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Prevalence of sensory behaviours in children with Autism Spectrum Disorder on short sensory profile

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ABSTRACT

The purpose of the study was to find out the performance of children with ASD belongs to Ahmedabad city by using SSP. It will be useful to understand their behaviour with the help of the caregivers of the children. 50 children with ASD were approached on different platforms and incorporated in the study on the basis of the inclusion and exclusion criteria of the study. The sample does not represent the entire population of children with ASD; therefore the study can be done with a larger sample size. Seventy-Eight (78%) children with ASD diagnosed with a definite and probable difference. Eighty-six (86%) children with ASD obtained a combined score of definite difference and probable differences in Tactile Sensitivity and Under responsive/Seeks Sensation and 64% in auditory filtering. Typical performance of children with ASD was also seen during the research. Forty (40%) children with ASD showed typical performance in Taste/Smell Sensitivity, 38% in Movement Sensitivity, 42% in Low energy/Weak and 46% in Visual/Auditory sensitivity. From the result of this study, different sensory patterns in children with ASD have been revealed. It can be treated with the SIT and with the help of it the child's performance can be improved. SIT can positively affect motor skills, socialization, attention, behaviour control, reading skills, participation in-game activities, and the achievement of personal goals. This study recognizes the importance of assessing the performance of children from different cultural contexts, particularly in relation to their everyday functioning or occupation.

Keywords— ASD-Autism Spectrum Disorder, Definite difference, Probable difference, Typical performance, SSP- Short Sensory Profile

1. INTRODUCTION

ASD is characterized by persistent deficits in social communication and social interaction across multiple contexts, including deficits in social reciprocity, nonverbal communicative behaviour used for social interaction, and skills in developing, maintaining, and understanding relationships. In addition to the social communication deficits, the diagnosis of ASD requires the presence of restricted, repetitive patterns of behaviour, interests, or activities.^{[1][2]} Symptoms typically are apparent before age 3 years.^[3] Because symptoms change with development and may be masked by compensatory mechanisms, the diagnostic criteria may be met based on historical information, although the current presentation must cause significant impairment. ASD is a new DSM-V disorder encompassing the previous DSM- IV autistic disorder (autism), Asperger's disorder, childhood disintegrative disorder, Rett's disorder, and pervasive developmental disorder not otherwise specified. It was characterized by deficits in two core domains: 1) deficits in social communication and social interaction and 2) restricted repetitive patterns of behaviour, interests, and activities.^[4]

In India, recent reviews of ASD epidemiological studies have reported higher estimates of incidence and prevalence than earlier studies and the current median ASD prevalence estimate is about 62 in 10,000 in India.^[5] There have as yet been no epidemiological studies of ASD conducted in India, or in any comparable region of the world in order to provide a definitive estimate of either prevalence or incidence. Most estimates are based on population, and there has been little evidence of variation based on geographic region (although this is an emerging field). Thus, while there are no studies from India, the numbers are likely to be similar. ASD is one of the most common developmental disabilities and current estimates of the prevalence of ASD are 1 in 250. This would suggest that there are approximately 4 million individuals with an ASD in India. Of course, the actual incidence is not known. Eighty per cent of those with ASD is males.^[6] The SSP is a standardized, abbreviated version of the Sensory Profile designed so that clinicians can quickly identify if a child is experiencing sensory processing difficulties as expressed in the functional performance of daily life. It measures children's sensory processing through caregivers' report on the frequency with which maladaptive behaviours in relation to sensory stimuli occur. It is having the highest discriminative power of a typical sensory processing among all the items. Reliability and Internal consistency of the sections within the scale ranged from SSP's is 0.70 to 0.90. Initial studies on the validity of the SSP demonstrated a discriminate validity of >95% in identifying children with and without sensory modulation

difficulties. Its validity and correlations between SSP total and sections ranged from 0.25 to 0.76 and all significant at P value less than 0.01. The value of Cronbach's Alpha ranges from 0.800 to 0.995. In the context of Test-Retest reliability, SSP is highly reliable.^[7] Together these findings provide support for the use of the SSP as a valid and reliable measure of sensory processing.^[8] It is a 38-items derived from the 125 items in the full version that presented with the highest discrimination for atypical sensory processing patterns. Each item is scored on a 5-point Likert scale (1 = always, 2 = frequently, 3 = occasionally, 4 = seldom, and 5 = never) to rate how often a child demonstrates particular sensory-related behaviors. Because the SSP items are negatively worded, lower scores indicate more atypical SP pattern. Typical Performance: If the child's score falls in this category, the child's sensory abilities are within normal limits. The highest scores (155-190) reflecting normal performance. Probable Difference: If the child's score falls in this category, the child may have some sensory processing difficulties but as it may not hamper his/her routine activities, they are not so noticeable on the first eye (Score- 142-154). Definite Difference: If the child's score falls in this category, the child is definitely having sensory processing difficulties and follow up assessments must be required (38-141). The items are grouped into seven sections: Tactile Sensitivity, Taste/Smell Sensitivity, Movement Sensitivity, Underresponsive/Seeks Sensation, Auditory Filtering, Low Energy/Weak, and Visual/Auditory Sensitivity. All sections relate to sensory modulation and reflect how the child's nervous system regulates the sensory information it receives.^[9]

1.1 Need for the study

To assess the performance of children with ASD on each section of SSP that can be useful to differentiate them from others.

2. METHODOLOGY

2.1. Study Design

Quantitative observational study.

2.2. Target Population

Children with ASD.

2.3. Study Setting

Ahmedabad

2.4. Sample Size

50

2.5. Codes of Ethics

Permission was taken before filling up the form and written consent was taken in the form. Any personal information of the children and parents will not be disclosed.

2.6. Inclusion criteria

- Age within the specific range (3-10 years) (3 years= 3 years and 0 Months, 10 years= 10 years and 11 months)
- Children diagnosed with ASD by paediatricians or child psychiatrists on DSM-V criteria

2.7. Exclusion criteria

- The children who are on medications for any condition
- The children who have any other disability

2.8. Study period

8 Months

2.9. Sampling method

Quota Sampling

2.10. Method Phase-1

Ahmedabad is divided into 5 zones. 1) East zone 2) West zone 3) North zone 4) South zone 5) Central zone. The data of 10 children with ASD were collected from each zone. In this way, the data of 50 children with ASD were collected from the whole Ahmedabad.

2.11. Method Phase-2

For children with ASD: 8 NGOs/Private Clinics/Hospitals/Trusts/Special Schools were approached for collecting the data. 86 children's data were received but only 50 children (3 Years- 4 Boys + 2 Girls, 4 Years- 3 Boys + 2 Girls, 5-10 Years- 29 Boys + 10 Girls) were selected from them and rest 36 were eliminated due to different issues like 4 of them were not within the specific age range (3-10 years), 6 Children were not fitted in the guidelines of DSM-V, caregivers of 14 children were uncooperative/unresponsive or they did not show interest in responding properly, 6 children were having other disabilities (3 children with Mental retardation, 2 children with learning disabilities and 1 child with preterm birth), 3 children were taking drugs for epileptic condition, 3 caregivers of children do not understand the English language.

Purpose of the study was explained to the caregivers and written informed consent was taken. Detailed information of the children was taken from the caregivers. SSP and 5 points Likert Scale were explained to the caregivers well in advance before filling up the SSP. The caregivers marked each question and fill up the form.

3. RESULT

Table 1: Data Distribution

Gender	3 Years	4 Years	5-10 Years
Boys	4 (8%)	3(6%)	29 (58%)
Girls	2 (4%)	2 (4%)	10 (20%)
Total	6 (12%)	5 (10%)	39 (78%)

Table 2: Performance classification of children with ASD

Children with ASD	Definite Difference	Probable Difference	Typical Probable
Tactile Sensitivity	64%(32)	22%(11)	14%(7)
Taste/Smell Sensitivity	36%(18)	24%(12)	40%(20)
Movement Sensitivity	40%(20)	22%(11)	38%(19)
Underresponsive/Seeks Sensation	68%(34)	18%(9)	14%(7)
Auditory Filtering	48%(24)	16%(8)	36%(18)
Low energy/ Weak	52%(26)	6%(3)	42%(21)
Visual/Auditory Sensitivity	28%(14)	26%(13)	46%(23)
Total	78%(39)	22%(11)	0%(0)

4. DISCUSSION AND CONCLUSION

Based on SSP scores, 50 children with ASD showed 0% (0) typical performance, 22% (11) were found to be in the probable difference range, and 78% (39) are in the definite difference range.

4.1 Definite difference and probable difference of children with ASD

Seventy-Eight (78%) children with ASD diagnosed with a definite and probable difference and performed differently than children without ASD. These children demonstrated some degree of sensory processing dysfunction. It suggests the possibility that they may have inaccurate or insufficient sensory information. As per DSM-V sensory reactivity word which was included in repetitive and restricted behaviours domain, this 78% of children with ASD were identified as having definite sensory reactivity symptoms according to SSP.

Forty (40%) children with ASD showed typical performance in Taste/Smell Sensitivity, 38% in Movement Sensitivity, 42% in Low energy/Weak and 46% in Visual/Auditory sensitivity.

Eighty-six (86%) children with ASD obtained a combined score of definite difference and probable differences in Tactile Sensitivity and Underresponsive/Seeks Sensation and 64% in Auditory filtering. Children with ASD have sensory processing difficulties majorly with these three sections. Children with ASD show a very low percentage in the rest four sections.

The results of these sections are consistent with the literature. These findings support previous researches reports documenting the results by Rogers et al., 2003; Tomchek and Dunn, 2007; Al-Heizan et al, 2015; Shah et al. 2015.

Rogers et al. analysed the parents of the children with ASD and other developmental disorders reported issues with sensory symptoms. Significant differences were detected at $\alpha < .01$ for tactile sensitivity [$F(3,99) = 10.01$], taste/smell sensitivity [$F(3,99) = 11.63$], underreactive/seek stimulation [$F(3,99) = 4.56$], auditory filtering [$F(3,99) = 19.67$], and low energy/weak muscles [$F(3,99) = 14.21$]. The research was done in U.S.A.^[10]

Tomchek and Dunn found 95% of the sample of children with ASD demonstrated some degree of sensory processing dysfunction on the SSP total score, with the greatest differences reported on the underresponsive/seek sensation (86.1%), Auditory Filtering (77.6%), and Tactile sensitivity (60.9%) sections. The research was done in the U.S.A.^[11]

Al-Heizan et al. found 84.8% of children with Autism demonstrated definite sensory processing dysfunction. The most prevalent sensory processing dysfunctions involved the under-responsive/seek sensation (89.13%), Auditory Filtering (73.90%) and Tactile sensitivity (60.87%) domains. The research was done in Saudi Arabia.^[12]

Shah et al. found 98% of children with ASD demonstrated some degree of Sensory processing disorders on SP. The research was done in India.^[13]

These researches were done at different cultural places. The researchers did researches in different cultures like Rogers et al. and Tomchek and Dunn in the USA, Al-Heizan et al. in Saudi Arabia, Shah et al. in India. The percentage may vary due to cultural competencies but the result is still the same. This definite and probable range suggests the possibility that they may have inaccurate or insufficient sensory information. The difference in the score may be because of different cultural and communities.

4.2 Typical performance of children with ASD

Forty (40%) children with ASD showed typical performance in Taste/Smell Sensitivity, 38% in Movement Sensitivity, 42% in Low energy/Weak and 46% in Visual/Auditory sensitivity.

Tomchek and Dunn also highlighted the same sections in which the children with Autism performed typically in Taste/Smell Sensitivity (32%), Movement Sensitivity (55.9%), Low energy/Weak (58%) and Visual/Auditory sensitivity (31%).^[11]

Al-Heizan et al. also analysed the same sections in which the children with Autism performed typically in Taste/Smell Sensitivity (28.26%), Movement Sensitivity (34.80%), Low energy/Weak (30.40%) and Visual/Auditory sensitivity (45.70%).^[12]

The percentage may vary due to cultural competencies but the result is still the same. These are the highlighted sections where the children with ASD performed in a typical performance. The scores of children with ASD are more widely distributed across the possible range of scores due to a broad spectrum of the frequency of behaviour occurrence. When one child of ASD displays one behaviour always another child may not display the same behavior at all or in the different level of frequency than others. As mentioned in the literature, these children with ASD perform in a very wide behavior range. It does not mean they do not belong to ASD. It is commonly accepted that children with ASD demonstrate varying patterns of functional difficulties and responsiveness to sensory events.^{[14] [15] [16] [17] [18]}

4.3 Culture perspective

The researcher has studied that the scores of all items, sections and total are different than other studies but the result is the same. The researchers did studies in different cultures like Rogers et al. and Tomchek and Dunn in the USA, Al-Heizan et al. in Saudi Arabia, Shah et al. in India, Engel-Yeger in Israel. This variation in the scores it might be due to the different cultures in the world, it creates a need to assess the expectation, perceptions and views of caregivers from different cultures. In this study, the prevalence of clinically significant sensory differences in children with ASD was 78% which is within the published range (40-88%) for the various communities. The values are given by Al-Heizan. Tavassoli et al. gave the range of 60%-90% for children with ASD having sensory reactivity issues on parent and self-report questionnaires. It shows the sensory problems are a common problem among children with ASD in various communities. This result suggests that ASD and sensory processing disorders are genetically and structurally (i.e., physiologically, neurologically, and biochemically) linked.^[12]

Children with ASD tend to exhibit different behaviors that affect their ability to engage in daily occupations, including inflexible behaviors, habits, and play patterns. In addition to sensory-motor problems such as excessive rocking and spinning, they have also preoccupations with personal interests, sensitivity to certain foods or clothes, and a strong attachment to certain objects. These behaviors can diminish the child's functional capabilities, including his sense of purposefulness, social interactions, participation in activities, and ultimately his overall health.^[19] Based on Ayres' sensory integration theory, the reduced ability to process and integrate sensation may be one of the underlying reasons for the behavioral and/or functional problems prevailing in ASD.^{[20] [21]} The children with ASD displayed more frequent sensory behaviors than children without ASD. The scores of children with ASD were significantly different from those of children on all of the sections of SSP. The finding shows the most of the children with ASD fall indefinite difference whereas most of the children fall in typical performance. These present findings, considered with similar studies reported in the literature, begin to confirm the presence of sensory processing disorders in children with ASD and begin to unravel the types. The findings describe hypo-sensitivities and hypersensitivities to sensory stimuli that results in sensory behaviors which develop the functional inabilities of the children. This finding suggests that although many children with ASD may have compromised sensory processing, the sensory processing of some children with ASD may be similar to that of children without ASD. This inconsistency highlights the individuality of each child and reminds therapists that a specific child may or may not exhibit differences from the group to which he or she belongs. Therefore, occupational therapists must remain objective when assessing a young child with ASD and conduct a thorough evaluation of sensory processing abilities to determine whether that child's sensory processing is compromised. From this study, it can be assumed that the researcher should avoid comparing average sensory scores across samples. Averaging the scores of children with ASD will necessarily confound opposite patterns of deficits. For example, the average sensory sensitivity of particular behaviour of children with ASD is very close to the average, but this average is clearly misleading because few other children with ASD show another type of sensory sensitivity for the same behaviour. So if some children with ASD are firmly over-sensitive whereas another is under-sensitive to that particular stimulus.

As a consequence, sensory-based intervention strategies may help counteract the emergence of maladaptive behaviors and could be an effective way. Under-sensitive children displayed a range of specific behavioral disorders, prominently including self-aggression, one of the most disabling symptoms of ASD from a clinical standpoint. Indeed, children belonging to the "under-sensitive" cluster demonstrated significantly higher self-aggression than all other patients in the sample. The idea that sensory dysfunction may be at the root of behavioral dysfunction suggests that self-aggression behaviors may actually be caused by sensory under-sensitivity, possibly because under-sensitive patients use self-aggression as a form of self-stimulation. If that is the case, self-aggression behaviors might be discouraged by offering increased sensory inputs to these children.^[22]

These findings support the inclusion of atypical sensory responsivity to the environment in the DSM-V diagnostic criteria but emphasize that such behaviours are not unique to ASD; one feature does not make a diagnosis, other features remain essential. The findings are also supportive of the hypothesis that sensory symptoms are a non-specific indicator of brain functional network difference in Developmental Psychopathology.

The researcher exclaimed whether the children are truly different from the group. The possible explanation for the difference in scores is that some of the caregivers of children with ASD may have reported extreme behaviors because they expected that their children were different. These questions regarding the accuracy of caregiver report underscore the importance of incorporating clinical observations and professional judgment with results from caregiver-report questionnaires, such as the SSP.

SIT based on Ayres' (1972) theory, Ayres Sensory Integration is a commonly used method of therapy by occupational therapists to increase the child's ability to process and integrate sensory information and thereby demonstrate more organized and adaptive

behaviors. [21] From the result of this study, different sensory patterns in children with ASD have been revealed. It can be treated with the SIT and with the help of it the child's performance can be improved. SIT can positively affect motor skills, socialization, attention, behavior control, reading skills, participation in-game activities, and the achievement of personal goals.

4.4. Limitations of the study

The sample does not represent the entire population of children with and without ASD, the small sample is not indicative of all children in 3 to 10 year Age- groups. All samples were taken from the urban area of Ahmedabad that represents only one region of the country.

5. RECOMMENDATIONS

- The study can be done with a large sample size.
- Comparison studies can be done between
 - The different severity levels of Indian children with ASD.
 - The children with and without ASD from different cultures and communities.
 - Performance of children with ASD from the Urban and Rural area.
 - Children with other sensory processing disorders.
 - Children with and without other disabilities in the Indian population on SSP.
- The study can be done to investigate the relevance of sensory processing aspects on the variable developmental presentation and occupational performance of children with ASD in Indian Population.
- To identify the patterns of sensory processing in people living with ASD and examine the effectiveness of sensory integration strategies by using SSP.
- Studies can be done to investigate Inter-rater Reliability and Validity studies of SSP in children with ASD.
- Factor analysis of SSP based on Indian children with a large Sample size.

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