Title: Joint Attention Gaze and Gesture Use in Infants at High-Risk for Autism

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Introduction: Given evidence that early identification of autism spectrum disorder (ASD) and targeted intervention leads to improved outcomes, identifying behaviors that serve as early indicators of ASD in the first years of life is important to target high-risk children who would benefit most from intervention. Children with fragile X syndrome (FXS) and infant siblings of children with ASD (ASIBs) are two groups who have a higher risk of ASD due to an unknown familial influence or comorbidity (50-75% and 18% respectively). Impairment in joint attention (JA), particularly in three-point gaze shifts and gestures to direct others’ attention, is characteristic of children with ASD as well as these children who are at-risk for ASD (Veness et al., 2014). Previous studies document deficits in both areas of JA throughout the second year of life for children who are later diagnosed with ASD (Barbaro & Dissanayake, 2013); however, few analyze these behaviors earlier than 15 months. The purpose of this study was to analyze the frequency of JA gaze shifts and gestures in children with FXS and ASIBs, compared to typically developing peers. The study also sought to determine whether these two JA behaviors were predictive of ASD symptom severity at 24 months.

Method: Participants were forty-nine 12-month-old males (mean age=12.59) divided into three groups: typically developing infants (n=16, mean age=12.26), infants with FXS (n=12, mean age=12.72), and ASIB infants (n=21, mean age=12.78). The frequency of JA gaze shifts and gestures were collected using the keys task of the Laboratory Temperament Assessment Battery designed to measure object attention. Joint attention gaze shifts were defined as three-point gaze shifts during which the participant looks from the keys to an examiner or parent and back to the keys to direct their attention to the keys. Gestures were defined using the Communication and Symbolic Behavior Scales (Wetherby & Prizant, 2002). All occurrences of JA gaze shifts and gestures were coded by two researchers who established a ≥ 80 percent inter-rater agreement on three consecutive videos. Reliability was maintained by a master coder who coded 20 percent of the videos with a Cohen’s kappa coefficient of 0.90 across all codes. Developmental level at 12 months was controlled across participants using an early learning composite score from the Mullen Scales of Early Learning. Participants’ ASD severity scores at 24 months were collected using the Autism Diagnosis Observation Scale – Second Edition, which was administered by research reliable staff members.

Results: Analyses showed that mean frequencies of JA gaze shifts were relatively similar for the typically developing (M = 2.94), FXS (M = 1.83), and ASIB (M = 2.24) groups. Similarly, there was not a huge difference in mean frequencies of JA gestures between typically developing (M = 2.69), FXS (M = 1.42), and ASIB (M = 2.62) groups. Two one-way ANCOVAs were conducted to analyze possible significant differences between the three groups of infants for frequency of JA gaze shifts and JA gestures while controlling for developmental level. For frequency of JA gaze shifts, no significant difference was found between the three groups, F(2, 45)=0.18, p=.60. For frequency of JA gestures, no significant difference was found between the three groups, F(2, 45)=0.51, p=.60. Regression analyses showed that there was no effect of JA gaze shift or JA gesture frequency across ASIB and FXS groups at 12 months on ASD symptom severity at 24 months controlling for developmental level.

Discussion: There were no group differences found for frequencies of JA gaze shifts and gestures at 12 months with no relationship of either of these behaviors with later ASD outcomes at 24 months. The lack of significant differences in the high-risk groups compared to the typically developing peers is interesting, because it suggests that high-risk infants are not yet experiencing impairments in JA behaviors at 12 months compared to their typically developing peers, despite previous literature finding significant differences at 15 months and older. The potential lack of differences could also be explained by the task used to collect each group’s mean frequencies. The Lab-Tab keys task focuses on infants’ attention to an object as opposed to social engagement, which limits the amount of opportunities for initiation of JA. The finding that JA gaze shifts and gestures at 12 months are not predictors of later ASD severity at 24 months also suggests that the first year of life might be too early to see any clear JA impairments that lead to later ASD severity. One potential explanation for this finding is that the present study focused on high-risk infants rather than focusing solely on ASD outcomes; therefore, although there is a great sample size of high-risk infants, there is a limited number of children who actually receive ASD diagnoses. Future directions for JA research on high-risk infants include increasing the sample size, analyzing JA behaviors in a social context, and determining the developmental trajectory of JA in each of the groups. Further research is needed to distinguish early differences in JA behavior and determine what point in development JA behaviors can be predictive of ASD.