Title: Audiovisual Multisensory Integration in Children with Autism Spectrum Disorder: Associations with Broader Symptomatology

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Introduction: Sensory differences, in particular differences in audiovisual integration, have been well documented in children with autism spectrum disorder (ASD) and are hypothesized to potentially underlie the core- and related-deficits observed in this clinical population. However, the extant literature is presently limited by a lack of studies that (a) compare groups across levels of stimulus complexity (social vs non-social stimuli specifically), and (b) explore associations between metrics of audiovisual integration and the broad range of ASD and related symptoms. The proposed study will attempt to address these gaps by (a) comparing children with ASD and well-matched controls on tasks tapping multisensory integration across both social and non-social stimuli, (b) evaluating associations between metrics of audiovisual integration and measures of core and related ASD symptoms, including language and intellectual ability, and (c) evaluating whether the aforementioned associations vary according to group.

Method: At present, 54 participants aged 8 to 18 years old have participated in this study, 31 with ASD (74% male, $M_{age} = 155.7$ mo) and 23 typically-developing (TD) controls (61% male, $M_{age} = 141.1$ mo). Recruitment is nearing completion, and it is anticipated that final results based on 70 participants ($n = 35$ in each group, matched on sex and chronological age) will be presented at the Gatlinburg Conference. Participants completed a battery of psychophysical tasks that assess multisensory integration in response to social stimuli, via a task based on the McGurk illusion (wherein participants are presented with an audio “ba” dubbed onto a visual “ga”, which elicits an illusory percept of “da” or “tha” upon integration) and in response to non-social stimuli, via a task based on the sound induced flash illusion (SIFI; wherein one visual flash is presented with two auditory beeps at a range of stimulus onset asynchronies, which elicits an illusory flash percept upon integration). The derived metrics of audiovisual integration included the number of reported McGurk illusions and the number of reported SIFI illusions at a 50ms auditory delay. Participants’ parents completed surveys that quantified concurrent autism symptom severity (Social Communication Questionnaire [SCQ] and Social Responsiveness Survey-2 [SRS-2]), as well as social and communication ability (Vineland Adaptive Behavior Scales-2). Participants also completed a neuropsychological battery that included the Leiter International Performance Scale-3 (a measure of nonverbal intelligence), the Receptive and Expressive One-Word Picture Vocabulary tests, and the Clinical Evaluation of Language Fundamentals. To answer the first research question, a 2 (group; ASD, TD) by 2 (social vs. non-social) ANOVA was carried out. To answer the second and third research question, a series of multiple regression analyses was conducted.

Results: The 2 (group) by 2 (social vs. non-social) ANOVA indicated that there was a significant main effect of group, $F(1, 31) = 18.7, p < 0.001$. On average across stimulus types, individuals in the ASD group perceived significantly fewer multisensory illusions than the TD group, $t = -3.64, p < 0.001$. There was also a marginal main effect of stimulus type, $F(1, 31) = 4.12, p = 0.051$. On average across groups, there was a trend toward perceiving more illusions in response to social (McGurk) than non-social (SIFI) stimuli, $t = 1.83, p = 0.072$. There was no significant group x stimulus type interaction. Of the metrics derived from multisensory tasks, only integration in response to social (McGurk) stimuli significantly correlated with the clinical metrics, correcting for multiple comparisons. Rate of perceived fusion on the McGurk task was significantly associated with autism symptom severity as measured by the SCQ and SRS-2, communication abilities, socialization abilities, nonverbal IQ, overall language ability, receptive language ability, expressive language ability, expressive vocabulary, and receptive vocabulary with moderate to large effect sizes (with absolute values for zero-order correlations across groups ranging from 0.40-0.50). None of the aforementioned associations were moderated by group ($p$ values for interaction term in multiple regression models $> .05$).
**Discussion:** This study is among the first to comprehensively evaluate multisensory integration in children with ASD. Results suggest that children with ASD show a reduced magnitude of multisensory integration across both social and non-social stimuli, but that diminished integration of social stimuli specifically may be most strongly linked with ASD and related symptomatology. Implications for research, theory, and practice will be discussed.

**References/Citations:**