed children with ASD using a range of proximal and distal measures on 1) receptive prosody (PEPS-C), 2) expressive prosody (PEPS-C), 3) pragmatic language skills (CELF Metalinguistics), and 4) social communication functions (SRS). Participants’ performances on the eye-tracking task will be used as an index of their sensitivity to specific prosodic cues and will be correlated with their performances on the broader social communication assessments.

Results: Participants in both groups reached ceiling in the AX Discrimination task, which suggests that participants were able to discriminate CPA on an auditory-perceptual level. In the Visual-World eye-tracking task, children with ASD demonstrated qualitatively similar visual search patterns with TD children and showed garden-path effect when CPA was used inappropriately in sentences. However, we did observe a delay in fixations to target items and poorer maintenance to target items across all conditions in children with ASD compared to TD children. Children with ASD also performed significantly worse on a semi-standardized assessment on prosody (PEPS-C) compared to TD children.

Discussion: Overall, these findings suggest that children with ASD are sensitive to specific prosodic cues when processing linguistic information on both auditory-perceptual and cognitive-linguistic levels. However, the delay in their visual search and the lower maintenance rate during the eye-tracking paradigm suggest that their ability to process prosodic information may come at a cost of attentional and cognitive resources. Additionally, the discrepant finding that children with ASD are sensitive to specific prosodic cues during online processing but performed significantly worse on a semi-standardized prosody measure highlights the need for additional research to improve assessment of prosody to understand the type and the magnitude of receptive prosodic deficits in this population.
References:


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