Title: Relations between Metrics of Multisensory Integration, Communication, and Broader Autism Symptom Severity in Children with and without Autism Spectrum Disorder

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Introduction: Past research indicates that many children with autism spectrum disorder (ASD) show differences in multisensory integration compared to their typically developing (TD) peers. For example, relative to TD controls, children with ASD on average have shown a reduced magnitude of integration in response to multisensory illusions, such as the McGurk Effect (wherein incongruent multisensory speech such as audio “ba” and visual “ga” often leads to the perception of a fused percept such as “da” in TD individuals). Children with ASD on average have additionally been observed to show extended temporal binding windows (TBWs; the period of time over which individuals tend to perceive multisensory stimuli as occurring at the same time or having arisen from the same event) in comparison to TD peers. These differences in magnitude of multisensory integration and temporal binding of multisensory stimuli are most robust in response to complex (i.e., speech syllables) stimuli. It has been proposed that the aforementioned differences in multisensory integration may underlie broader autism and related symptomatology, particularly differences in communication, in children with ASD. As a first step in testing this theory, the present study evaluates the extent to which several metrics of multisensory integration for complex speech stimuli relate to concurrent measures of autism symptom severity and communication skill (the first criteria for inferring a causal link).

Method: Eighteen children with ASD and 18 chronological age- and sex-matched TD peers participated in the present study. Participants completed a battery of psychophysical tasks that assess multisensory integration, including the McGurk task (wherein participants were presented with an audio “ba” dubbed onto a visual “ga” and asked to report their perception) and a speech syllable simultaneity judgment task (wherein auditory and visual speech components were presented synchronously and at a range of stimulus onset asynchronies, and participants were asked to report whether they perceived them to occur at the same time or different time). The derived metrics of audiovisual integration included the number of reported McGurk illusions and TBW for speech stimuli. Participants’ parents completed surveys that quantified concurrent communication ability (Vineland Adaptive Behavior Scales-2 [VABS-2]) and broader autism symptom severity (Autism Spectrum Quotient [AQ] and Social Responsiveness Survey-2 [SRS-2]).

Results: Preliminary results indicate that metrics of multisensory integration of audiovisual speech are associated with indices of ASD symptomatology. For example, the number of perceived McGurk illusions correlated with autism symptom severity as measured by the SRS-2 total score ($r = -0.38$), as well as receptive communication ($r = 0.41$) and overall communication ($r = 0.43$) as indexed by the VABS-2, across groups. Several associations between metrics of multisensory integration and ASD symptomatology, however, were moderated by diagnostic group ($p$ values for group x metric of multisensory integration product terms in the multiple regression models testing relations of interest $< .05$). For example, the perception of McGurk illusions and TBWs for audiovisual speech were positively correlated with expressive communication in the ASD group ($rs = 0.76$ and $0.57$, respectively) but nonsignificantly correlated with expressive communication in the TD group ($rs = -0.11$ and $-0.39$, respectively). Final results will be presented at the conference.

Discussion: This work is among the first to comprehensively evaluate relations between metrics of audiovisual multisensory integration, autism symptom severity, and communication skill in children with ASD. Findings suggest that multisensory integration for more complex and/or social speech stimuli is linked with communication ability and broader autism symptom severity, at least in children with ASD. Additional work is needed to determine whether differences in multisensory speech perception temporally precede, or are causally related to, symptomatology in children affected by ASD.
References/Citations:

