Title: Eye Gaze Patterns Correlate with Vocal Complexity and Language Development in Infants at High- and Low-Risk for Autism Spectrum Disorder

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Introduction: Theory and recent research suggest that attention to audiovisual speech cues may be useful for predicting vocal complexity and broader spoken language development. Specifically, typically developing infants shift their gaze from the eyes to the mouth of a speaker in the second half of the first year of life and again in the second year of life, presumably to facilitate integration of the auditory and visual elements of speech. These shifts appear to correspond with the timing of qualitative changes in prelinguistic and linguistic development, such as the onset of canonical babbling and the vocabulary burst. Gaze patterns to audiovisual speech differ in children who are diagnosed with or at heightened risk for autism spectrum disorder (ASD) relative to their typically developing (TD) or lower risk peers. The present project is evaluating whether individual differences in gaze to audiovisual speech are related to differences in vocal complexity and vocabulary in infants at high risk (i.e., siblings of children diagnosed with ASD) and relatively low risk (i.e., siblings of TD children) for ASD.

Methods: Participants were recruited from a larger, longitudinal study of infants at high- and low-risk for ASD from primarily English-speaking households. Gaze patterns to eye versus mouth regions of the face were measured as infants viewed videos of a woman speaking in infant-directed speech in their native language (English). Concurrent vocal complexity was measured with two full-day audio recordings collected on consecutive days using LENA digital language processors and in the context of the Communication and Symbolic Behavior Scales (CSBS). Concurrent word use and understanding was measured with the MacArthur-Bates Communication Development Inventories (MB-CDI).

Results: Preliminary results from our pilot sample of 13 low risk infants, aged 5-25 months ($M_{age} = 14.4$ months, 6 males) indicate that eye gaze patterns to audiovisual speech is associated with several indices of vocal complexity and vocabulary, with large effects. For example, time looking to mouth correlated with canonical syllabic communication (i.e., the proportion of intentional communication acts that include a canonical syllable; $r(12) = 0.60, p = 0.040$), consonant inventory ($r(12) = 0.62, p = 0.031$), receptive vocabulary ($r(13) = 0.73, p = 0.005$), and expressive vocabulary ($r(13) = 0.62, p = 0.023$). Data collection on high risk infants is ongoing but will be complete prior to the Gatlinburg conference.

Discussion: Preliminary findings suggest that eye gaze patterns to audiovisual speech hold some promise for predicting prelinguistic and linguistic development. We hypothesize that a greater amount of time looking to the mouth region will additionally be associated with greater vocal complexity and a larger vocabulary in infants at high risk for ASD. If our hypotheses are born out, we will have identified a novel measure that may facilitate earlier identification of language impairments in infants at heightened risk for ASD.

References: