



Background

- Among individuals diagnosed with Autism Spectrum Disorders (ASD), approximately 87% and 95% have motor and sensory impairments, respectively^{1,2}.
- However, the relationship between motor and sensory impairments is not well known in ASD. Hypersensitivity and restrictive and repetitive behaviors have been shown to correlate³ and it is thought that impaired sensory processing in children with ASD impedes interactions with their surroundings leading to motor abnormalities^{4,5}. Yet, little research has been done to understand how sensory and motor impairments may be related in the first year of life.
- To study this relationship, we will be looking at infants with older siblings diagnosed with ASD because approximately 20% of them meet criteria for ASD diagnosis by 3 years of age⁶. Understanding the motor and sensory development of these high risk infants during their first year of life can provide an opportunity to prospectively study the relationship between sensory and motor impairments and identify early markers for ASD.

Objectives

- To understand the relationship between gross motor development and sensory processing in high-risk infants (HR) compared to low risk infants (LR).

Methods

- Participants:** 41 HR infants, defined as those with at least one older sibling with an ASD diagnosis, and 15 LR infants, defined as those with an older sibling but no family history of ASD.
- Measures:**
 - Alberta Infant Motor Scale (AIMS) is an observational, norm-referenced, standardized assessment with 58 items assessing motor skills at prone, supine, sit and stand positions.
 - Sensory Profile (SP2) is a caregiver questionnaire with items assessing infants' and toddlers' sensory processing. SP2's domains used in this study include general and sensitivity categories.
 - Infant-Toddler Social and Emotional Assessment (ITSEA) is standardized norm referenced caregiver form that measures the social emotional problems and competencies of children.
- Analysis:** We used ANOVA test and correlation analysis to evaluate the relationship between the motor and sensory scores of HR and LR infants at 3, 6, 9 and 12 months.

Results

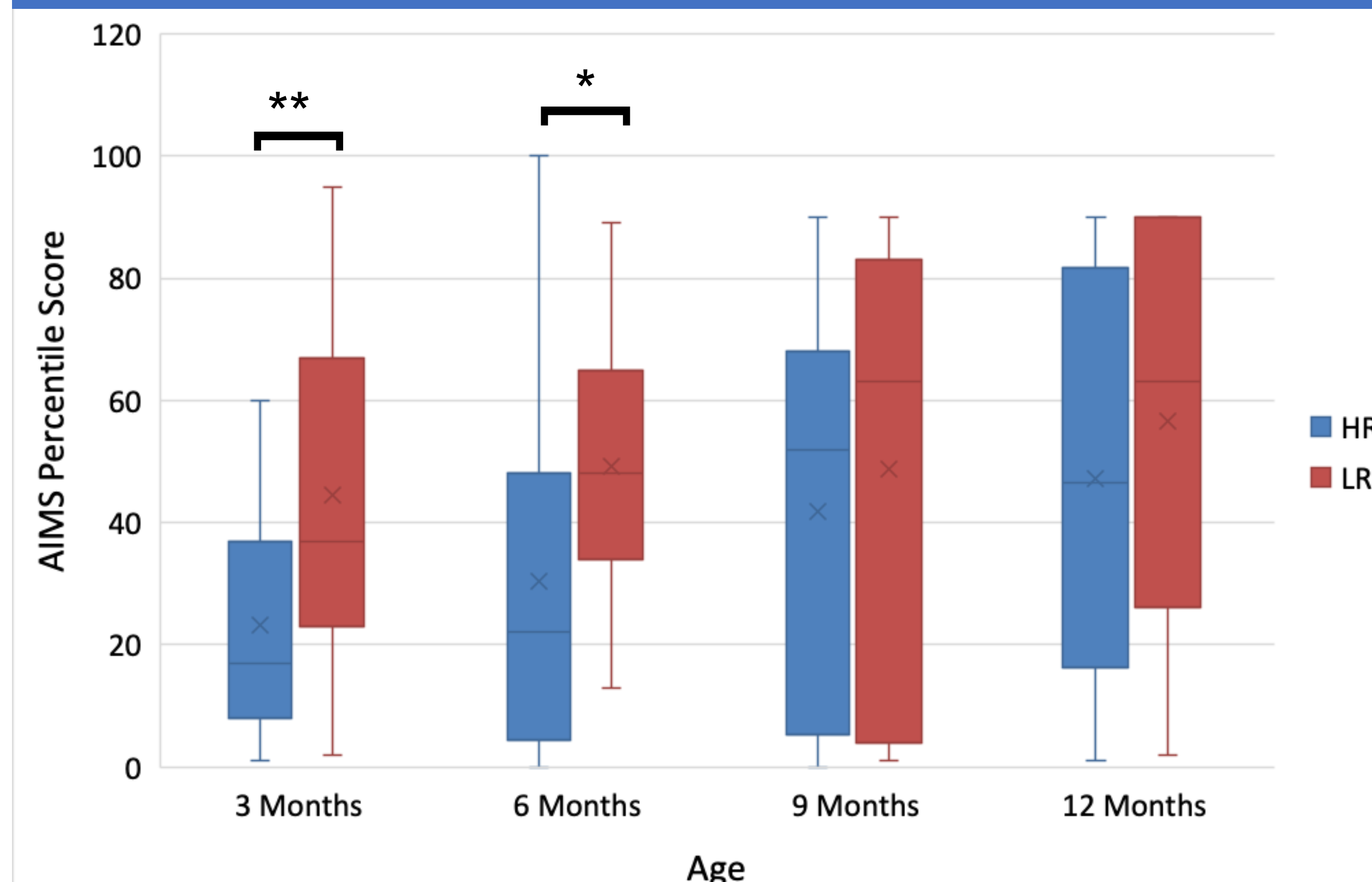


Figure 1: AIMS percentile score for HR and LR infants at 3, 6, 9 and 12 months: statistically significant difference between HR and LR groups' AIMS percentile scores at 3 months ($p < 0.01$) and 6 months ($p < 0.05$).

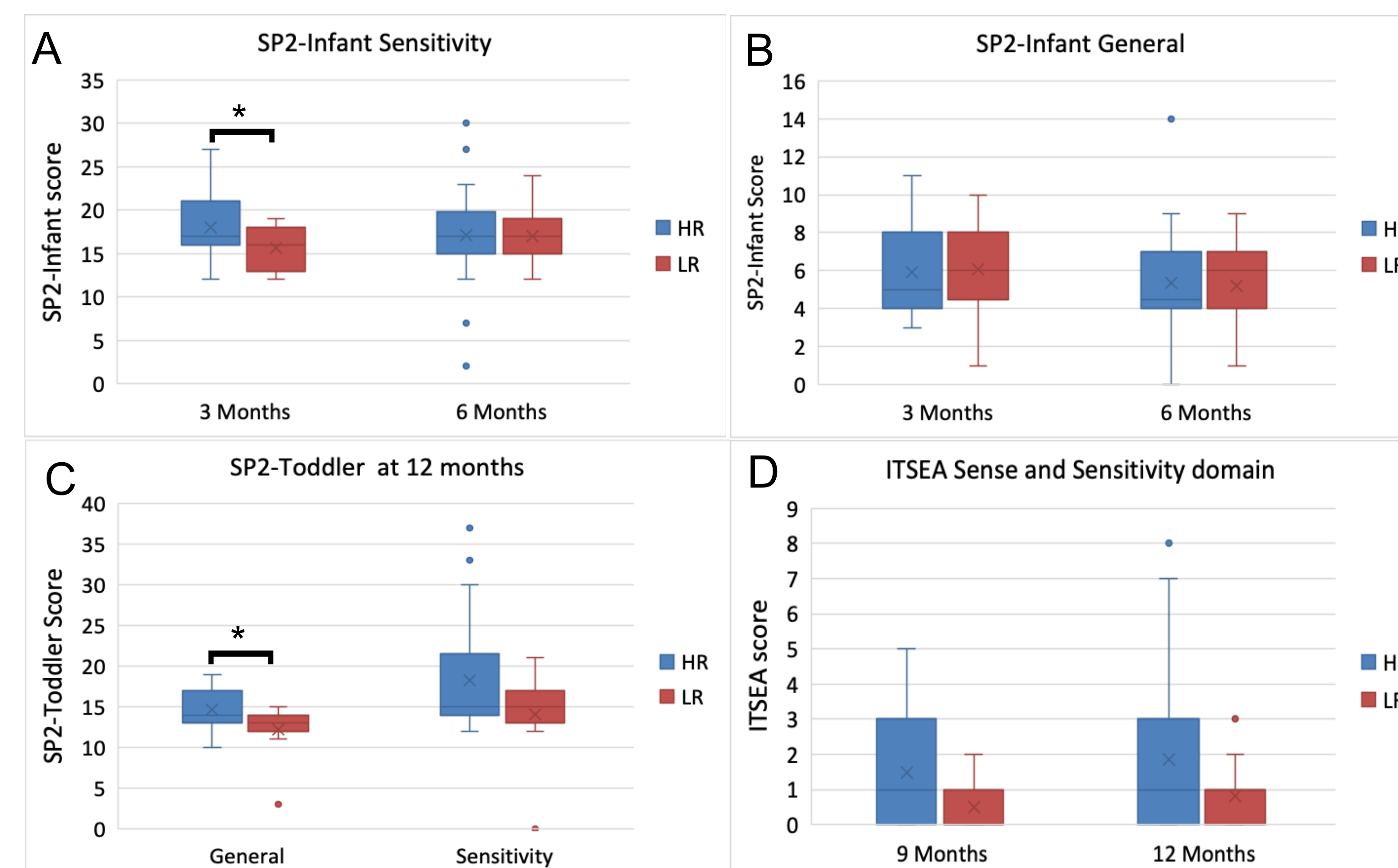
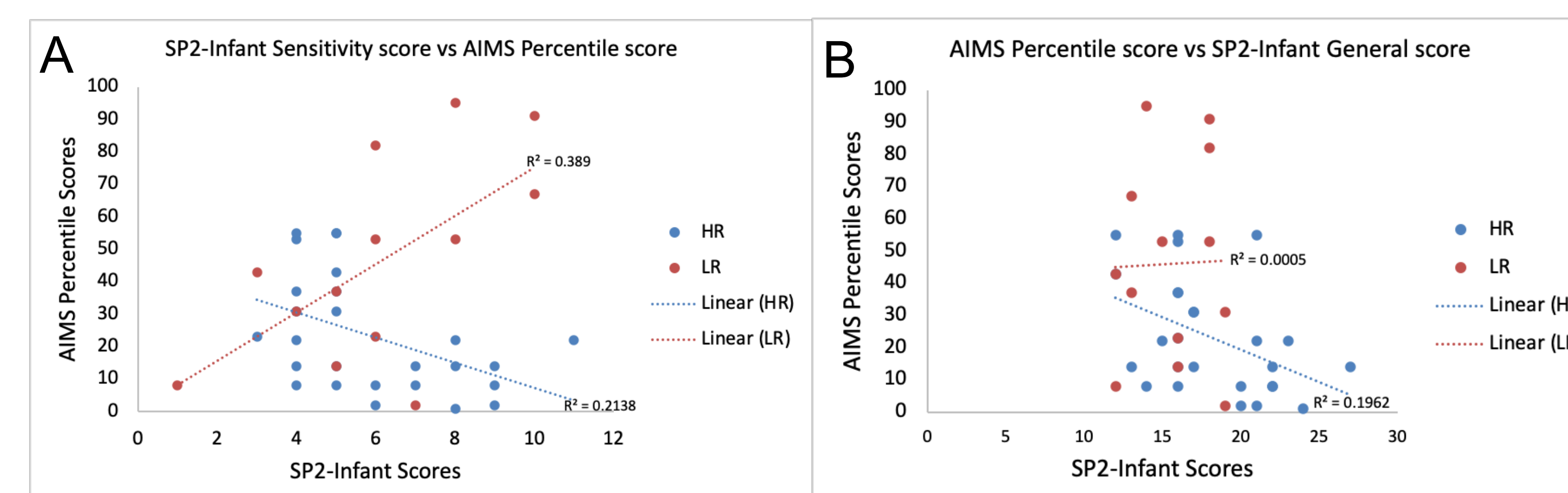


Figure 2: Sensory measure scores for HR and LR infants at 3, 6, 9 and 12 months: there are statistically significant differences between HR and LR groups' for A) SP2 infant sensitivity score scores at 3 months and C) SP2-toddler general score at 12 months ($p < 0.05$).



SP2 Domain	Risk	Coefficient r	N	T statistic	DF	P-value
General	HR	-0.443	26	2.420	24	0.023*
	LR	0.023	13	0.076	11	0.941
Sensitivity	HR	-0.462	26	2.555	24	0.017*
	LR	0.624	13	2.647	11	0.023*

Figure 3: Correlation between motor and sensory measures at 3 months: there are statistically significant correlations between AIMS percentile score and SP2-infant domains for LR group in the sensitivity domain and HR group in both sensitivity and general domain.

Conclusions

- Motor development and sensory processing differences between HR and LR infants emerge as early as 3 months of age.
- LR infants had better gross motor skills as shown by their higher AIMS scores compared to their HR counterparts at all time points and significantly so at 3 and 6 months.
- Conversely, HR infants on average showed more sensory dysfunction compared to LR infants at 3, 9, and 12 months but the sensory measure difference was statistically significant only at 3 and 12 months.
- Our data suggests an inverse correlation between motor and sensory scores for high risk infants at 3 months.
- However, significant correlation between motor and sensory measures was only seen at 3 months and not at any of the other timepoints.
- The correlation observed may support the hypothesis that infants with less sensory dysfunctions feel less hindered to explore their environment and consequently have improved development of their motor skills compared to their counterparts who may have sensory impairments in sensory processing.

Future Directions

- Next steps will include a larger sample size of infants to better interpret the findings of this study.
- We also plan to evaluate whether motor development as measured by AIMS and Mullen predicts sensory outcomes measured by ITSEA, SP2 and SAND, or vice versa
- These data can provide valuable information on potential early interventions that could reduce sensory and motor impairments in ASD

References

- Bhat AN. Is Motor Impairment in Autism Spectrum Disorder Distinct From Developmental Coordination Disorder? A Report From the SPARK Study. *Phys Ther.* 2020;100(4):633-644.
- Tomchek SD, Dunn W. Sensory processing in children with and without autism: a comparative study using the short sensory profile. *Am J Occup Ther.* 2007;61(2):190-200.
- Schulz SE, Stevenson RA. Sensory hypersensitivity predicts repetitive behaviours in autistic and typically-developing children. *Autism.* 2019;23(4):1028-1041.
- O'Neill M, Jones RS. Sensory-perceptual abnormalities in autism: a case for more research? *J Autism Dev Disord.* 1997;27(3):283-293.
- Liu T. Sensory processing and motor skill performance in elementary school children with autism spectrum disorder. *Percept Mot Skills.* 2013;116(1):197-209.
- Ozonoff S, Young GS, Carter A, et al. Recurrence risk for autism spectrum disorders: a Baby Siblings Research Consortium study. *Pediatrics.* 2011;128(3):e488-495.