Introduction: Impairments in visual object attention have been identified as a significant predictor of social functioning relative to autism spectrum disorders (ASD). Infants with an older sibling diagnosed with autism (ASIBs) are at high genetic risk for developing ASD in addition to infants with fragile X syndrome (FXS). Both of these high-risk groups have been found to demonstrate impairments in their object attention in infancy; however, their impairments have yet to be examined from a cross-syndrome approach. The present study examines object attention trajectories across 9 to 24 months in infants with FXS and infant ASIBs based on their ASD diagnostic outcomes in relationship to typically developing same-aged peers. Additionally, the present study examines if these early object attention trajectories are predictive of later ASD diagnoses.

Method: Participants included 25 infant males with FXS (10 with FXS and 15 with FXS+ASD), 25 infant males with an older sibling with autism (ASIBs; 17 ASIBs and 8 ASIBs+ASD) and typically developing infant males (TD; n=28) assessed at 9, 12, and 24 months of age. A toy play epoch from the Laboratory Temperament Assessment Battery (LabTAB; Goldsmith & Rothbart, 1996) was used to measure proportion of object attention toward a set of toy keys. Behaviors were coded offline with a kappa of 0.85 using Observer XT 10.5. The Mullen was utilized to derive quotients for verbal (VDQ) and nonverbal (NVDQ) functioning to control for variations in developmental level across groups. The Autism Diagnostic Observation Schedule-2 was utilized to obtain an autism severity score at 24-months. Clinical Best Estimate (CBE) diagnoses were utilized to differentiate the FXS and ASIB groups based on their diagnostic outcomes and were determined by expert clinicians based on several measures including development, behavioral questionnaires, family/medical history, and gold standard measures for ASD.

Results: Piecewise multilevel models were utilized to estimate how object attention changes across 9 to 12 and 9 to 24 months of age while controlling for VDQ and NVDQ across the 4 groups of participants in comparison to their TD peers. Results of the model suggest infants with FXS+ASD ($\beta$=31.22, $SE$=11.35, t=2.75, $p=0.006$) and infant ASIBs+ASD ($\beta$=19.83 $SE$=10.96, t=1.81, $p=0.071$) demonstrate significant increases in their object attention between 9 and 12 months compared to their TD peers. Infants with FXS and infant ASIBs did not demonstrate significant changes in their object attention between 9 and 12 months of age in relation to their TD peers. Conversely, infants with FXS ($\beta$=-26.69, $SE$=13.80, t=-1.93, $p=0.054$) and infant ASIBs ($\beta$=-20.78, $SE$=10.25, $t$=2.03, $p=0.043$) demonstrate marginally significant and significant declines in their object attention from 9 to 24 months in comparison to their TD peers. Infant ASIBs+ASD and infants with FXS+ASD did not demonstrate significant changes in their object attention across 9 to 24 months of age.

Two ANOVA models were utilized to examine differences in infants at high-risk for ASD trajectories of object attention based on their diagnostic outcomes. For participants change in object attention from 9 to 12 months, no significant group differences were found, $F(1,47)=0.46, p=0.501$, partial $\eta^2= 0.01$. For participants change in object attention from 9 to 24 months, significant group differences were found, $F(1,47)=4.53, p=0.039$, partial $\eta^2= 0.09$. Specifically, the high-risk infants who did not develop ASD demonstrated a decrease in their object attention ($M$=-5.56, $SD=2.26$), whereas high-risk infants who did develop ASD demonstrated an increase in their object attention across 9 to 24 months of age ($M=0.91, SD=2.26$).

Discussion: Object attention impairments appear to emerge as early as nine months of age in infants at high genetic risk for ASD across two distinct etiologies. Impairments in object attention can vary across the FXS and ASIB groups depending on their ASD diagnostic outcomes. Specifically, object attention increased overtime with the added ASD diagnosis in contrast to decreasing over time without the added diagnosis. Overall, Infants with FXS and infant ASIBs demonstrated remarkably similar object attention profiles regardless of ASD outcomes and despite them being etiologically distinct. These impaired object attention trajectories across 9 to 24 months are predictive of ASD outcomes and increased symptomology, suggesting the need for early intervention in an attempt to improve clinical outcomes.
References/Citations: