

# Comparing Sensory Processing Abilities of age-Matched Atypical and Typical School Going Children in Pakistan

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## **Abstract:**

**OBJECTIVE:** The purpose of this study was to investigate differences in sensory processing abilities among age-matched children between ages 3 to 9 years with atypical children i.e. Autism Spectrum Disorders (ASD) & Cerebral palsy (CP), and those who are typically developing i.e. School going children in Pakistan.

**METHOD:** Reported sensory processing abilities of 150 children with ASD and CP were compared to age-matched peers who were typically developing, using the Short Sensory Profile (SSP). Data was collected through the survey. Forms were distributed and then recollected from different mainstream schools to collect the data of typical children and special schools and institutions in Karachi for data collection of atypical children.

**RESULTS:** Data gave the clear evidence that there are more sensory issues in children with disabilities as compared to typical developing children.

**CONCLUSION:** The findings of the study confirm the prevalence and types of sensory processing impairments in atypical children. Further research is needed to more clearly define patterns of sensory processing problems in children with ASD and CP as well as school going children.

**Keywords:** sensory integration, sensory processing abilities, short sensory profile, sensory processing disorders, autism spectrum disorder, cerebral palsy, inclusive education

## I. INTRODUCTION

Sensory integration is an innate neurobiological process and refers to the integration and interpretation of sensory stimulation from one's own body and the environment by the brain. Sensory integration is the processing of sensory modality inputs from multiple senses such as, visual, auditory, tactile, olfactory, taste, proprioception, and vestibular system for functional outputs that assists an individual to use the body efficiently within the environment. Sensations received from different sensory organs are thought to be processed in specialized areas located in the brain and the communication within and among these areas is known as functional integration (P.P.P. Cheung & A.M.H. Siu, 2009).

Sensory integrative function is a key aspect of clinical assessment in evaluating children with developmental disabilities, especially for children with autism spectrum disorders (ASD) or attention deficit hyperactivity disorder

(ADHD). The results of these assessments are important in planning and implementing effective intervention for the individual child.

Estimated rates of sensory processing dysfunction (SPD) for children with various disabilities have ranged as high as 40%–88%. Researches show that children with disabilities display significantly more sensory processing issues than children without disabilities (P.P.P. Cheng & A.M.H. Siu, 2009). One study (Ahn, Miller, Milberger, McIntosh, 2004) indicates that at least 1 in 20 children's daily life is affected by SPD. Another research study by the Sensory Processing Disorder Scientific Work Group (Ben-Sasson, Carter, Briggs-Gowen, 2009) suggests that 1 in every 6 children practices sensory issues that may be significant enough to affect everyday life functions.

These sensory processing difficulties can make everyday childhood activities quite challenging. They can effect a child's capability to perform self-care tasks such as participate in mealtimes, brushing teeth, washing face & hands, combing hair, going to the bathroom, being able to dress or feed themselves, going out and engage within the community, or develop the motor and social skills necessary to participate and make progress in school.

Review of the clinical literature recommends that sensory processing dysfunction in autism is global in nature and affects all the main modalities across multisensory processing systems (Kern et al., 2007; Marcus & Stone, 1993). Estimates of sensory-perceptual defects in children with autism have ranged between 42% and 88% (Baranek, 1999; Dawson & Watling, 2000), including over responsivity to tactile input, auditory hypersensitivity and attention and arousal impairments as correlated with the faulty modulation of sensory input (Adamson, O'Hare, & Graham, 2006).

Although Cerebral palsy is generally known as motor disorder but CP children may have poorer tactile discrimination, stereognosis, vestibular and proprioception skills compared with healthy children (Cooper et al., 1995; Sanger & Kukke, 2007; Wingert et al., 2009). Children with CP as compared to healthy controls indicated more reduced sensitivity and alter sensory processing abilities due to primary injuries in subcortical and cortical somatosensory regions (Inmaculada Riquelme, Pedro Montoya 2010). Researchers have further

identified vestibular sensory differences in children with attention difficulties; moreover, these difficulties interfere with the children's performance in movement and skills development (Ayres, 1979; Fisher, Murray, & Bundy, 1991). Children without disabilities between ages 6 and 12 can be expected to have some degree of sensory processing issues over time (P.P.P. Cheng & A.M.H. Siu, 2009). A sensory history may consist of statements directed to a parent or caregiver about a child's behavior while the child is engaged in functional activities (Dunn, 1994).

The rationale of the study was to compare sensory processing issues in children both with and without disabilities, and to examine whether differences in sensory processing exist among children with ASD, cerebral palsy and those without disabilities, as new researches indicate that CP and ASD children are majorly found in Pakistani Community (NazirB, 2003; AtifA.K, 2014; Nazish I, Waqar M, 2014). A sensory history can yield information about a child's sensory processing skills. This information can help to describe problems and to plan appropriate intervention (Cook, 1991; Winnie D, 1994; Mary A. K., Winnie D, 1997).

## II. METHODOLOGY

### *Participants:*

500 children (280 boys and 220 girls) which includes typical and atypical were assessed with short sensory profile. 350 Number of typical children (170 boys and 180 girls) were selected randomly from different schools in different areas. 150 Number of atypical (CP and ASD) children (110 boy's and 40 girls) were assessed on short sensory profile. As shown in Table No. 1. These children were selected from the different rehabilitation centers of Karachi Pakistan. All subjects with stated diagnosis were receiving services from the rehabilitation centers. All had been diagnosed by independent physicians or at state diagnostic centers. There were 60 Number of CP (dipleitics and hemipleitics) and 90 number of ASD children in atypical group. All the participants were matched on chronological age that is 3 – 9years. Prior permission was taken from the head of all the Schools and rehabilitation centers to indicate their agreement.

Table No. 1: Sample size of typical And atypical Children

Variable	No. of Children	Gender	
		Male	Female
<b>Typical Children</b>	350	170	180
<b>Atypical Children</b>	CP	32	28
	ASD	75	15

### *Inclusion criteria:*

An inclusion criterion of each group was applied in strict manner only children of ages 3-9 were included. "Atypical group" consist of children with the diagnosis of CP and ASD. Children attending mainstream schools and not taking any special education or therapies were included in "Typical group".

### *Exclusion criteria:*

Children older or younger than ages 3- 9 years, children attending mainstream school but taking any special education or therapy services and children with special needs other than mentioned diagnosis were excluded.

### *Instrument used:*

In this research, a parent or major caregiver assessed the recruited participants using the Short Sensory Profile (SSP) by Winnie Dunn, a standardized 38 item questionnaire for measuring sensory processing issues. Items are scored on 1-point to 5-point scale. The 7 sections of the SSP are Tactile Sensitivity, Taste/Smell Sensitivity, Movement Sensitivity,

Under responsive/Seeks Sensation, Auditory Filtering, Low Energy/Weak, and Visual/Auditory Sensitivity. Scores of raw data result depicts typical performance, probable difference and definite difference.

### *Scoring of Short Sensory Profile:*

Scoring criteria of all 7 sections of short sensory profile (SSP) are standardized and divided into typical performance, probable difference and definite difference.

**Typical performance:** when a child gets this score, it means the child responds to stimuli just like their peers.

**Probable difference:** when a child gets this score, it means the child responds to stimuli 'probably less than others. Children typically respond less often than this to stimuli in their environment.

**Definite difference:** when a child gets this score, it means the child responds to stimuli 'definitely less than others'. Children typically respond less often than this to stimuli in their environment.

*Data collection procedure:*

Study follows cross-sectional study design and data were collected through surveys. The questioner was distributed randomly in different mainstream schools for typical children and well-known rehabilitation centers for a typical children in different towns of Karachi. Atypical children were selected from Ma Ayesha memorial center, Center for child development Dow University of Health Sciences (DUHS), Occupational Therapy department of Institute of Physical Medicine and Rehabilitation, DUHS (main & Ojha campus) Karachi.

The SSP form was converted into Urdu language by professional translator and cross checked through reversed translation, in order to decrease language barrier and research limitations to some extent. All the participants were given both forms (Urdu and English) and were asked to fill upon their convenience. A total of 750 forms were distributed but only 500 forms were recollected. Recipients who choose not to participate were asked to simply return the material.

*Data analysis:*

Mean score and standard deviation were done to know the central tendency and dispersion within the data. Independent T-test and Chi square test was applied to identify the significant difference among typical and atypical children. To accomplish the analysis of the data had been done through Statistical Package for the Social Sciences (SPSS) version 16.0.

## III. RESULT

The overall sample (typical + atypical) analysis found that 57% of children lie within the criteria of definite difference, 15% within the criteria of probable difference and 27% were on typical performance. Where, 53.6% of atypical & 19.3% of typical children lie within the criteria of definite difference, 35.4% of atypical & 62.3% of typical children lie within the

criteria of probable performance while 11% of atypical & 18.3% of typical children lie within the criteria of typical performance.

T test was applied to find out whether there is a significant difference between the scores of typical and atypical children. The independent T test p value was 0.01 (i.e. <0.05) at 95% Confidence interval. The Chi-square test was applied to find the overall differences between typical and atypical group. Chi square p value was 0.033 (i.e. <0.05) which means that there is a significant difference between the scores of typical and atypical children.

Among 150 atypical children the mean score for the sense of under responsivity/seek sensation in CP was 23 that lie within the criteria of “definite difference”. The mean score for the sense of under responsivity/seek sensation in ASD was 18 that lie within the criteria of “definite difference. The standard deviation of the three senses in CP and ASD reflects a fair amount of variation in the group. But the standard deviation for the sense of taste and smell in CP and ASD is quite small that reflects that there is a less amount of variation.

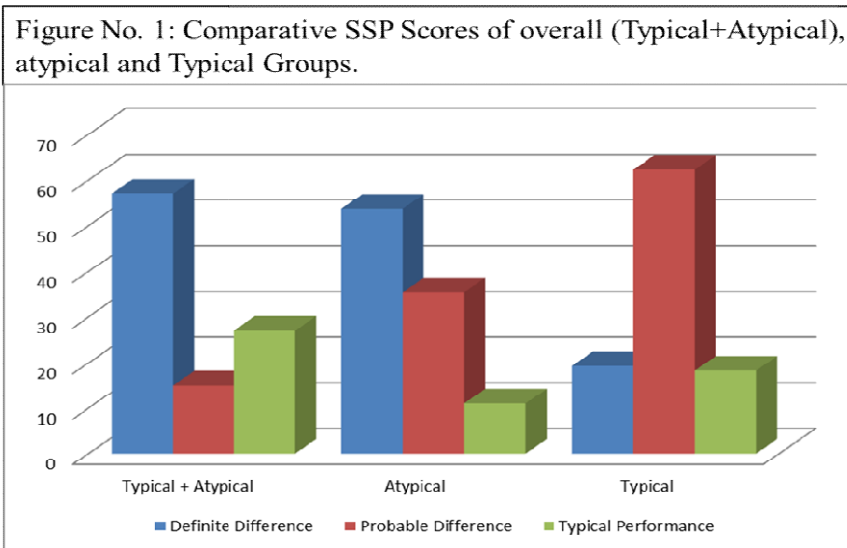
For the estimation of difference among atypical group we pick three “common senses” randomly to find the difference in scores of CP and ASD. The mean score for the sense of “taste and smell” in CP was 17 that lie within the criteria of “typical performance” but the mean score for of taste and smell in ASD was found 12 that lie within the criteria of “probable difference”. The mean score for the “tactile sense” in CP was found 29 that lie within the criteria of “typical performance” but the mean score for “tactile sense” in ASD 26 that lie within the criteria of “definite difference”. The mean score of the under responsive/seek sensation in CP was 18 which lie within the criteria of “definite difference” but the mean score of the under responsive/seek sensation in ASD was 23 which lie within the criteria of “probable difference”, as shown in Table 2.

Table No. 2: Comparison of three Senses between children having Cerebral Palsy (CP) and Autism Spectrum Disorder (ASD).

Sub domain of SSP	Mean Score	St. Deviation	min	max	SSP classification
Under responsive/ Seek Sensation –CP	18	7.12	13	33	Definite difference
Under responsive / Seek Sensation – ASD	23	5.70	4	32	Definite difference
Tactile – CP	29	4.09	17	35	Probable difference
Tactile –ASD	27	5.95	11	35	Probable difference
Taste & Smell – CP	17	2.63	5	20	Typical performance
Taste & Smell –ASD	12	4.62	4	20	Probable difference

Data also revealed that children without disabilities also have sensory issues, the SSP overall mean of typical children

scored as “definite difference” slightly more than “typical Performance”. (Figure No. 1).



#### IV. DISCUSSION

The purpose of the study was to determine the differences of sensory deficits in between typically developing children and those of children with ASD and CP using short sensory profile. The short sensory profile had been translated into various languages and tested for its usefulness in their cultural background and a useful tool to assess sensory problems in children with and without disabilities.(Chow, 2005; Neuman, Greenberg, Labovitz & Suzuki, 2004). Therefore, for the convenience of parents and to diminish the language barrier and obtaining more accurate results short sensory profile conversion into native language was useful.

The participants in the ASD group performed differently from the participants in the typically developing group on all SSP sections and for the total score. The children with ASD had significantly lower scores on all seven subscales than those without disabilities. It is also evident in the data that regardless of motor disorder, CP children possess sensory processing difficulties.

This study also indicates that typical developing children may suffer from sensory issues which were remained undiagnosed. According to the finding of the study, further studies and awareness programs for teachers and parent/caregiver of typical children are required to evaluate the causes and effect of sensory processing issues in school going children which could hinder in their performances and to promote inclusive education in Pakistan. Future research is also needed to know the cause and severity of Sensory processing disorders in typical and atypical children.

#### V. CONCLUSION

The impaired sensory processing skills indicate the functioning difficulties in Autistic and Cerebral Palsy children while, the ASD children showed more impairment compared to the CP children. The results of this study indicated significant group differences between atypical and typical groups.

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