



Measure the Level of Sensory Processing Problem in Children with and without Autism in Classroom Environment

Nighat Tahir^{1*}, Asma Khalid², Sana Nauman³

^{1*}Senior Lecturer, Sindh Institute of Physical Medicine & Rehabilitation, Karachi, Pakistan 

²Sindh Institute of Physical Medicine & Rehabilitation, Karachi, Pakistan 

³Sindh Institute of Physical Medicine & Rehabilitation, Karachi, Pakistan 

ABSTRACT

Background of the Study: Sensory processing is the process in which all sensory stimuli integrate and enable person to respond according to the situation. There are number of sensory issues that either parents or teacher do not identify on early stages and various times it also cause behavioral issues or academic issues with in typical children too. The study aims to assess the sensory vulnerability of children with and without autism in the school environment and to identify the sensory issues.

Methodology: This was a cross-sectional study conducted in Karachi, Pakistan. Total 86 children recruited and divided into two groups included typical and atypical children. Using a standardized questionnaire-SPM (sensory processing

measure) distributed in schools and completed by teachers.

Result: Autism affects both mainstream children and children with autism, with sensory process subscales showing significant differences p value ($< .005$) for t-test. Autism children have higher sensory process vulnerability, particularly in social participation and praxis variables, compared to mainstream children's.

Conclusion: The study reveals that school initiates sensory stimuli, affecting children's vulnerability, even in special schools, despite providing structured environments for atypical children.

Keyword: Perception, SPM, sensory responses, sensory threshold, autism, autistic disorder.

INTRODUCTION

Sensory processing is the process in which all sensory stimuli integrate and enable person to respond according to situation. It affects development of a child. A typical child from gestation period till birth learn and perceive sensory stimuli and develop proper sensory system which enable individual to sense the world¹. sensory processing measurement comprises of social participation, planning and total of sensory system. Sensory processing challenges can be faced by typical development children. Most of the time teacher and people face problems with child but due to hypo responsivity they showed laziness, such behavioral issues and academic issue may be indication of poor sensory registration³. Total sensory systems have vision, hearing, touch, body awareness and balance and motion senses. In an environment these all sense supports

*Corresponding Author: Nighat Tahir

Email: nighatahir08@gmail.com

Citation: Tahir N, Khalid A, Nauman S. Measure the Level of Sensory Processing Problem in Children with and without Autism in Classroom Environment. Pakistan Journal of Rehabilitation. 2024 Jan 5;13(1):109–118. Available from: <https://doi.org/10.36283/pjr.zu.13.1/015>

Received: Sun, Aug 13, 2023

Accepted: Mon, July 03, 2023

Published: Fri, Jan 05, 2024

human body to response on control threshold. Over responsiveness or under responsiveness causes change in behavior. ASD has poor communication and deprived of socialization, problems in praxis. They have high vulnerability to behave over or under responsive. A special school provide structure environment to control these behavior. In mainstream school most of the times not consider it. ASD have sensory processing dysfunction, they showed, stereotypical, repetitive or nonproductive behavior. It gave an immediate relationship between sensory dysfunction and self-regulation and behavior issues^{2,5}. One of Pakistani study about comparing sensory behavior in age matched typical and atypical children, revealed that autism showed more vulnerability in sensory modality as compared to typical and other disorders². There are number of sensory issues mild to moderate level and sometime severe level typical children have. But either parents or teacher not identifying it on early stages and various times it also cause behavioral issues or academic issues with in typical children. While children with mild to moderate autism having sensory processing issues can be settled with modified environment in mainstream school and community, just need to identify their Sensory vulnerabilities. Division of school system in mainstream and special school segregated children. While now globally education system transform with inclusion concepts. This study find out teacher perceptible regarding sensory behavior and issues of children with or without autism in main class room environment. if teacher understand the sensory need and its role in adaptive functioning they can modified environment as per child need. In this way child get plenty of opportunities to learn and explore more in inclusive settings. The main concern of this study is to identify the teacher perception about sensory issues in group of children who had autism spectrum disorder and children who developed normally. This study analyzed sensory processing challenges in different sensory motor domains. In fact different literature reviews suggested that autism has more prevalence of sensory difficulties rather than typically developed child².

METHODOLOGY

This study was carried out in Karachi. Data of typical children taking from 3 different main stream schools of Karachi and data for diagnosed cases of Autism or ADHD was collected from autism unit, Sindh Institute of Physical Medicine and Rehabilitation (SIPM&R) and Association for Children with Emotional and Learning Problems (ACELP). Teachers of main stream schools and special school were the target population for this cross sectional descriptive study recruited by convenience sampling technique. Duration of the study was 8-10 months.

Sample size was calculated by using Open Epi software 3.0. With the anticipated frequency of 50%, Confidence Interval of 95% with margin of error at 8%, the sample size of **n=86**

Inclusion criteria

- Group I has 64 typically developed children taking randomly from mainstream school (having no significant issues) age from 5 to 12
- Group II has children who are diagnosed as ASD mild to moderate 22 taken from special school both gender male and female are enrolled, age from 5 to 12.

Exclusion criteria

- We excluded children who diagnosed other than ASD and have secondary issues like heart, kidney and severe issues. We also excluded children's who are not going to school
- Children older or younger than ages 5-12 years, and in typical children having any significant issue or taking any therapy.

A standardized questionnaire was used .i.e. sensory processing measure (SPM), consist of three forms including Home form, main classroom form and school environment. Classroom form was being filled by teachers at school. A consent sign by parents of typical and atypical children's.

Main classroom form has 62 items and evaluate social behavior, visual, auditory, tactile, body balance, oral motor and planning skills.

Participants were recruited through random sampling technique from different mainstream and special institutes. The standardized assessment form used and given to the teachers of these institute, to filled and returned. Prior to this consent was taken from parents also taken and from teachers. A consent form was filled by all participants. After collecting data analyses done on SPSS.

Data was analyzed on SPSS version 16.0. The demography of the participants were represented through descriptive method .M ANOVA and independent t test is used to identify significant comparison among sensory processing and vulnerability in typical and atypical children.

RESULTS

MANOVA is performed with the scores obtained from classroom version of SPM, It showed statistical difference between the two groups. The results showed numerous issues in children's sensory processing subscales and teacher perceive these problems in both population, children with and without autism. Result analyzed percentage of sensory issues in typical children and atypical children.

Figure 1 showed distribution of children according to diagnosis. It is elaborated 26% of ASD children and 74 % of typical children participated in this study.

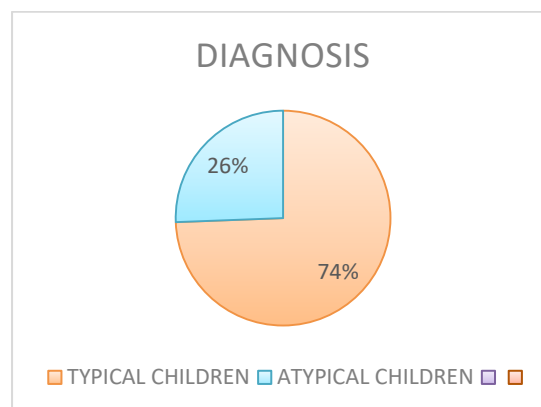


Figure-1 shows percentage of children involved

The following pie chart in fig.1 showed that in 86 children, 74% population were typical and 26% atypical children. Further, series of pie chart showed that if sensory issues analyze in whole population regardless diagnosis than there are different ratios of sensory issues. In Figure 2 –a, b, c, d, e, f , g showed series of pie chart, in which sensory issues differentiate in typical, some problem and definite dysfunction, regardless diagnosis of children.

(a) Hearing

A total number of 86 children, 58% lies in typical range without any hearing issues, while 23% showed some problem and 19% have definite dysfunction in sensory processing of hearing.

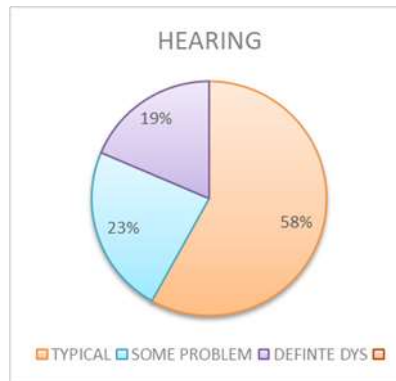


Fig 2(a) the chart showed percentage of Hearing among total population

(b) Vision

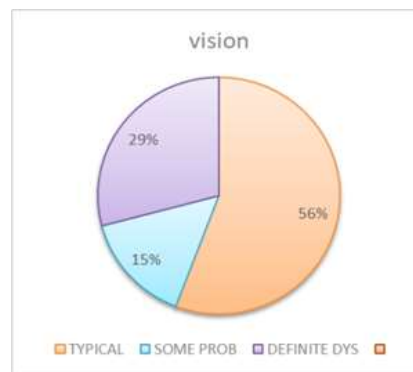


Fig 2(b) the chart showed percentage of Hearing among total population

A total number of 86 children 56% lies in typical range without any vision/ perception issues, while 15% showed some problem and 29% have definite dysfunction in sensory processing of vision.

(c) Touch

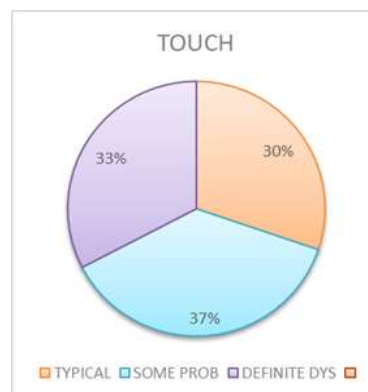


Fig 2(C) The chart showed percentage of Hearing among total population

A total number of 86 children 30% lies in typical range without any tactile issues, while 37% showed some problem and 33% have definite dysfunction in sensory processing of touch system.

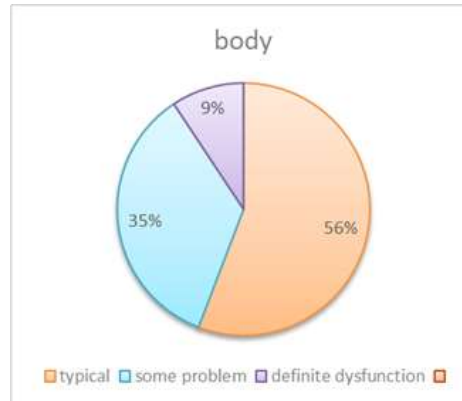
(d) body movement

Fig 2(d) the chart showed percentage of body movement among total population

A total number of 86 children 56% lies in typical range without any body movement (vestibular) issues, while 35% showed some problem and 9% have definite dysfunction in spatial relationship and balance.

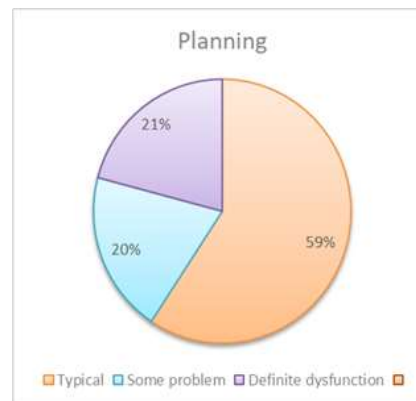
(e) Planning

Fig 2(e) the chart showed percentage of Planning among total population

Planning portion revealed that 59% children showed typical sensory processing, while 20% have some problem while 21% showed definite dysfunction in sensory processing.

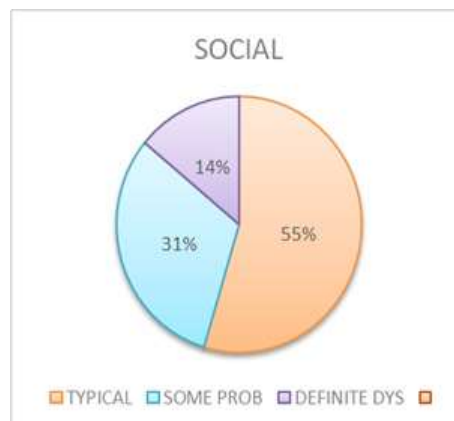
(f) Social

Fig 2(f) the chart showed percentage of Social among total population

In social portion 55% lies in typical range without any social issues, while 31% showed some problem and 14% have definite dysfunction in sensory processing of social participation.

(g) total teacher perception

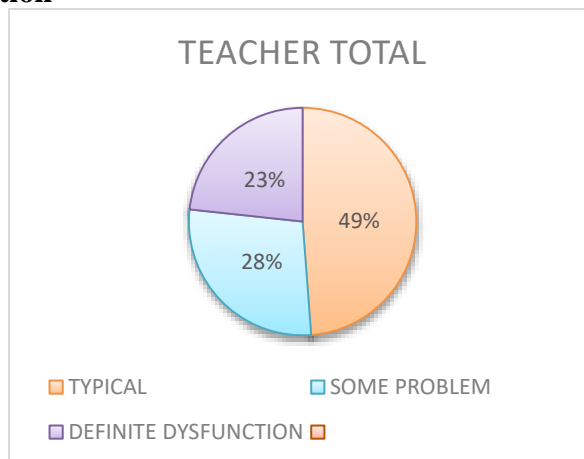


Fig 2(g) the chart showed percentage of Teacher among total population

Total score revealed percentage of total 86 children, 49% children showed typical sensory processing, and 28% have some problem while 23% showed definite dysfunction in sensory processing. The total sensory system has 56 items. It is combination score of 5 sensory system scales (VIS, HEA, BOD, BAL, PLA,) and taste and smell scores also added in it. Total sensory system expressed total sensory processing dysfunction level.

Below the table describe sensory vulnerability in detailed in two different population. There is significant difference between two groups. Autism and mainstream children both showed significant p value (< .005) for t- test. The typical children obtained score that indicate they also have significant issues in planning, total sensory system, touch, hearing, vision. Autism group has significance difference with mainstream children in the social interaction and motor planning.

S.NO	SPM SCALES	MAINSTREAM		ASD		P
		Mean	SD	mean	SD	
1	Social participation(SOC)	1.375	.0078	2.227	.133	.000
2	Vision (VIS)	1.500	.100	2.409	.170	.000
3	Hearing (HEA)	1.438	.092	2.091	.157	.001
4	Touch (TOU)	1.875	.095	2.455	.162	.003
5	Body awareness (BOD)	1.344	.072	2.091	.124	.000
6	Balance and Motion (BAL)	1.438	.098	1.909	.167	.017
7	Planning and Ideas (PLA)	1.438	.095	2.136	.162	0.000
8	Total (TOT)	1.531	.092	2.364	.156	

Table1. Means, standard deviation, and P values obtained in over-responsiveness for the different sensory modalities in the school environment

S.NO	SPM SCALES	MAIN STREAM			AUTISM		
		Typical	Some problem	Definite dysfunction	Typical	Some problem	Definite dysfunction
1	Social participation(SOC)	68.8%	25.0%	6.3%	13.6%	50.0%	36.4%
2	Vision (VIS)	71.9%	6.3%	21.9%	9.1%	40.9%	50.0%
3	Hearing (HEA)	70.3%	15.6%	14.1%	22.7%	45.5%	31.8%
4	Touch (TOU)	37.5%	37.5%	25.0%	9.1%	36.4%	54.5%
5	Body awareness (BOD)	65.6%	34.4%	0.0%	27.3%	36.4%	36.4%
6	Balance and Motion (BAL)	71.9%	12.5%	15.6%	40.9%	27.3%	31.8%
7	Planning and Ideas (PLA)	73.4%	9.41%	17.2%	18.2%	50.0%	31.8%
8	Total (TOT)	64.1%	18.8%	17.2%	4.5%	54.5	40.9%

Table -2 MANOVA, percentage showed significant difference in sensory processing between two groups

MANOVA is performed with the scores obtained from classroom version of SPM, It showed statistical difference between the two groups. The results showed numerous issues in children's sensory processing subscales and teacher perceive these problems in both population, children with and without autism.

DISCUSSION

In this research sensory processing measure of classroom was used that focused on school environment in particular. SENSORY PROCESSING MEASURE (SPM) has two assessments scale one in home environment and other in school environment. The aim for the selection had been based on the hypothesis that child's familiarity with the home environment usually results in habitual, self-control and regulations. In this article, only consideration was school environment. Because child is familiar with home environment and their self-control and regulation in this context is habitual. On the other hand, school environment is essential for providing exposure to learn so outside environment give him chance of learning and exploration as well as multi-sensory inputs. It gives equal chance to typically developed children or ASD. According to Dr. A Jean Ayers child received a continuous internal and external stimulation from the environment and brain process it organize, filter the information to give an appropriate response^{1,3,5}. Touch, along with vestibular and proprioception is strong stimuli to move the body and control the movement in appropriate way. Integration of these senses necessary for harmony and productive outcome^{2,15}. She identified those children who have challenges in integrating multiple sensory stimuli. Multiple sensory system comprises of visual, auditory, proprioceptive, vestibular and tactile input, and she unfold a relationship between poor sensory processing may cause difficulties in academics, spatial relationship, learning disorder, and it result in behavioral issues^{5,7,13}. Therefore compare children with autism and without autism in school environment. To identify Teacher perspective. Their feedback help to identify underlying cause in academic and behavior issues and also determine that typical children may have problem but definitely autism showed significant issues in multiple sensory inputs and in processing it. Result revealed momentous difference between typically developed children and ASD.SPM classroom form has 62 items completed by class teacher. Age range from 6 to 12 years. It evaluates sensory processing, praxis and social participation in school setup and interpret^{6,16}.

1. Typical
2. Some problem
3. Definite dysfunction⁵.

In this study the result described similar response as in previous studies and revealed high vulnerability in ASD as compared to typical children. Children sensory vulnerability suppressed their capability to uncover the new skills. Showing some problem or definite dysfunction in interpretation showed, the child unable to use appropriately his/her skills to learn new skills,

participate in new tasks because together integration of these senses boost their confidence and increase their understanding for complex task. Follow the sequence and grade the activity channelize the child to propagate natural ability into productive function.

Strength

This study reports significant findings of sensory issues in both typical and atypical children. Teacher is the person who built the career of the child, it is necessary to consider their perception about child task pattern and behavior in school. In this study teacher identify problems in both population, that will helpful to modify the school setting and improve learning pattern of children.

Limitations

One of the limitations in this research is short sample size. Moreover the author prefer to collect data from teacher who attends the child since 1 year at least and same time the special school must have qualified special educator, we find little ratio. Due to Covid time period data also limited.

Future Directions

Must carry out this study with large sample size and in inclusive setting it will also shows that if both population having the same classroom setup than what the difference between processing.

CONCLUSION

This study provides basic information's that how multiple sensory stimulus in school initiate or restricts child performances. This study proved that even in both special and main stream school structured environment provided but there is a significant findings in sensory responses and vulnerability in typical and ASD. This decreases the performance and participation of a child.

AUTHORS' CONTRIBUTION:

The following authors have made substantial contributions to the manuscript as under:

Conception or Design: Asma Khalid, Nighat Tahir, Sana Nauman

Acquisition, Analysis or Interpretation of Data: Asma Khalid, Sana Nauman, Nighat Tahir

Manuscript Writing & Approval: Asma Khalid, Nighat Tahir, Sana Nauman

All authors acknowledge their accountability for all facets of the research, ensuring that any concerns regarding the accuracy or integrity of the work are duly investigated and resolved.

ACKNOWLEDGEMENTS: We thanks all the participants in this study.

INFORMED CONSENT: (dealing with studies involving human subjects.)

CONFLICT OF INTEREST: No conflict of interest.

FUNDING STATEMENTS: N/A

ETHICS STATEMENTS: The protocol of the present study was registered by the local ethics committee of __IRB-1279/DUHS /Approval/Approval /2019.

REFERENCES

1. Ayres, A. J. *Sensory Integration and the Child*. Los Angeles, CA: Western Psychological Services. *Psychology*. 2020;11(6)
2. Jawaria. S, Rizwana.W, Imran.A, Nighat.T. Comparing Sensory Processing Abilities of age- Matched Atypical and Typical School Going Children in Pakistan. *International Journal of Research and Innovation in Social Science (IJRISS)*. 2019;3(11).
3. Fernández MIA, Cerverza PS. Comparative study of sensory modulation vulnerabilities in children with and without ASD in family and school contexts. *Journal of Occupational Therapy Schools & Early Intervention*. 2018:318-28.

4. Critz C, Blake K, Nogueira E. Sensory Processing Challenges in Children. *The Journal for Nurse Practitioners – JNP*. 2015;11(7): 710-6.
5. Amireh, M. M. H, Omer FEZAM. Caregivers' Perspective about the Levels of Sensory Processing Problems in Children with Autism. *Journal of Client-Centered Nursing Care*. 2018
6. Parham et al., 2007, Sensory Processing Measure –SPM.
7. Jasmin, E. Sensori-motor and daily living skills of preschool children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*. 2009;39(2): 231-41.
8. Nieto, C, Lopez B, Gandia H. Relationships between atypical sensory processing patterns, maladaptive behaviour and maternal stress in Spanish children with autism spectrum disorder. *Journal of Intellectual Disability Research*. 2017;61(12): 1140-50
9. Kausar T, Fazil H. Perceptions of Teachers on Prevalence of Sensory Problems among Children with Autism Spectrum Disorder. *Pakistan Social Sciences Review*. 2020;4(3):749-65.
10. Chien CW, Rodger S, Copley J, Branjerdporn G, Taggart C. Sensory processing and its relationship with children's daily life participation. *Physical and Occupational Therapy in Pediatrics*, 2016;36: 73–87.
11. Costa R, Lampreia C. Findings on sensory deficits in autism: Implications for understanding the disorder. *Psychology & Neuroscience*. 2012;5:231–7.
12. Jewel E C, Salzinger E, Lin MH, Gavin WJ, Davies PL. Sensory Processing and Attention Profiles among Children with Sensory Processing Disorders and Autism Spectrum Disorders: *Frontiers in Integrative Neuroscience*. 2020:1-10
13. Pfeiffer B, Coster W, Snethen G, Derstine M, Piller A, Tucker C. Caregivers' Perspectives on the Sensory Environment and Participation in Daily Activities of Children With Autism Spectrum Disorder. *Am J Occup Ther*. 2017;71(4):1
14. Gabriels RL, Agnew JA, Miller LJ, Gralla J, Pan Z, Goldson E et al. Is there a relationship between restricted, repetitive, stereotyped behaviors and interests and abnormal sensory response in children with autism spectrum disorders?. *Research in autism spectrum disorders*. 2008;2(4):660-70..
15. Miller LJ, Nielsen DM, Schoen SA, Brett-Green BA. Perspectives on sensory processing disorder: a call for translational research. *Frontiers in Integrative Neuroscience*. 2009;3:597.
16. Tripathi HJ, Varma TV, Prabhakar KB. A Comparative Study using the Short Sensory Profile by the Caregivers on the Performance of Children With and Without Autism Spectrum Disorders.
17. Kuhaneck HM, Henry D, Glennon TJ. Sensory Processing Measure: SPM. Western Psychological Services (WPS); 2007.
18. Kilroy E, Aziz-Zadeh L, Cermak S. Ayres theories of autism and sensory integration revisited: What contemporary neuroscience has to say. *Brain sciences*. 2019;9(3):68.
19. Tomchek SD, Dunn W. Sensory processing in children with and without autism: a comparative study using the short sensory profile. *The American journal of occupational therapy*. 2007;61(2):190-200.
20. Sleeman HR, Brown T. An exploratory study of the relationship between typically-developing school-age children's sensory processing and their activity participation. *British Journal of Occupational Therapy*. 2022;85(4):251-61.
21. Thye MD, Bednarz HM, Herringshaw AJ, Sartin EB, Kana RK. The impact of atypical sensory processing on social impairments in autism spectrum disorder. *Developmental cognitive neuroscience*. 2018;29:151-67.
22. Russell S, McCloskey CR. Parent perceptions of care received by children with an autism spectrum disorder. *Journal of Pediatric Nursing*. 2016;31(1):21-31.

23. Makin C, Hill V, Pellicano E. The primary-to-secondary school transition for children on the autism spectrum: A multi-informant mixed-methods study. *Autism & Developmental Language Impairments*. 2017; 2:2396941516684834.
24. Ayres AJ. *Sensory integration and learning disorders*. (No Title). 1972.
25. Ayres, A. J. *Sensory integration and the child*. Los Angeles, CA: Western Psychological Services. 1979
26. Brown NB, Dunn W. Relationship between context and sensory processing in children with autism. *The American Journal of Occupational Therapy*. 2010;64(3):474-83.
27. Rayan A, Ahmad M. Psychological distress in Jordanian parents of children with autism spectrum disorder: The role of positive reappraisal coping. *Archives of Psychiatric Nursing*. 2017;31(1):38-42.
28. Feroz R. Perspectives of Facilitators and Parents about the Development of ASD Children.

