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Paper Title: Audiovisual Speech Processing and Language are Linked in Children with Autism Spectrum Disorder

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Introduction: Explaining individual differences in the language ability of children with autism spectrum disorder (ASD) is a top priority of research because language has been repeatedly linked with long-term social, academic, and vocational outcomes in this clinical population. Theory and findings from past research suggest that attention to, and processing of, the redundant multisensory cues inherent to audiovisual speech may account for variability in language understanding and use in children with ASD. The high demands of experimental tasks used in prior work, however, have limited many past investigations of audiovisual speech processing and perception in ASD to older and high-functioning children. This study explores the association between audiovisual speech processing and language in children with ASD who represent a broader range of ages, cognitive abilities, and language levels by using low demand biobehavioral measures.

Methods: Data processing is ongoing; preliminary analyses were conducted on 25 school-age (i.e., 5-12 year old) children with ASD and 25 typically developing (TD) peers matched on chronological age and biological sex. Participants completed a passive EEG task, during which we collected event-related potentials (ERPs) in response to audiovisual (AV) and auditory only (AO) syllables (e.g., "ba"). ERP analyses focused on the P2 amplitude (i.e., the amplitude of a positive deflection peaking ~200ms after the onset of a speech stimulus in children) in response to AV and AO stimuli, which our prior work found to be acceptably stable in children with ASD (see Study 1 of the present symposium). An Eyelink 1000 plus eye tracker was used to control stimulus presentation and to monitor selective attention to areas of interest (i.e., eye and mouth regions of the talking face) during AV speech. A battery of norm-referenced and standardized language assessments, including the Receptive- and Expressive- One Word Picture Vocabulary Tests (ROWPVT and EOWPVT) was collected concurrently.

Results: P2 amplitudes were significantly reduced for AV versus AO speech across groups ($p < 0.001$; this finding is consistent with increased efficiency of processing on average for AV versus AO speech according to prior literature), but mean P2 amplitude suppression did not significantly differ between groups. Children were, however, highly heterogeneous in P2 amplitude suppression, and the degree of suppression experienced for AV versus AO speech was related to degree of both receptive and expressive language impairment across groups (e.g., zero order correlations = 0.41 and 0.24 for associations between P2 amplitude suppression and ROWPVT and EOWPVT scores, respectively). These relations do not vary according to group (p values for product terms in regression models testing moderated effects > .05). Participants also attended significantly more to the mouth (the source of multisensory redundancy) versus eyes during AV speech across groups ($p = 0.033$). Mean attention to the mouth did not significantly differ between groups ($p > .05$). The relation between attention to the mouth and language level, however, varied by group (p values for product terms in moderation models for receptive and expressive language = 0.058 and 0.059, respectively), such that looking to the mouth was more strongly associated with language ability in children with ASD than TD controls.

Discussion: Preliminary results provide some empirical support for the theory that disruptions in multisensory speech processing are linked with language ability in children with ASD. Additional work is necessary, however, to establish the direction and causal nature of associations observed here. If results hold in the context of longitudinal studies, biobehavioral measures of audiovisual speech processing and attention to audiovisual speech, in particular ERPs and measures of eye gaze, may hold some promise for predicting language in children with ASD. Implications for research and practice, as well as future directions for research, will be discussed.

References/Citations:

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