Patterns of Interactional Prosody in Youth with and without Autism

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Nigel G. Ward, Jonatan M. Contreras, Heike Lehnert-LeHouillier

Background: Difficulties in social interaction and communication are defining features of autism, with prosodic differences often implicated. However, investigations of prosody in those with ASD have focused mostly on aspects relating to emotional and linguistic functions (Marchi et al, 2018), and the ways in which autistic people differ in the interactional aspects of prosody remain poorly understood.

Recent work in prosody modeling has developed the notion of ``prosodic construction'': a temporal configuration of multiple acoustic-prosodic features --- pitch, intensity, lengthening, reduction, voicing properties, and others --- that serves a specific function or family of functions (Ogden 2010, Niebuhr et al 2013). In English, prosodic constructions serve many functions relating to turn taking, topic management, information structure, speech acts, and the expression of stance (Ward 2019). Computational methods have been developed, notably including the application of Principal Component Analysis (PCA) to multiple robustly computed features over a corpus, for the automatic identification of common dimensions of variation. These generally correspond to meaningful prosodic constructions, and support analysis of differences in construction form and frequency of use across subpopulations (Ward & Gallardo, 2017).

Objective: In this exploratory study, we aim to identify ways in which interactional prosody differs between youth with ASD and their neurotypical peers.

Methods: From the NMSU corpus of autistic and neurotypical dialogs (Lenhert-LeHouillier et al, 2020), we selected 10 dialogs from each, totaling 83 and 72 minutes, respectively, whose recording conditions supported automatic analysis. In these dialogs, confederates engaged children and adolescents between the ages of 9 and 15 years (ASD mean = 12.66, NT mean = 12.57) in dialogs seeking to find differences in a pair of pictures. Applying PCA to 212 features computed across 400,000+ overlapping samples from each group's data, we examined the top 8 dimensions derived for each group, accounting for 44% and 33% of the variance, respectively. We noted differences between the constructions found and differences in the detailed forms.

Results: Contrary to our expectation, the youth with ASD exhibited prosodic patterns marking many of the same functions as the NT youth, including those used to mark contrast and correction, factual versus affective or personal stance, and topic keeping versus topic transitions. However there were often salient differences in the realization of these patterns. For contrast and corrections, for example, these included atypically strong use of high pitch and lengthening, marking with atypical features such as high harmonicity, and marking on only the content word rather than using the usual wider pattern. We also noted tendencies to not always use the typical prosody appropriate for the context, meaning that at such times the speaker's intent was often unclear. Further, we noted many cases of apparently non-functional and possibly uncontrolled occurrences of prosodic features, including wide pitch range, lengthening, and loudness.

Conclusions: The youth with ASD exhibited use of many of the prosodic patterns involved in pragmatic and interactional functions, but in many cases they were realized differently.