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Sensory Processing in young autistic children and children carrying genetic risk factors for Autism Spectrum Disorders

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Introduction

Atypical responses to sensory stimuli are present in various neurodevelopmental disorders including Autism Spectrum Disorders (ASD). Although such atypicalities have long been reported in ASD, they have not been thoroughly investigated until they have been added as a diagnostic criteria in the latest version of DSM-5[1]. Sensory processing difficulties can affect all modalities at different time in development and also vary in type (hyper-responsivity, hypo-responsivity) which makes these processes difficult to assess[2-3]. These alterations can play a role in the core deficits seen in ASD, but to date, their specific contribution to the clinical features remain unclear.

Over the past decade, various genetic variants associated with a higher risk of developing ASD have been discovered. There is a growing interest in using these genetically homogeneous cohorts as a tool to better understand underlying causes of ASD[4] and association with clinical symptoms.

This project is part of a larger study that investigates early development and sensory processing using various methods including EEG and MRI, eye-tracking and behavior observations in ASD, genetic populations as well as typically developing children.

Aim

The main goal of this sub-project is to study behaviors related to sensory processing in various domains using parent-report on the Sensory Processing Measure (SPM-P /SPM)[5].

More specifically, we aimed at describing the sensory profile in ASD children and those carrying a genetic risk factor for ASD. We hypothesized that sensory profile would be different between the groups.

Methods

Participants (age range 2-8 years old)

- 51 children with a ASD diagnosis assessed at the Centre Cantonal Autisme, Lausanne University Hospital
- 17 children carrying a genetic rearrangment (16p11.2 deletion or 1q21.1 deletion or duplication) that are risk factor for ASD
- 34 typically developing children

Assessment

Sensory Processing Measure (SPM) – parent report, home form. We used the SPM-p for 2-5 years and the SPM for 5-12 years. This questionnaire assesses sensory processing issues, praxis and social participation in children. It consists of 75 items rated in terms of frequency of the behavior on a 4-point Lickert-type scale. Subscales are 1/SOC - social participation, 2/Vis - vision, 3/ Hea - hearing, 4/Tou -touch, 5/ Bod -body awareness, 6/Bal - balance and motion, 7/Pla - planning and ideas, 8/Tot - total.

Statistical analyses:

We performed descriptive statistics and a MANCOVA controlling for age and gender. All analyses were performed on R-software (version 3.6.1)

Results

Demographics:

	ASD	Genetic (G)	Controls (C)	statistics
N	*51*	*18*	*34*	
Mean age (SD)	4.3 (1.8)	6.2 (2)	5.9 (1.9)	*ASD <G,C, p<0.001*
Gender (M/F)	42/9	12/6	15/19	
Overall Cognition*	75(26)	86 (12)	115 (13)	*C>ASD, G p< 0.001*

*Overall cognition was assessed using the Mullen scale of early Learning, or the Wechsler Intelligence rating scale for preschoolers or school age children

Figure 1:

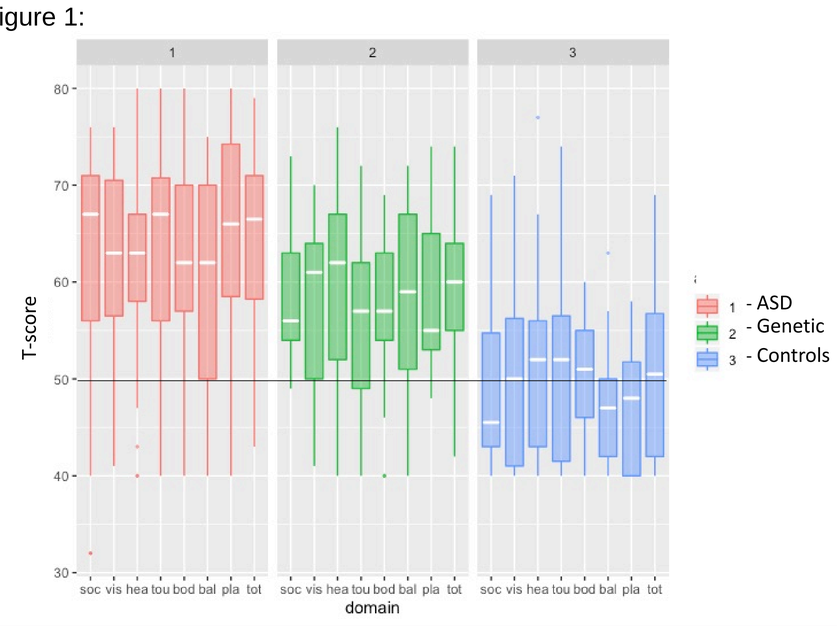

Figure 2:

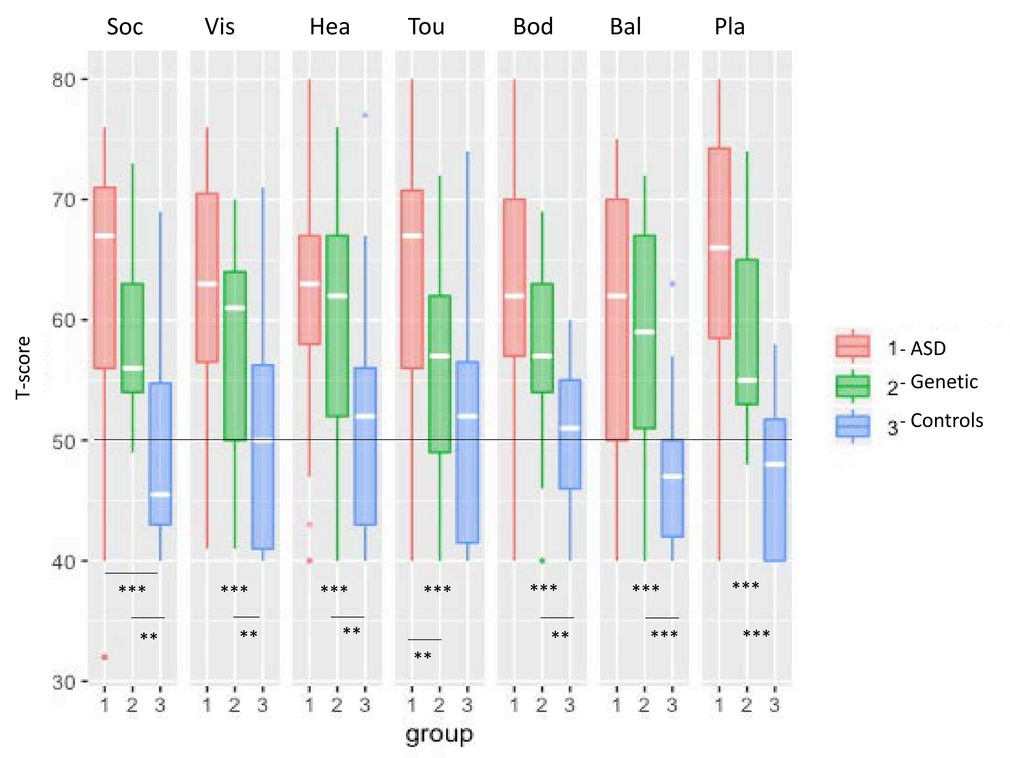

Figure 1 illustrates the subscale results (T-score, mean = 50, SD = 10) for all three groups. ASD children score significantly higher on all sensory subscales compared to the control group.

Figure 2 illustrates the results per domain on the SPM. The genetic group differs significantly from controls on all scales except the touch subscale.

Discussion

These initial analyses on the Sensory Processing Measure highlight and confirm the presence of significant atypical responses to sensory stimuli in a cohort of young ASD children. There seems to be no specific profile within the SPM in this cohort probably due to the variability in symptoms presentation (see the variance). Future analyses will look if there are subgroups showing specific profiles within the cohort and will also investigate differences in over- and under-reponsiveness.

Children carrying a genetic risk factor for ASD also score higher than typically developing children on most subscales. Interestingly, our genetic cohort only differs from the ASD cohort on the touch subscale, which suggest this sensory domain to be very specific to ASD. Literature on tactile abnormalities in ASD is inconsistant due to methodogical differences and the important heterogeneity of ASD presentation. The somatosensory domain is however important as altered tactile processing might explain differences in clinical features.

This sub-project is part of a larger project that will look at different levels of sensory processing in these three cohorts. A better understanding of the underlying mechanisms of sensory processing could help adapt the environment and also ideally normalize the sensory experience to alleviate downstream effect on higher order cognition in ASD children.

References: (1) Diagnostic and Statistical Manual of Mental disorders (DSM-5), Manual of APA,2013. (2) Baum, S.H. et al., *Behavioral perceptual and neural alterations in sensory and multisensory function in autism spectrum disorder*, Progess in Neurobiology, 2015 134:140-160. (3) Robertson, C.E. & Baron-Cohen, S. Sensory Perception in autism, Nat Rev Neurosci, 18(11):671-684. (4) Sanders SJ et al., Insights into Autism Spectrum Disorder Genomic Architecture and Biology from 71 Risk Loci. Neuron, 2015;87(6):1215-33.. (5) Parham, L.D. et al., Sensory Processing Measure (SPM- Manual), 2007, Torrance, CA: Western Psychological Services.

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