

# Analysis of Each Item of Short Sensory Profile Filled Up By the Caregivers on the Performance of Children with and Without Autism Spectrum Disorders

<sup>1</sup>Hetal Jagdishkumar Tripathi, <sup>2</sup>Titiksh Vijeshkumar Varma, <sup>3</sup>Krupa Babulal Prabhakar

<sup>1</sup>Occupational Therapist, Department of Occupational Therapy, Government Spine Institute, Civil Hospital Campus, Ahmedabad, Gujarat, India

<sup>2</sup>Occupational Therapist, Department of Occupational Therapy, Civil Hospital, Asarwa, Ahmedabad, Gujarat, India

<sup>3</sup>Physiotherapist Tutor, Trauma Center, Civil Hospital, Asarwa Ahmedabad, Gujarat, India

---

**Abstract:** The purpose of the study was to find out the most common behaviours/items from each sections of SSP that can be useful to differentiate children with ASD from children without ASD among Indian population with the help of 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 of the study. 47.37% (18 of 39) of the items have greater significance difference and can be used to discriminate children with ASD from children without ASD. On the basis of the most common items, the caregivers and the therapists can differentiate children with ASD from children without ASD. These Behaviors/items play a major role in diagnosis of 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 these items can be used to evaluate sensory processing abilities of children with ASD which can be really very helpful to occupational therapists in assessing and programme planning. SSP was made by the occupational therapists only so the views of caregivers of children with ASD and people with ASD with good intellectual abilities can be incorporated which increases the fruitfulness of SSP. 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 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.<sup>[1][2]</sup> Symptoms typically are apparent before age 3 years.<sup>[3]</sup> 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.<sup>[4]</sup>

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.<sup>[5]</sup> 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.<sup>[6]</sup>

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.<sup>[7]</sup> Together these findings provide support for the use of the SSP as a valid and reliable measure of sensory processing.<sup>[8]</sup> 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.<sup>[9]</sup>

### **1.1 Need of the study:**

To find out the most common behaviours/items from each sections of SSP that can be useful to differentiate children with ASD from children without ASD among Indian population by using SSP.

## **2. LITERATURE REVIEW**

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 2/3<sup>rd</sup> 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.<sup>[10]</sup>

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.<sup>[11]</sup>

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.<sup>[12]</sup>

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).<sup>[13]</sup>

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.<sup>[14]</sup>

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.<sup>[15]</sup>

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.<sup>[16]</sup>

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.<sup>[17]</sup>

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.<sup>[18]</sup>

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.<sup>[19]</sup>

Shah et al. (2016) did a study to investigate the prevalence of sensory processing dysfunction in children with ASD in the Urban 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.<sup>[20]</sup>

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 whereas 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).<sup>[7]</sup>

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.<sup>[8]</sup>

### 3. METHODOLOGY

**3.1. Study Design:** Quantitative observational study

**3.2. Target Population:** Children with ASD and Children without ASD

**3.3. Study Setting:** Ahmedabad

**3.4. Sample Size:** Children with ASD (50) and children without ASD (50) (Age and Gender matched)

**3.5. 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.

**3.6. 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)<sup>[21]</sup>
- No genetic history with ASD<sup>[13]</sup>

### 3.7. 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

### 3.8. Study period: 8 Months

### 3.9. Sampling method: Quota Sampling

### 3.10. 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 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.

### 3.11. 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 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. FINDINGS & 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.<sup>[3]</sup>

Table 2: Tests applied, P and U values of applied tests for each item analysis between children with and without ASD

Sr. No.	Tests Applied	U Value	P Value
1.	<b>Mann- Whitney U-Test</b>	<b>775.50</b>	<b>0.00</b>
2.	<b>Mann- Whitney U-Test</b>	<b>997.50</b>	<b>0.05</b>
3.	Mann- Whitney U-Test	1005.00	0.08
4.	Mann- Whitney U-Test	1157.00	0.49
5.	Mann- Whitney U-Test	1000.00	0.07
6.	<b>Mann- Whitney U-Test</b>	<b>603.00</b>	<b>0.00</b>
7.	Mann- Whitney U-Test	1099.00	0.23
8.	Mann- Whitney U-Test	1083.00	0.23
9.	Mann- Whitney U-Test	1051.00	0.15
10.	Mann- Whitney U-Test	1132.50	0.40
11.	Mann- Whitney U-Test	1238.50	0.93
12.	Mann- Whitney U-Test	1099.00	0.26
13.	Mann- Whitney U-Test	1021.00	0.10
14.	<b>Mann- Whitney U-Test</b>	<b>914.00</b>	<b>0.01</b>
15.	<b>Mann- Whitney U-Test</b>	<b>978.00</b>	<b>0.05</b>
16.	<b>Mann- Whitney U-Test</b>	<b>462.50</b>	<b>0.00</b>
17.	Mann- Whitney U-Test	989.50	0.06
18.	<b>Mann- Whitney U-Test</b>	<b>905.00</b>	<b>0.01</b>
19.	Mann- Whitney U-Test	1051.50	0.15
20.	<b>Mann- Whitney U-Test</b>	<b>660.50</b>	<b>0.00</b>
21.	<b>Mann- Whitney U-Test</b>	<b>885.50</b>	<b>0.00</b>
22.	<b>Mann- Whitney U-Test</b>	<b>934.00</b>	<b>0.02</b>
23.	<b>Mann- Whitney U-Test</b>	<b>753.50</b>	<b>0.00</b>
24.	Mann- Whitney U-Test	1188.50	0.62
25.	Mann- Whitney U-Test	1235.00	0.91
26.	<b>Mann- Whitney U-Test</b>	<b>888.00</b>	<b>0.00</b>
27.	<b>Mann- Whitney U-Test</b>	<b>360.50</b>	<b>0.00</b>
28.	Mann- Whitney U-Test	1018.50	0.06
29.	<b>Mann- Whitney U-Test</b>	<b>907.00</b>	<b>0.00</b>
30.	<b>Mann- Whitney U-Test</b>	<b>796.50</b>	<b>0.00</b>
31.	Mann- Whitney U-Test	1036.00	0.11
32.	Mann- Whitney U-Test	1109.00	0.29
33.	<b>Mann- Whitney U-Test</b>	<b>867.00</b>	<b>0.00</b>
34.	<b>Mann- Whitney U-Test</b>	<b>813.00</b>	<b>0.00</b>
35.	<b>Mann- Whitney U-Test</b>	<b>895.50</b>	<b>0.01</b>
36.	Mann- Whitney U-Test	1196.00	0.67
37.	Mann- Whitney U-Test	1138.00	0.42
38.	Mann- Whitney U-Test	1238.00	0.92

Bold items shows significant difference between children with and without ASD

There is significant difference seen in 47.37% items (18 out of 38) ( $p < 0.05$ ) while comparing the children with ASD and without ASD.

Q-1 Express Distress during grooming (for example, flights or cries during haircutting, face washing, fingernail cutting)

Q-2 Prefers long-sleeved clothing when it is warm or short sleeves when it is cold

Q-6 Has difficulty standing in line or close to other people

Q-14 Dislikes activities where head is upside down (for example, somersaults, roughhousing)

Q-15 Enjoys strange noises/ seeks to make noise for noise's sake

Q-16 Seeks all kinds of movement and this interferences with daily routines (for example, can't sit still, fidgets)

Q-18 Touches people and objects

Q-20 Jumps from one activity to another so that it interferes with play

Q-21 Leaves clothing twisted on body

Q-22 Is distracted or has trouble functioning if there is a lot of noise around

Q-23 Appears to not hear what you say (for example, does not "tune-in" to what you say, appears to ignore you)

Q-26 Doesn't respond when name is called but you know the child's hearing is ok

Q-27 Has difficulty paying attention

Q- 29 Tires easily, especially when standing or holding particular body position

Q-30 Has a weak Grasp

Q-33 Poor endurance/tiers easily

Q-34 Responds negatively to unexpected or loud noises (for example, cries or hides at noise from vacuum cleaner, dog barking, hair dryer)

Q-35 Holds hands over ears to protect ears from sounds

**Table 3: Percentage and number of significantly different items of each section**

Sections	Percentage	Number of Items
Tactile Sensitivity	42.85%	3
Taste/Smell Sensitivity	0%	0
Movement Sensitivity	33.33%	1
Underresponsive/Seeks Sensation	71.42%	5
Auditory Filtering	80%	4
Low energy/ Weak	50%	3
Visual/Auditory Sensitivity	40%	2
Total	47.37%	18

From these 18 items, 4 items are from Auditory filtering section (80%) that represents Auditory processing of the children, 5 items from under responsive/seek sensation section (71.42%), 3 items from Low Energy/ weak (50%), 3 items belong to Touch sensitivity section (42.85%) that represents touch processing of the children, 2 items from Visual/Auditory Sensitivity (40%) and 1 item from Movement sensitivity (33.33%). Touch sensitivity, Under responsive/seek sensation and Auditory filtering are the most common factors affecting in children with ASD. 86% children with ASD behaved frequently in sections of Tactile Sensitivity and Underresponsive/Seeks Sensation and 64% in Auditory filtering. These results are consistent with the literatures (Kientz & Dunn, 1997; Watling et al., 2001; Rogers et al., 2003) and studies done by Tomchek & Dunn, Al-Heizan and Shah<sup>[16][8][20]</sup>

All these items show significant difference while comparing the values of both the groups. These items are highly differentiated (the most common) behaviors for children with ASD and uncommon for children without ASD. Therefore, these items may be the key behaviors which may indeed differentiate children who have sensory processing problems from those who do not have and help to find out the children with ASD easily. These items cannot be eliminated in any future version of SSP as they show high significance. However, it cannot be assumed that these are the only items that best discriminate between children with and without ASD as children with ASD demonstrate a wide spectrum of functional abilities and they show varying patterns of the behaviors, therefore any child with ASD may also show some behaviors which has not significant difference in this study.

The highest frequency of occurrence is 88% and this have happened with only one item, Q-16- Seeks all kind of movement and this interferes with daily routine activities. It is very common for children with ASD and uncommon for children without ASD. The finding that no items on the SSP were reported at 90% occurrence rate supports the notion that children with ASD demonstrate a wide spectrum of functional abilities.

However, this study finding suggests that the distribution of responses is different for children with ASD, even on items that are somewhat common for children without ASD. For example, Q-3 Avoids going barefoot, especially in grass or sand, Q-10 Limits self to particular food textures/temperatures Q-17 Becomes overly excitable during a movement activity Q-37 Watches everyone when they move around the room. These behaviors that were considered common for children without ASD are also common for children with ASD, yet the frequency distribution was still significantly different between the groups. This is important to note because despite the fact that children with and without ASD engage in the same behavior frequently, their performances are still different.<sup>[12]</sup>

These common behaviors are not likely to be appropriate items for a test of sensory processing problems. If a child displays one or more of these behaviors, the therapist would not know whether the behaviors are present as a result of typical development or because of dysfunction. Further consideration suggests that these items may have been suggested a desirable trait to a parent.<sup>[22]</sup> For example- a therapist might consider a child who “watches everyone when they move around the room” as distractible whereas a parent might perceive this behavior as exhibiting curiosity. These variations may be because of poor wording of some of the questions of SSP. It has been hypothesized that some of the sensory items are worded such that the meaning may have been unclear to parents and it resulting in the different interpretation than intended, contributing to this diversify of responses.<sup>[12]</sup>

Examples-

Q.7. Rubs or scratches out a spot that has been touched

Q.10. Limits self to particular food textures/ temperatures (List.....)

Q.18. Touches people and objects

Q. 36. Is bothered by bright lights after others have adapted to the light

Few items can be added in the sections of SSP so that all the items together represent each sensory system. E.g.: Lack of response to pain and lack of awareness of temperature, represents hypo-responsivities to Tactile processing but it is not a part of the SSP. Furthermore, 50% of the items on the SSP differentiated children with ASD from children without ASD. The items that are the most representative of children with ASD, are uncommon for children without ASD, and differentiated between the groups. For instance, some of the most frequently occurring items for children with ASD reflected hypersensitivity to touch and auditory input (i.e., Q-1-“Expresses discomfort during grooming”; Auditory Filtering-Q-22 "is distracted or has trouble functioning if there is a lot of noise around"), and these items were reported as rarely occurring with the children without ASD. Yet, other items that are indicative of hyposensitivity (i.e., Underresponsive/seek sensation- Q-16-" Seeks out all kinds of movements and this interferes with daily routine activities", Auditory Filtering- Q-27- "Difficulty in paying Attention") are also common for children with ASD and uncommon for children without ASD.

It has been noticed by the researcher while collecting the data, the caregivers got confused with few of the questions of the SSP and they asked for the help of the researcher to make them understand so that they can report properly. The ideal time to report the questions in SSP is 10 Minutes but it was observed by the researcher that the caregivers of children took mean time of 20 minutes to fill it up. Along with that the English language of SSP also create barrier for the rest of the children who go to the schools and centers every day, though their data has not been collected as their caregivers do not



understand English language therefore the SSP can be translated in Indian regional languages and it will be very fruitful for further studies with SSP. SSP was made by the occupational therapists only so the views of parents of children with ASD and people with ASD with good intellectual abilities can be incorporated which increases the fruitfulness of SSP because SSP is based on parent's report which is a valid source of information that can provide accurate assessment of children's abilities in a natural environment.

## **5. CONCLUSION**

47.37% (18 of 39) of the items have greater significance difference and can be used to discriminate children with ASD from children without ASD. On the basis of the most common items mentioned in discussion part, the caregivers and the therapists can differentiate children with ASD from children without ASD. These Behaviors/items play a major role in diagnosis of children with ASD. From this study it has been concluded that 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. SSP was made by the occupational therapists only so the views of caregivers of children with ASD and people with ASD with good intellectual abilities can be incorporated which increases the fruitfulness of SSP. This study recognizes the importance of assessing the performance of children from different cultural contexts, particularly in relation to their everyday functioning or occupation.

### **5.1. 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 urban area of Ahmedabad that represents only one region of the country.

### **5.2. Limitation of SSP**

- It analyzed only the items data and not each of the items. Examination of individual item in the group of a particular section will help to validate the placement of items into the section. For example, Question-12- behavior such as "becomes anxious or distressed when feet leave the ground" was placed in Movement section but may be associated with the emotional/social factor.
- Some of the items in SSP are poorly worded so it becomes challenging to some caregivers.
- Sensory responses were considered only in the context of behavioral observations via caregiver's reporting and not in direct observations.
- It lacks cultural competencies.
- It does not include emotional and social responses.

## **6. RECOMMENDATION**

- The study can be done with 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 Urban and Rural area
  - Children with other sensory processing disorders
  - Children with and without other disabilities in Indian population on SSP

- 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 typical Indian children
- Factor analysis of SSP based on Indian children with large Sample size
- Modified SSP can be developed with the views of the caregivers of children with ASD and people with ASD with good intellectual abilities
- Adaptation of SSP can be done-
  - Cultural adaptation and translation of SSP for typical children of Indian population
  - Certain items on SSP need to be reworded which helps Indian parents to understand questions easily
  - Addition of the items in the sections of SSP so that all the items together represent each sensory system
  - Other sections can be added in SSP which focuses on emotional-social responses.

#### REFERENCES

- [1] Rosenblatt A, Carbone P (2001) Autism Spectrum Disorders: What Every Parent Needs to Know *Autism Spectrum Disorders*, American Academic Press : 1-65.
- [2] Sagar VK (2011) Research on autism spectrum disorders in India. *AP J Psychol Med*; 12: 69–72.
- [3] Morbidity and Mortality weekly report (2012) United States, Centers for Disease Control and Prevention, Autism and Developmental Disabilities, Surveillance Summaries “Autism and Developmental Disabilities Monitoring Network, 14 Sites, United States, ,61(3): pp 2- 7.
- [4] American Psychiatric Association (2013c) Highlights of Changes from DSM-IV-TR to DSM-V, Washington DC: *American Psychiatric Publishing*.
- [5] Malhi P, Singhi P (2014) A retrospective study of toddlers with autism spectrum disorder: Clinical and developmental profile. *Annals Ind Acad Neurol* 17: 25–29.
- [6] Barua M, Daley T (2008) *Autistic Spectrum Disorders. A Guide for Paediatricians in India*, New Delhi, Action for Autism, pp. 14.
- [7] Tripathi H, Varma T, Prabhakar K (2015) Performance of Indian children of Age 3 to 10 years on short sensory profile in Ahmedabad : An observational Study. *J Rehabil council of India* 15: 25-38.
- [8] Al-Heizan M, AlAbdulwahab S, Kachanath H, Natho M (2015) Sensory processing dysfunction among Saudi children with and without autism. *J. Phys. Ther. Sci.* 27:1313-1316.
- [9] Dunn W (2008) *Sensory Profile- Technical Report*. San Antonio, Pearson Education.
- [10] Dunn W (1994) Performance of typical children on the Sensory Profile: An item analysis. *Am J Occup Ther.* 48:967-974.
- [11] Dunn W, Westman K (1997) The sensory profile: The performance of a national sample of children without disabilities. *Am J Occup Ther.* 51: 25-34.
- [12] Kientz M, Dunn W (1997) A comparison of the performance of children with and without Autism on the Sensory Profile. *Am J Occup Ther* 51: 530-537.
- [13] Watling R, Deitz J, White O (2001) Comparison of sensory profile scores of young children with and without Autism Spectrum Disorders. *Am J Occup Ther* 55: 416-423.
- [14] Padankatti SM (2005) A comparison of the performance of children with and without learning disability on the Sensory Profile tool. *The Ind J Occup Ther* 36:63-69.

- [15] Prakash A, Vaishampayan A (2007) A preliminary study of the sensory processing Abilities of children with cerebral palsy and typical children on the sensory profile. *The Indian J Occup Ther* 41:27-34.
- [16] Tomchek S, Dunn W (2007) Sensory processing in children with and without Autism: Tonge B, Dissanayake C, Brereron AV (1994) Autism: Fifty years on from Kanner. *J Paediatr Child Health* 30: 102-107.
- [17] Ashburner J, Ziviani J, Rodger S (2008) Sensory Processing and classroom Emotional, Behavioral, and Educational outcomes in children with Autism Spectrum Disorder. *Am J Occup Ther* 62 :564-573.
- [18] Ben-Sasson A, Hen L, Fluss R, Cermak SA, Engel- Yeger B, Gal E (2009) A meta-analysis of sensory modulation symptoms in individuals with Autism Spectrum Disorders. *J Autism Dev Disord* 39(1): 1-11.
- [19] Engel- Yeger B (2010) The applicability of the SSP for screening SPDs among Israeli children. *Int J Rehabil Res* 33: 311-318.
- [20] Shah SP, Joshi A, Kulkarni V (2015) Prevalence of sensory processing dysfunction and patterns on sensory profile of children with Autism Spectrum Disorder in Mumbai: A Pilot Study. *The Indian J Occup Ther*: 47: 52-57.
- [21] Adams J, Heidi M, Feldman MD, Lynne C. Huffman, Irene M. Loe (2015) Sensory Processing in Preterm Preschoolers and Its Association with Executive Function. *Early Hum Dev.* 91(3): 227–233.
- [22] Dunn W, Brown C (1997) Factor analysis on the sensory profile from a national sample of children without Disabilities. *Am J Occup Ther* 51: 490-495.