
Sheza Ahmed  Atia ur Rehman  Humaira Waseem
Ambreen Sadaf  Rabia Ashiq  Sybil Rose  Hafsa Basit
Department of Health Professional Technologies, University of Lahore, PO box 54000, Lahore, Pakistan

Abstract
Sensory-motor problems are the main clinical features of autism spectrum disorder (ASD). Due to sensory-motor problem, individual with autism spectrum disorder face difficulties in performing their daily living skills. The objective of this study was to determine how sensory-motor problems affect the performance of activities of daily living in children of autism spectrum disorder. The study conducted in Rehab care school for special children and Hamza Montessori School for special children. Data was collected by using purposeing non-random sampling technique in the duration of 4 months. Cross sectional study design was used. 60 patients from both genders were included. Sample selection criteria included the children with autism spectrum disorder with age range of 4-15 years. Sensory profile questionnaire based on Ayers sensory integration theory and Standardized Barthel index scale were used to determine the impact of sensory-motor problems on the performance of activities of daily living. The results showed that visual processing disorders were highly affecting the performance of activities of daily living. It was concluded that most of the children with autism spectrum disorder have sensory-motor problems. The performance in activities of daily living is affected by sensory-motor problems especially the visual processing problems. Visual processing shows that children have difficulty in performing activities like dressing, eating and toileting.

Keywords: Autism spectrum disorder, Activities of daily living, Sensory-motor problems
DOI: 10.7176/JHMN/70-01
Publication date: January 31st 2020

1. Introduction
Autism spectrum disorder (ASD) is a neurological and developmental disorder described by deficiencies in social interaction, verbal and non-verbal communication, stereotyped behavior and prohibitive interest1. These debilitating may make troubles for an individual perform task independently2. A developing societal concern, the commonness of Autism Spectrum Disorder (ASD) has about multiplied in the previous ten years. In 2008, the predominance of ASD was evaluated to be one in each 125 kids; nonetheless, as of the 2018 Autism and Developmental Disabilities Monitoring Report, the quantity of children determined to have ASD has expanded to one in each 593. Late investigations evaluate that 96% of the youngsters with autism spectrum disorder have sensory difficulties4. The reason of autism spectrum disorder is as yet obscure. However, the analysts propose that genetics and ecological variables can assume significant job. ASD is neurodevelopmental issue that is very heritable5–6. A few investigations have recommended that ASD might be brought about by an epigenetic instrument (heritable change in the quality articulation without change in DNA grouping) . Now it is increasingly evident that there is anything but a solitary reason for ASD. Its etiology is multifactorial7. The proof assessed has shown that sensory-motor issues are pervasive in autism spectrum condition and they have huge effect on a person's capacity performance8. Youngsters with autism spectrum disorder ordinarily indicates following side effects, for example prohibitive and repetitive behaviors and obsessive, over the top or confined interests, and language delays (echolalia), hostility, avoid eye to eye contact and trouble, constraint or limitation in verbal and non-verbal communication9. Studies have demonstrated that autism spectrum condition has a relationship with sensory reactivity and motor coordination and recommending that the advancement of correspondence and social abilities influenced by these sensory issues10. Sensorimotor problems includes the way receiving sensory messages (sensory info) and delivering a reaction (movement output). We get sensory information from our bodies and nature through our sensory system (vision, hearing, smell, taste, contact, vestibular, and proprioception) 11. Sensory motor system gives a fundamental establishment to perception and activity just as numerous significant cognitive and social procedures all through life 12. Sufficient sensory regulation is expected to keep up fitting physiological excitement for self-support (for example eating, resting) to encourage advancement of self-controlling behaviors (for example Sucking to mollify, self-talk amid testing task) and to help persuasive system to participate in meaningful tasks 13. Individuals with autism spectrum disorder regularly show an example of hyper or hypo-sensitivity to a sensory stimulus14. Numerous investigations have done as so far on behavioral area of autism spectrum disorder which centers on weaknesses in socialization, communication and comprehension. Anyway sensorimotor improvement and self-care stay little investigated
when contrasted with different areas of development. Kids with autism spectrum disorder experience issues in freely performing self-care aptitudes which we call daily living skills (DLS) like dressing, washing, self-nourishing and toileting independently. The activities which we play out each day, the tasks of daily living are of two kinds; Basic activities of daily living and instrumental activities of daily living (IADL). Children with ASD who have difficulties in performing fine motor activities, buttoning a sweater will turn into a test for them; they likewise don't care for the way some woolen stuff of clothing feel. There are not many studies that research the effects of sensorimotor challenges on daily living skills in youngsters with autism spectrum disorder. It is critical to archive the connection among sensorimotor and everyday living aptitudes to all the more likely comprehend the particular needs of a child with autism spectrum disorder and to make feasible for them to coordinate in the social environment. Tzameret Ricon, et al., (2017) conducted a study on relationship between sensory processing in children with high functioning autism spectrum disorder (HFASD) and their daily schedules which involves 20 kids aged 5-7 with high functioning autism spectrum disorder (HFASD) and 30 ordinarily developing age matched children having the equivalent financial foundation. A short sensory profile finished by the guardians from the two groups to examine their kids' sensory processing and sensory processing disorder. Data about youngsters' support and execution in tasks of daily living was acquired by Make My Day (MMD) list. Kids with advanced high functioning autism spectrum disorder (HFASD) were having altogether progressively tangible troubles because of which they face confinements in performing tasks of daily routine. (Jeanne Zobel-Lachiusa et al., 2015) the study examined the meal time behaviours in children with autism spectrum disorder (ASD) and sensory differences. 34 kids with ASD and 34 normally developing children of same age were involved in this study. A youngster and parent report Performa was used and the outcome shows that the kids with autism spectrum disorder scored essentially extraordinary on the proportion of sensory differences and eating practices from the normally developing children. The examination helps the parental figure and advisor to recognize the issues of eating conduct related with sensory differences. (Scott D. Tomchek., et al., 2015) the examination researches to what extent, particular sensory processing pattern identifies with the parts development for example social behavior, fine and gross motor skills, and commitment in activities of daily living and so forth. Members included 400 pre-school aged youngsters with autism spectrum disorder and the clinical information was gathered by a review outline survey. Results recommend that sensory processing patterns influence child's improvement and versatile behavior and motor skills. The purpose of this study is to assess the relationship between sensory motor development and activities of daily living. Independence in activities of daily living for a child with autism spectrum disorder is the main concern of the therapist and parents and it is important for child’s participation in school and day care.

2. Methodology
It is an observational study cross sectional study, conducted in private Rehab Care and Hamza Montessori for special children in Lahore. Barthel index scale, a valid and reliable tool is used for daily living assessment. Its test-retest reliability is 0.89 and its inter-rater reliability is 0.95. Sensory profile questionnaire developed from literature review and Ayer’s sensory integration theory was used for the assessment of sensory-motor problems. The duration of study was 4 months. 60 children diagnosed with Autism Spectrum Disorder (ASD) were included in the study whose age range was 4-15. ASD’s with other comorbid conditions were excluded. Permission was taken by the higher authorities of the clinics and then approached the parents of the ASD’s children. Data was collected by observing the children and interviewing the parents of Autism Spectrum Disorder. SPSS 21 version was used for statistical data analysis. Age ranges and gender distribution was represented by pie charts. The frequency of sensory-motor problem and the frequency of ADLs were represented by bar charts. Pearson’s correlation was used to find relationship between sensory-motor problems and activity of daily living.

3. Results
The result selection is consisted of descriptive and inferential statistics. Percentage, frequencies, means and standard deviations were calculated for the demographics. Pearson correlation was used to assess correlation between sensory-motor issues and activities of daily living in children with autism spectrum disorder.

**Descriptive statistics**
Descriptive statistics were used to describe the demographical. Percentages and frequencies were taken for all demographic variables. Mean and standard deviations were calculated for the age of the participants, which was the only continuous variable.

The majority of the individual (28) were in the age range of 4-7 years, 23 individuals in the age range of 8-12 years and 9 individuals in the age range of 13-15 years and the majority of the individual (28) were male than female.
Table 1: Frequency of sensory-motor problem in children with ASD

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sub variables</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vestibular problems</td>
<td>Dislikes play</td>
<td>7</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Clumsy, stumbles</td>
<td>13</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Jumps on swing</td>
<td>53</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Spin constantly</td>
<td>38</td>
<td>22</td>
</tr>
<tr>
<td>Proprioceptive problems</td>
<td>Stiff movements</td>
<td>24</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Difficulty in and out chair</td>
<td>9</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Pencil grasp</td>
<td>41</td>
<td>19</td>
</tr>
<tr>
<td>Tactile problems</td>
<td>Dislikes textures</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Dislikes brushing, combing</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Craves touch</td>
<td>24</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>React to painful stimuli</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Visual processing</td>
<td>Avoid eye contact</td>
<td>41</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Avoid reading and writing</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>Auditory processing</td>
<td>Responds to name</td>
<td>49</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Love noises</td>
<td>38</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Irritate by sounds</td>
<td>34</td>
<td>26</td>
</tr>
</tbody>
</table>

Above table show the frequency of sensory-motor problems in children with autism spectrum disorder. In data analysis of vestibular problems 7 children disliked play, 13 were clumsy and 7 children did not like to jump on swings and 38 children spins constantly. Analysis of proprioceptive problems showed that 24 children had stiff and uncoordinated movements, only 9 had difficulty in getting out of chair and 19 were unable to grasp pencil. A tactile problem showed that 28 children disliked textures, 28 disliked brushing, combing, 30 showed no reaction to stimuli and 24 craves touch. Visual processing disorder showed that most of the children, 41 avoid eye contact, and 35 children avoid reading and writing. Auditory processing disorder analysis showed that 11 children did not respond to name, 38 children loved noises, most of the children (34) irritate by sounds.

Figure 3: Bar chart of frequency of Activities of Daily Living children with ASD

Statistical Analysis of Activities of Daily Living showed that in case of analysis of Bowels/Bladder 9 children had Bowel incontinence, 10 occasional accidents and maximum 41 children had Bowel continence, most of the children 38 had bladder continence, 9 children had occasional accident and 13 were incontinent. Analysis of Grooming showed that in case of dressing 17 were dependent, 28 children needed help in dressing and 15 were independent in dressing. In case of grooming, most of the children 35 needed help in grooming and 25 were independent. Analysis of Bathing showed that in Toilet use 17 were dependent, 29 needed help and 14 were independent, In case of Bathing 27 were dependent, 33 were independent. Feeding analysis showed that minimum children 5 were unable; mostly children 33 needed help and 22 were independent. In Mobility, 21 children needed minor help in transferring; most of the children 39 were independent in the transfer. In using stairs 5 needed help and a maximum number of children 51 were independent in using stairs.
The aim of the study was to assess how sensory-motor issues effects activities of daily living in children with autism spectrum disorder (ASD). Children with ASD have sensory - motor impairments which affect the performance of ADLS like grooming, bathing, toileting, hygiene, feeding dressing, etc. In the domain of self-care of this vulnerable population, its sensory-motor aspect remains to be characterized. The total sample consisted of 60 children with autism spectrum disorder in which there were 40 male and 20 female. The children were in the age range of 4-15. The present study explains poorest expected ADLS of ASD’s group. The result of the research shows the calculated correlations between sensory-motor performance and ADLS. These results illustrated that vestibular system, Proprioceptive system, visual processing system were not correlated significantly with ADLS. While tactile processing and auditory system processing was significantly correlated with ADLS. According to these correlations children having difficulties in the tactile processing, integration found it difficult to perform the tasks which involve fine motor skills for example toileting, grooming, bathing, and dressing. (Carolanne Mattard-Labrecque,et al., 2013) This pilot study aimed to compare sensory processing, motor skills and adaptive behaviors in children with a double diagnosis of Autism Spectrum Disorder (ASD) and Attention Deficit Hyperactivity Disorder (ADHD) (ASD+ADHD) with children with ADHD alone and to examine the association of sensory processing and motor skills with adaptive behaviors (self-care) Thirty kids aged 5-14 years determined to have ASD and ADHD (n = 13) or ADHD (n = 17) were assessed on their sensory processing and motor skills and adaptive behaviors. Investigation of covariance looked at the gatherings on these measurements. Connection examinations analyzed the relationship between sensory processing and motor skills and adaptive behaviors. Contrasted with children with ADHD alone, kids with ASD and ADHD had less fortunate aptitudes in sensory preparing (p < 0.001), motor (p = 0.001) and adaptive behaviors (p < 0.001). For all children, expanded self-rule in self-care was connected with better sensory processing (p < 0.001) and motor skills (p = 0.002). Children with ASD+ADHD have poorer sensory processing, motor and adaptive behavior than those with ADHD alone. Sensory processing and motor problems were adversely connected with independence in self-care. Intercensions intending to improve sensory processing and motor skills and self-governance in self-care ought to wind up significant focuses for these children24. (Vanessa Hus Bal et al., 2015) this study was conducted on Daily living skills in individuals with autism spectrum disorder from 2 to 21 years of age, this examination was directed on Daily living abilities in people with autism spectrum disorder from 2 to 21 years of age. Daily living skills (DLS) for example, personal hygiene, meal preparation, and money management, are important to independent living. Research recommends that numerous people with autism spectrum disorder display disabilities in daily living activities in respect to their psychological abilities. This examination inspected indicators of daily living skills achievement and directions to their daily living skills in a longitudinal example alluded for conceivable autism spectrum disorder and pursued from 2 to 21 years of age. Reliable with past examinations, members with autism spectrum disorder and non-spectrum diagnosis indicated nonstop development of daily living skills all through childhood and pre-adulthood. Early youth nonverbal mental age was the most grounded indicator of daily living activities fulfillment for both diagnostic groups. Group-based modeling proposed two particular directions of daily living skills development for members with autism spectrum disorder. Expertise levels for the two groups of young adults with autism spectrum disorder remained significantly beneath age level desires. While the "High-DLS" bunch picked up roughly 12 years in daily living skills from T2 to T21, the "Low-DLS" group's daily living skills improved 3–4 years over the 16-to 19-year study period. Nonverbal mental age, receptive language, and social-communication hindrance at 2 years anticipated High-versus Low-DLS bunch participation. Accepting more prominent than 20 h of parent-executed mediation before age 3 was likewise connected with daily living skills trajectory. Results recommend that daily living skills ought to be a focal point of treatment plans for people with autism spectrum disorder, especially adolescents changing to young adult25. Ayers et al., (2013) conducted a study on awareness of available technologies and how these technologies can support daily living activities. Performing the essential daily living activities becomes difficult due to fine and gross motor problems and sensory sensitivities. 97% of the individuals with ASD can’t live independently and for daily assistance, they require a caregiver. The study concluded that by expanding the

### Table 5.3: Correlation between Barthel Index scale and sensory-motor issues.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Mean</th>
<th>St. deviation</th>
<th>r</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total score of vestibular problem</td>
<td>6.1333</td>
<td>0.74712</td>
<td>0.23</td>
<td>-1.57</td>
</tr>
<tr>
<td>Total score of proprioceptive problems</td>
<td>4.7667</td>
<td>0.72174</td>
<td>0.656</td>
<td>-0.059</td>
</tr>
<tr>
<td>Total score of tactile problems</td>
<td>6.1667</td>
<td>1.02786</td>
<td>0.001</td>
<td>.404**</td>
</tr>
<tr>
<td>Total score of visual processing</td>
<td>2.7333</td>
<td>0.75614</td>
<td>0.671</td>
<td>0.056</td>
</tr>
<tr>
<td>Total score of auditory problems</td>
<td>5.6833</td>
<td>0.98276</td>
<td>0.009</td>
<td>-3.32**</td>
</tr>
</tbody>
</table>

ADLS (Mean= 13.96667, St. Deviation= 2.99132)

The table showed that the tactile system is highly negatively significantly (.404**) correlated with ADLS (r=-.001). Auditory processing is negatively significant (-.332**) in correlation with ADLS (r=0.009).

4. Discussion

The aim of the study was to assess how sensory-motor issues effects activities of daily living in children with autism spectrum disorder (ASD). Children with ASD have sensory - motor impairments which affect the performance of ADLS like grooming, bathing, toileting, hygiene, feeding dressing, etc. In the domain of self-care of this vulnerable population, its sensory-motor aspect remains to be characterized. The total sample consisted of 60 children with autism spectrum disorder in which there were 40 male and 20 female. The children were in the age range of 4-15. The present study explains poorest expected ADLS of ASD’s group. The result of the research shows the calculated correlations between sensory-motor performance and ADLS. These results illustrated that vestibular system, Proprioceptive system, visual processing system were not correlated significantly with ADLS. While tactile processing and auditory system processing was significantly correlated with ADLS. According to these correlations children having difficulties in the tactile processing, integration found it difficult to perform the tasks which involve fine motor skills for example toileting, grooming, bathing, and dressing. (Carolanne Mattard-Labrecque, et al., 2013) This pilot study aimed to compare sensory processing, motor skills and adaptive behaviors in children with a double diagnosis of Autism Spectrum Disorder (ASD) and Attention Deficit Hyperactivity Disorder (ADHD) (ASD+ADHD) with children with ADHD alone and to examine the association of sensory processing and motor skills with adaptive behaviors (self-care) Thirty kids aged 5-14 years determined to have ASD and ADHD (n = 13) or ADHD (n = 17) were assessed on their sensory processing and motor skills and adaptive behaviors. Investigation of covariance looked at the gatherings on these measurements. Connection examinations analyzed the relationship between sensory processing and motor skills and adaptive behaviors. Contrasted with children with ADHD alone, kids with ASD and ADHD had less fortunate aptitudes in sensory preparing (p < 0.001), motor (p = 0.001) and adaptive behaviors (p < 0.001). For all children, expanded self-rule in self-care was connected with better sensory processing (p < 0.001) and motor skills (p = 0.002). Children with ASD+ADHD have poorer sensory processing, motor and adaptive behavior than those with ADHD alone. Sensory processing and motor problems were adversely connected with independence in self-care. Intercensions intending to improve sensory processing and motor skills and self-governance in self-care ought to wind up significant focuses for these children24. (Vanessa Hus Bal et al., 2015) this study was conducted on Daily living skills in individuals with autism spectrum disorder from 2 to 21 years of age, this examination was directed on Daily living abilities in people with autism spectrum disorder from 2 to 21 years of age. Daily living skills (DLS) for example, personal hygiene, meal preparation, and money management, are important to independent living. Research recommends that numerous people with autism spectrum disorder display disabilities in daily living activities in respect to their psychological abilities. This examination inspected indicators of daily living skills achievement and directions to their daily living skills in a longitudinal example alluded for conceivable autism spectrum disorder and pursued from 2 to 21 years of age. Reliable with past examinations, members with autism spectrum disorder and non-spectrum diagnosis indicated nonstop development of daily living skills all through childhood and pre-adulthood. Early youth nonverbal mental age was the most grounded indicator of daily living activities fulfillment for both diagnostic groups. Group-based modeling proposed two particular directions of daily living skills development for members with autism spectrum disorder. Expertise levels for the two groups of young adults with autism spectrum disorder remained significantly beneath age level desires. While the "High-DLS" bunch picked up roughly 12 years in daily living skills from T2 to T21, the "Low-DLS" group's daily living skills improved 3–4 years over the 16-to 19-year study period. Nonverbal mental age, receptive language, and social-communication hindrance at 2 years anticipated High-versus Low-DLS bunch participation. Accepting more prominent than 20 h of parent-executed mediation before age 3 was likewise connected with daily living skills trajectory. Results recommend that daily living skills ought to be a focal point of treatment plans for people with autism spectrum disorder, especially adolescents changing to young adult25. Ayers et al., (2013) conducted a study on awareness of available technologies and how these technologies can support daily living activities. Performing the essential daily living activities becomes difficult due to fine and gross motor problems and sensory sensitivities. 97% of the individuals with ASD can’t live independently and for daily assistance, they require a caregiver. The study concluded that by expanding the
technologies and by giving proper instructions on how to use the advanced technologies, individuals with ASD may perform their activities of daily living independently to some extent, approaching ultimate functioning criteria\(^2\). Our result was also in agreement with the study conducted by Nadon et al., (2011) in which they found the relationship between a number of eating problems and sensory processing in ASD children. They use a short sensory profile, Of 95 children, their ages were between 3 to 10 years, the definite difference was shown by 65\% and other 21\% showed a difference in sensory processing on total score. Increased number of eating problems was measured by using eating profile and the result was related significantly\(^2\). Kern et al., (2006) conducted a cross-sectional study to check the sensory processing of the oral, visual, touch and auditory systems in 104 Autistic individuals, 3-56 years of age by using sensory profile. Their findings match our results that person with ASD has abnormal processing of visual, auditory, touch and oral systems, those abnormalities are global in nature while with increasing age they have a tendency to improve\(^2\).

5. Conclusion

It is concluded that atypical motor and sensory responses are shown by Autistic children, and they have difficulties in performing their ADLS. Abnormal sensory motor responses especially tactile and auditory processing problem, are the cause of poor performance and independence in ADLS. Problems in tactile processing indicate children may have difficulties in tasks such as dressing, grooming, bathing toileting, etc. In order to validate caregiver’s responses, needs which assist in the planning of intervention should be confirmed and the addition of observational testing of ADLS and sensory-motor responses is suggested.

References

3. (Baio J. Prevalence of autism spectrum disorder among children aged 8 years-autism and developmental disabilities monitoring network, 11 sites, United States, 2010.)
10. Susan Dodd. Understanding Autism. Introduction
14. Sensorimotor skills.North Shore Pediatric Therapy
19. Ricon, Tsameret, Rachel Sorek, and Batya Engel Yeger. "Association between sensory processing by


