Title: The Effect of Sensory Experience on Motor Ability in Autism Spectrum Disorder

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Introduction: Individuals with Autism Spectrum Disorder (ASD) often face a number of sensory and motor challenges throughout their lifetimes (reviewed by Marco et al., 2011). These challenges can have significant impact on daily living skills and quality of life (Jasmin et al., 2009). Similarly, atypical sensory experience and motor challenges may also extend to individuals with genetic profiles similar to those commonly found in ASD (Kopp et al., 2010). In the current study, we sought to further characterize the extent to which these challenges affect individuals with ASD and individuals with ASD-related disorders (ASD-R) in comparison to individuals with typical development (TD). We also investigated which behavioral variables (cognitive, sensory, muscle strength, and ADHD-like features) were most associated with motor challenges.

Method: Data pertaining to motor ability, sensory features, and IQ were gathered from 44 children with ASD, 23 children with ASD-related conditions (ASD-R), and 30 children with TD, ages 6-10 years. The ASD-R group included children who had a genetic risk factor for ASD (i.e., having an ADHD diagnosis or a first-degree relative with one of the following: ASD, major depressive disorder, bipolar disorder, or schizophrenia). Groups were well-matched on age (p = .30), but the ASD group had lower IQ than both the ASD-R and TD groups (p < .001). There was no difference in IQ between the ASD-R and TD groups (p = .23). Motor ability was classified using a percentile rank standardized for age and sex, calculated from the Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (Bruininks & Bruininks, 2005). Sensory features were measured using the Sensory Experience Questionnaire Version 3 (SEQ-3.0; Ausderau et al., 2014; Baranek, 2009), which includes sensory subdomains of hypo/ hyperresponsiveness, sensory interests, repetitions, and enhanced perception. While the SEQ-3.0 was designed to examine discrete sensory profiles across the autism spectrum, all four subdomains of the SEQ-3.0 were highly correlated in the present study. Therefore, we used a principal component analysis to calculate a single, continuous sensory measure that accounted for 79% of the variance.

Result: Group comparison showed that participants diagnosed with ASD had lower motor percentile scores (M = 15.76, SD = 15.64) compared to participants in the ASD-R group (M= 37.13, SD = 25.13), and the participants in the TD group (M= 38.8, SD = 21.10), F(2,92) = 13.34, p < .001. Tukey’s post-hoc analyses confirmed that the percentile scores in the ASD group were significantly lower than both the ASD-R group (p < .001) and the TD group (p < .001) with no significant difference between the ASD-R and TD groups (p = .95). In the ASD group, 55% of children were below the 15th percentile for motor ability, consistent with a co-occurring diagnosis of Developmental Coordination Disorder (DCD), while only 22% of participants in the ASD-R group and 7% of participants in the TD group met this criteria. Follow-up analyses examined which behavioral features were associated with having motor skills below the 15th percentile. Factors included diagnostic group status (ASD, ASD-R, or TD), IQ, sensory features, ADHD-like symptoms, and grip strength (as a proxy of overall muscle strength). Binomial logistic regression suggested that the most predictive model (according to Akaike’s Information Criterion) included sensory features, b = -0.66, se = .19, p < .001, and IQ, b = -0.66, se = .19, p < .001. When IQ and sensory features were included, incorporation of diagnostic group into the model did not improve the prediction of being below the 15th percentile in motor skills.

Discussion: Motor challenges were highly evident in the group with ASD, with over half of the ASD group demonstrating motor challenges in the DCD range. These motor challenges in ASD were above-and-beyond that seen in the ASD-R and TD groups. However, the group with a high genetic risk factor for ASD (ASD-R group) did not exhibit different motor skills from the group with TD, suggesting that motor challenges may not be a feature of children at a higher genetic risk for ASD. Intriguingly, the factors that best predicted motor challenges were sensory features (as a composite across multiple sensory domains) and IQ, and these were more predictive than diagnostic group status when determining motor challenges. These results suggest that
children with more sensory features and lower IQ are more likely to have motor challenges, regardless of whether they have an ASD diagnosis.

References/Citations: