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A Comparative Study using the Short Sensory Profile by the Caregivers on the Performance of Children With and Without Autism Spectrum Disorders

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Abstract: ***The purpose of the study was to compare the performance of children with and without ASD by using SSP. The SSP was filled up by the caregivers of the children. Age and Gender matched 50 children with and without ASD were approached on different platforms and incorporated in the study on the basis of inclusion and exclusion criteria. Seventy Eight (78%) children with ASD diagnosed with definite and probable difference and performed differently than children without ASD. These children demonstrated some degree of sensory processing dysfunction. 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. Tactile Sensitivity, Underresponsive/Seeks Sensation and Auditory filtering sections become the most sensitive sections for children with ASD. The sample does not represent the entire population of children with ASD and without ASD; therefore the study can be done with larger sample size. From this study it has been concluded that the total score shows high significance difference, therefore SSP can be used as a satisfactory evaluatory tool to evaluate sensory processing abilities of children with ASD which can be really very helpful to occupational therapists in assessing and programme planning. Cultural adaptations of SSP increase its effectiveness and will become more understandable for caregivers of India.***

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 behaviors 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 behavior, 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 behavior, 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 are 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 frequency with which maladaptive behaviors in relation to sensory stimuli occur. It is having the highest discriminative power of atypical 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 is ranges from 0.800 to 0.995. In 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 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]

Need of the study: To investigate the sensory processing dysfunction in children with ASD and compare the sensory processing behaviors between children with and without ASD among Indian population by using SSP.

- To analyze the performance of children with and without ASD on SSP belongs to various Age-groups
- To identify the sections of the SSP that best discriminate and/or more sensitive to diagnose the children with ASD.

2. Literature Survey

Dunn (1994) prepared SP along with other 8 occupational therapists. It was made up of 99 items (Auditory-9, Visual- 12, Taste/smell- 6, Movement- 18, body position- 10, touch-21, emotional/social- 20, activity level- 3). SP was introduced to the parents of 64 typical children of 3-10 years of ages. There were 99 items in the profile. Parents used a 5-point Likert scale to report percentage of time their children engaged in each behavior mentioned in the SP and researchers found that 2/3rd of them (67 items) were very uncommon items among typical children, younger children are more likely to display the uncommon behaviors than older children, girls are more likely to display these behaviors than boys and typical children were more commonly engaged in other 32 items.[10]

Dunn & Westman (1997) prepared prepared SP of 125 items was introduced to the parents of 1115 children of 3-10 years of ages. Parents used a 5-point Likert scale to report the percentage of time their children engaged in each behavior. Researchers then analyzed the data, using multivariate methods to identify trends in performance and age and gender differences. But this time the SP which was introduced, it was made up of 125 (99+26) items (Auditory-10, Visual- 18, Taste/smell- 10, Movement- 22, body position- 11, touch-24, emotional/social- 24, activity level- 6) to find out the most uncommon behaviors. Researcher found 73% of the items were very uncommon for this national sample of children without disabilities. This research was done to find out the more uncommon behaviors among typical children. There were no meaningful gender differences found.[11]

Kientz & Dunn (1997) did a comparative study to determine whether the SP discriminates between children with and without Autism and which items on the profile best discriminate between these groups. Parents of 32 children with autism aged 3 to 12 years and of 64 children without autism aged 3 to 10 years completed the SP. 84 of 99 items (85%) on the SP differentiated the sensory processing skills of subjects with autism from those of subjects without autism. There were no group differences between subjects with mild or moderate autism and subjects with severe autism.[12]

Watling et al. (2001) conducted a research to describe the sensory-based behaviors of young children with autism as reported by their parents on the SP. Factor scores of children with autism were compared with those of children without autism. The SP questionnaire was completed by parents of 40 children with autism 3 through 6 years of age and parents of 40 children without autism 3 through 6 years of age. Sensory processing of children with autism was significantly different from the sample without autism on 8 of 10 factors (Sensory Seeking, Emotionally Reactive, Low Endurance/Tone, Oral Sensitivity, Inattention/Distractibility, Poor Registration, Fine-Motor/Perceptual, and Other).[13]

Padankatti (2004) planned a study to determine whether the 99 item SP tool discriminates between children with and without LD and which items on the profile best discriminates between these groups. Parents of 35 children with LD and 70 children without LD aged 5-12 years of both genders completed the SP. Parents used a 5-point Likert scale to report the percentage of time their children engaged in each behavior. 64 of the 99 items (65%) were found to be uncommon behaviors for the sample of children without LD. Children with LD performed differently on all categories on the Sensory Profile. 7 Items were found to be common behaviors for this sample of children. Age and gender differences were significant on several individual items for both samples of children.[14]

Prakash & Vaishampayan (2007) did a research to compare the sensory processing abilities of children with CP and typical children and to identify the items and components on the SP that discriminate between children with CP and typical children. Parents of 60 children (30 children with CP and 30 typical children) between the age group of 5-8 years filled up each of the 125 items on SP. 40 of 125 items and 7 of 14 components on the SP showed statistically significant difference between the children with CP and typical children.[15]

Tomchek & Dunn (2007) conducted a study to investigate differences in sensory processing among typically developed and 281 ASD age matched children between ages 3 and 6

years, using the SSP. 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/ Seeks Sensation, Auditory Filtering, and Tactile Sensitivity sections. The ASD group also performed significantly different on 92% of the items, total score, and all sections of the SSP.[16]

Ashburner et al. (2008) did a study to explore the associations between sensory processing and classroom emotional, behavioral, and educational outcomes of children with ASD with the use of SSP. 28 children with ASD (with average-range IQ) were compared with 51 age- and gender matched typically developed peers on sensory processing and educational outcomes. For children with ASD, the SSP scores Underresponsive/Seeks Sensation and Auditory Filtering explained 47% of the variance in academic performance, yet estimated intelligence was not a significant predictor of academic performance. A pattern of auditory filtering difficulties, sensory under responsiveness, and sensory seeking is associated with academic underachievement in the children with ASD. Children who have difficulty processing verbal instructions in noisy environments and who often focus on sensory-seeking behaviors appear more likely to underachieve academically.[17]

Ben-Sasson et al. (2008) did a meta-analysis of sensory modulation symptoms in individuals with ASD. Results from 14 studies indicated a significant high difference between ASD and typical groups in the presence/frequency of sensory symptoms, with the greatest difference in under-responsivity, over-responsivity and sensation seeking. Chronological age, severity of autism, and type of control group these three moderators reduces the variability in findings among studies. Sensory differences were highest for studies of children ages 6–9 years, samples with more than 80% with an autism diagnosis. It is important to consider these moderators in the design of studies and interventions addressing sensory symptoms.[18]

Engel- Yeger (2010) did research to examine the applicability of the SSP for screening SPDs among typical children in Israel, and to evaluate the relationship between SPDs and socio-demographic parameters. Participants were 395 Israeli children, aged 3 years to 10 years 11 months, with typical development. Parents of all children completed the SSP. Factor analysis found similarity between the Hebrew version of the SSP and the original SSP. About 15% of the children had SPD. Differences between age groups and sexes were found in several SSP sections. The scores of the Israeli children were lower than the scores of the American children (indicating higher tendencies for atypical sensory based behaviors) across all ages. In conclusion, typical children may have SPD. The SSP may be appropriate for screening SPD among Israeli children.[19]

Shah et al. (2016) did a study to investigate the prevalence of sensory processing dysfunction in children with ASD in the Urbal Indian context and to understand the dominant sensory processing patterns. SP caregiver questionnaires for toddler and children were administered on 68 children with ASD receiving occupational therapy intervention in the age range of 3-10 years. 98% of the sample demonstrated some degree of SPD. The dominant factors that emerged in section summary of the SP are Auditory processing (48.52%), Multi sensory processing (47.05%), Sensory processing related to endurance/Tone (63.23%), Sensory input affecting emotional responses (58.82%) and behavioral outcomes (64.70%). They concluded the prevalence of SPDs in children with ASD is similar to findings in the previous studies and predominant sensory processing patterns in children with ASD in Mumbai.[20]

Tripathi et al. (2015) did a research to find out the performance of Indian Normal children on SSP. 101 children (40 Girls+61 Boys) of 3-10 years age group of Ahmedabad city were participated. The Normative values of SSP for age-groups 3 years, 4 years and 5-10 years for Indian typical children have been developed. There is no difference in the performance of children age-groups 3 years and 4 years where as the performance of the children age-groups 4 years and 5-10 years are different on SSP. In this study, the scores of 4 years age-group children were towards typical performance whereas the scores of 5-10 years age-groups children were more towards definite deference. From this study, it is concluded that in the age-group 3 years and 4 years, there is no difference in the performance of boys and girls on SSP. In the age-groups of 5-10 years, boys score is more towards definite difference on SSP. There is no difference in the performance of the typical children on SSP belongs to various socio-economic classes too. 47% (18 of 38 items) were uncommon. There is 100% uncommon items in Movement sensitivity and Low energy/weak categories for all the age groups. SSP is highly reliable in the context of Test-Retest Reliability (0.975).[7]

Al-Heizan et al. (2015) investigated the manifestation of sensory processing dysfunction in autism and compared the functional components of sensory processing between Saudi Arabian children with and without autism. A convenience sample of 46 Saudi Arabian children with autism and 30 children without autism participated in this study. The sensory processing functions of both groups were assessed with the SSP. The overall findings indicated that 84.8% of children with autism demonstrated definite sensory processing dysfunction. The most prevalent sensory processing dysfunctions involved the under-responsive/seeks sensation (89.13%), auditory filtering (73.90%), and tactile sensitivity (60.87%) domains. Most of the children without autism (66.66%) demonstrated typical sensory function; the most prevalent sensory processing dysfunctions involved the tactile sensitivity (33.3%), under-responsive/ seeks sensation (23.33%), and movement sensitivity (20%) domains. Saudi Arabian children with and without autism have clinically significant sensory dysfunctions. However, the prevalence of those sensory dysfunctions in children with autism is significantly higher than in the children without autism.[8]

3. Methodology

Study Design: Quantitative observational study
Target Population: Children with ASD and Children without ASD
Study Setting: Ahmedabad
Sample Size: Children with ASD (50) and children without ASD (50) (Age and Gender matched)

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.

Inclusion criteria:
For children with ASD group-
- 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 pediatricians or child psychiatrists on DSM-V criteria

For children without ASD group-
- Age within the specific range (3-10 years)
- Absence of a diagnosed medical condition that might compromise the development of children (e.g; Mental Retardation, Learning Disabilities, Down syndrome, Cerebral palsy, ADHD)
- No children with Preterm birth (Preterm birth required gestation age of 34 weeks or less and birth weight under 2500 gms) [21]
- No genetic history with ASD[13]

Exclusion criteria:
For children with and without ASD:
- Uncooperative/ Unresponsive caregivers (Parents and family members)
- The children below the age of 3 years and above 10 years.
- The caregivers who does not understand the English language
- Caregivers (Parents and family members) who do not spend minimum 12 hours (except sleeping hours) a day with the child.

For children without ASD group-
- The children who are on medications for any condition
- The children who have any other disability

Study period: 8 Months
Sampling method: Quota Sampling
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 and 10 children without ASD were collected from each zone. In this way, the data of 50 children with ASD and 50 children without ASD were collected from whole Ahmedabad.

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 English language.

For children without ASD: The aim was clear to collect the age and gender matched data of normal children. 5 Normal schools of 5 regions were approached for data collection purpose and 85 data of children were received. From those 85 children, 35 children were excluded as they were meeting the exclusion criteria (7 children were on medication, 15 children were out of age specific range, 3 caregivers of children do not understand English language and 10 children had uncooperative/ unresponsive or they did not show interest in responding properly) and only the data of 50 children were collected. 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 point Likert Scale were explained to the caregivers well in advance before filling up the SSP. The caregivers marked each question and filled up the form.

4. Results & Discussion

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%)

During the procedure of collecting the data of children with ASD, the researcher could not get enough girls to match with the number of boys. It has been noticed that the number of boys are four times more in compared to the girls.[3]

Table 2: P and U values of applied tests for children with and without ASD

Sections	*p- value*	*U- value*
Tactile Sensitivity	0.00	787.00
Taste/Smell Sensitivity	0.00	123.50
Movement Sensitivity	0.04	959.50
Underresponsive/Seeks Sensation	0.00	599.00
Auditory Filtering	0.00	633.00
Low energy/ Weak	0.00	815.50
Visual/ Auditory Sensitivity	0.05	971.50
Total	0.00	531.00

The SSP items written in such a way that frequent behaviors are undesirables. Behaviors that occur frequently receive low score and high scores of the SSP represent the typical performance means the desirable behaviors. The children with ASD consistently demonstrated lower mean score (127.20) than children without ASD (149.40) which indicates the children with ASD shows frequent behaviors. Difference in total score, sections and items existed between children with and without ASD. Children with ASD were compared with the age and gender matched children without ASD to eliminate the age and gender bias. Highly significance difference (p=0.00) has been found between these two groups which shows that the children with ASD performed/behaved frequently and differently than children without ASD on SSP.

Table 3: 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)

Performance of children with ASD:
Seventy Eight (78%) children with ASD diagnosed with definite and probable difference and performed differently than children without ASD. These children demonstrated some degree of sensory processing dysfunction.

Definite difference and probable difference of children with ASD:
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 very low percentage in the rest 4 sections. These sections results are consistent with the literatures.[12][13][22] This findings support previous researches reports documenting the results by Tomchek & Dunn, Al-Heizan and Shah.[16][8][20] These three researches were done at different cultural places. Their scores are varying but the result is same. The difference in the score may be because of different cultural and communities.

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 & Dunn also highlighted the same sections in which the children with Autism performed typically in Movement Sensitivity (55.9%) and visual/Auditory sensitivity (58%). 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 typical performance. The scores of children with ASD are more widely distributed across the possible range of scores due to a broad spectrum of frequency of behavior occurrence. When one child of ASD displays one behavior 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.[23][24][25][26][27]

Table 4: Performance classification of children without ASD

Children without ASD	*Definite Difference*	*Probable Difference*	*Typical Probable*
Tactile Sensitivity	38%(19)	16%(8)	46%(23)
Taste/Smell Sensitivity	20%(10)	36%(18)	44%(22)
Movement Sensitivity	26%(13)	16%(8)	58%(29)
Underresponsive/Seeks Sensation	30%(15)	22%(11)	48%(24)
Auditory Filtering	6%(3)	24%(12)	70%(35)
Low energy/ Weak	18%(9)	10%(5)	72%(36)
Visual/Auditory Sensitivity	18%(9)	20%(10)	62%(31)
Total	32%(16)	28%(14)	40%(20)

Performance of children without ASD:
Forty (40%) children without ASD fall in typical performance whereas 28% children without ASD fall in the range of probable difference and 32% children without ASD fall into definite difference. This probable and definite difference may be due to three reasons. One is it has been observed by the researcher the caregivers marked in the occasionally category if they got confused with the frequency of their children's behavior if the child does it frequently (75%) or seldom (25%). Second one can be the children without ASD also suffer with some kind of sensory processing issues.[10] Third might be it has been noticed during collecting the data of children without ASD, few caregivers scored low on SSP as they may relate their children's' behavior with the academic performance. Caregivers make their close observations on the children and become more attentive towards their academic performance. Therefore, their responses vary according to the children's caregiver's thinking.[7]Together, These kinds of responses make the child fall into the probable difference range instead of the typical performance. The same result has been found in children without ASD in the applicability of the SSP for screening SPDs among Israeli children by Batya Engle-Yeger.[7] The children without ASD who fall in definite difference range may compromise their sensory ability at a few extends but it may not hamper their routine activities so these kinds of sensory inabilities cannot be identified on first eye.

It assumes that children with and without autism exhibit some degree of sensory dysfunction which is greater in children with autism than children without autism. Similar results have been reported in other populations.[12][13][28][29][30] However, the prevalence of sensory processing dysfunction has ranged from 5 to 10 % for children without ASD.[31] Therefore; further studies can to be done for the screening of sensory processing

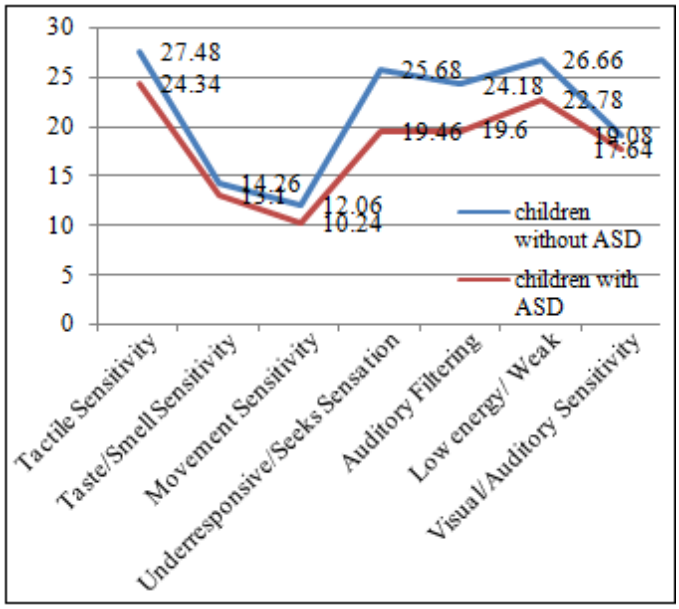
dysfunctions in children without ASD to avoid/minimize the SPD complications. Therefore, occupational therapists should use caution not to assume a diagnosis when a child demonstrates a pattern of sensory behaviors similar to those identified for the children with ASD. The therapist should not rely on the SSP only and go for clinical observations, behavior during standardized assessment, structured play observations and follow up assessments.

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 without ASD on most of the sections of SSP. The finding shows the most of the children with ASD fall in definite difference whereas most of the children without ASD 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 n with ASD and begin to unravel the types. The findings describe hyposensitivities and hypersensitivities to sensory stimuli that results in sensory behaviors which develop the functional inabilities of the children.

Sensory processing is an important area of difference between these groups. This finding also supports using the SSP to identify the sensory behaviors of these age groups. The children with ASD also had scores that tended to spread further across the possible score ranges than the scores of the children without ASD, suggesting that this group may not be homogenous. This wide spread of scores is evident in the distributions on the Taste/Smell Sensitivity, Movement Sensitivity, Low energy/ Weak and Visual/Auditory sensitivity.

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.

The researcher exclaimed whether the children 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.



Graph 1: Comparison of mean scores of children with and without ASD

Culture perspective

The researcher has studied that the scores of all items, sections and total is different than other studies but the result is the same (Significant difference has been found in all the studies). This variation in the scores is may 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. 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. It shows the sensory problems are a common problem among children with ASD in various communities. This result suggests that autism and sensory processing disorders are genetically and structurally (i.e., physiologically, neurologically, and biochemically) linked.[8] However, the involvement of other factors, such as culture, child-rearing style, and social experiences, may also play roles in sensory experiences and sensory integration and processing abilities. Cultural and community lifestyles have some degree of effect on the severity and percentage of involvement of sensory processing dysfunctions in children with autism.[31][32] Children from different geographical areas or different cultures may exhibit differences in their performance, as each culture has its own distinctive pattern of child-learning practices, variable attitudes toward and expectations from children, and different concepts of the behaviors and skills that are to be encouraged in their development.[33] Further studies can to be done with children from different cultures.

5. Conclusion

78% children with ASD diagnosed with definite and probable difference and performed differently (behaved frequently) than children without ASD. Children with ASD have sensory processing difficulties majorly with these three sections-

Tactile Sensitivity (86%) and Underresponsive/Seeks Sensation (86%) and Auditory filtering (64%).

A total score and scores for all sections of the SSP were likewise significantly different when children with ASD were compared to age-matched and gender matched peers who were typically developing. The children with ASD displayed more frequent sensory behaviors than children without ASD on SSP which supports using the SSP to identify the sensory behaviors of these age groups. It has been reported that the children with ASD have difficulties with processing and responding to sensory input on the SSP. SSP needs to be used in combination with clinical observations and other measures of sensory processing abilities to ensure that a child's full range of behaviors are assessed. Sensory integration frame of references need to be used while addressing communication difficulties in children with ASD. Standardising SSP will be very useful to identify sensory processing difficulties in Indian Children if the tool can be adapted with cultural competences.

From this study it has been concluded that the total score of all the age-groups shows highly significance, therefore SSP can be used as a satisfactory evaluatory tool to evaluate sensory processing abilities of children with ASD which can be really very helpful to occupational therapists in assessing and programme planning. The scores of children with ASD are more widely distributed across the possible range of scores due to a broad spectrum of frequency of behavior occurrence. This variability in the magnitude of the symptoms is moderated by the age of the child. Therapists should not rely on the SSP only and should go for clinical observations, behavior during standardized assessment and structured play observations. SSP will be useful for screening sensory processing problems and assist in intervention planning that focused on enhancing child's performance, social participation, and well being. This study recognizes the importance of assessing the performance of children from different cultural contexts, particularly in relation to their everyday functioning or occupation. Cultural adaptations of SSP increase its effectiveness and will become more understandable for Indian caregivers.

6. Limitations of the Study

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

7. Future Scope

a) The study can be done with large sample size
b) 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 Urban and Rural area
   - Children with other sensory processing disorders
   - Children with and without other disabilities in Indian population on SSP
c) 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
d) To identify the patterns of sensory processing in people living with ASD and examine the effectiveness of sensory integration strategies by using SSP
e) Studies can be done to investigate Inter-rater Reliability and Validity studies of SSP in typical Indian children
f) Factor analysis of SSP based on Indian children with large Sample size
g) Modified SSP can be developed with the views of the caregivers of children with ASD and people with ASD with good intellectual abilities

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