

## Original Article

# A pilot study to examine the impact of behavioral interventions on stereotyped behavior among children with autism spectrum disorder in selected special schools at pudukkottai

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## ABSTRACT

**Introduction:** Behavioral interventions can significantly improve the core features of autism such as difficulties in social communication, social interaction, and restrictive and stereotyped patterns of behavior. **Aim:** This study focuses on hypothetical testing by examining the impact of behavioral interventions on stereotyped behavior among children with autism spectrum disorder (ASD). **Methods:** After obtaining written informed assent, children with ASD who fulfilled the inclusion criteria were recruited and enrolled in this pilot study in selected special schools (Sulekha Autism and slow learners school, Sathya Special school for Autism) at Pudukkottai. The sample size was 16 children with ASD, eight samples in experimental group and eight samples in control group. Quasi experimental non-randomized with control group design was used in this study. Simple random sampling technique was used to recruit the study subjects. The data were collected between January 2022 and April 2022. All 16 subjects were interviewed before intervention by assessing background variables. Stereotyped behavior was assessed using Gilliam Autism Rating Scale 3 – Subscale Stereotype behavior in both experimental and control group. Experimental group subjects received behavioral interventions on weekly basis for 30–45 min, for the period of 4 months. Control group received standard methods of care. Post-test was conducted using the same assessment technique at the end of 4<sup>th</sup> month in both experimental and control group. **Results:** The Paired “*t*”-test value of stereotyped behavior scores showed statistical significance in experimental group ( $t = 9.94$ ). The Paired “*t*”-test value of stereotyped behavior scores showed statistical non significance in control group ( $t = 0.89$ ). The estimated unpaired *t*-test between experimental and control group post-test scores depicted statistical significance ( $t = 3.19$ ). Based on the mean scores, experimental group mean ( $M = 22.75$ ) showed reduction in the level of stereotyped behavior compared to the control group mean scores ( $M = 27.38$ ). **Conclusion:** Administration of behavioral interventions reduces stereotyped behavior among children with ASD.

**Keywords:** Autism spectrum disorder, behavioral intervention, stereotyped behavior**Submitted:** 18-08-2022, **Accepted:** 26-08-2022, **Published:** 30-09-2022

## INTRODUCTION

Autism spectrum disorder (ASD) is an important cause of developmental disability worldwide. ASD is a complex developmental disorder characterized by impaired social interaction and communication and restrictive and repetitive behavior. Once thought to be relatively rare, there has been a worldwide increase in the prevalence of children

diagnosed with ASD with figures rising from 2 to 6/10,000 in epidemiological studies before the 1990s to current estimates of up to 260/10,000 or 2.6%.<sup>[1]</sup> It has been estimated that more than 2 million people might be affected with ASD in India.<sup>[2]</sup>

There is a lack of evidence-based estimate of the population prevalence of ASD in India. The scarcity of high-quality population-based epidemiological studies on ASD in India

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highlights an urgent need to study the burden of ASD in India. The proper acquisition of data related to the prevailing burden of ASD in India would lead to a better development of rehabilitative services in our country.<sup>[3]</sup> Most of the reported studies on ASD are based on hospital-based data, and thus, lack information on the prevalence estimates of this disorder in India.<sup>[4-6]</sup> There is also under-recognition of the disorder due to a delay in the diagnosis of ASD at a young age.<sup>[7]</sup>

Increasing prevalence of ASD, changes in risk factors, or etiological causes and non-etiological factors have been explored. These include factors which may be on the causal pathway to ASD such as the effect of increasing parental age and other perinatal risk factors such as gestational age and birth weight. However, studies generally suggest minimal contribution (<1%) to increasing ASD prevalence rates.<sup>[8]</sup>

According to new research, Allopregnanolone a hormone made by the placenta late in pregnancy is such a potent neurosteroid that disrupting its steady supply to the developing fetus can leave it vulnerable to brain injuries associated with ASD.<sup>[9]</sup>

Repetitive and stereotyped behaviors are one of the core features of ASD.<sup>[10]</sup> The most common stereotypical behaviors are rocking motion of the hands, nodding or shaking arms, sudden runs, body balance forward and backward, repeated manipulation of objects, and finger movements.<sup>[11]</sup> These movements are involuntary, with an exclusive function of producing physical and sensorial self-regulation, limiting individual's interaction with the environment.<sup>[12]</sup>

Treatment options directed to the reduction of stereotypies, in individuals with ASD, are often highly intrusive. Psychotropic medication and intensive behavioral interventions are the most common treatments. The impact of the treatments in the reduction of stereotypical behavior is assessed based on the number of stereotypical episodes occurring over a period of time, that is, the number of times repetitive voluntary acts are outcast during a limited observation period of time.<sup>[13]</sup>

Behavioral interventions are designed to encourage appropriate behavior (such as getting dressed or talking to other people) and to discourage inappropriate behaviors (such as self-harm or aggression toward others). Therapists, teachers, and/or parents break down the desired behaviors into small, achievable tasks which are then taught in a very structured manner.

Behavioral interventions can significantly improve the core features of autism such as difficulties in social communication, social interaction, and restrictive and stereotyped patterns of behavior. Furthermore, researchers have claimed that behavioral interventions can lead to recovery in some autistic children.

Some forms of the early intensive behavioral interventions may provide some benefits to some young autistic children according to a very limited amount of research evidence of sufficiently high quality. Pivotal response training may provide some benefits to some children on the autism spectrum according to an extremely limited amount of research evidence of sufficiently high quality. Determining the benefits of other forms of behavioral intervention, such as positive behavioral support or the individual techniques used within some forms of early intensive behavioral interventions, are more difficult.

Hitherto paucity of nursing literatures abounded on behavioral interventions on stereotyped behavior for autism; besides, this study focuses on hypothetical testing by examining the impact of behavioral interventions on stereotyped behavior among children with ASD.

## METHODS

After obtaining written informed assent, children with ASD who fulfilled the inclusion criteria were recruited and enrolled in this pilot study in selected special schools (Sulekha Autism and slow learners school, Sathya Special school for Autism) at Pudukkottai. The sample size was 16 children with ASD, eight samples in experimental group and eight samples in control group. Quasi experimental non-randomized with control group design was used in this study. Simple random sampling technique was used to recruit the study subjects. Sampling frame was made; consecutively list of elements numbered and by adopting random number table children with ASD was selected. The data were collected between January 2022 and April 2022. All 16 subjects were interviewed before intervention by assessing background variables such as age, gender, first born, type of play, parent's age at child's birth, residential area, family monthly income, and type of family.

Stereotyped behavior was assessed using Gilliam Autism Rating Scale 3 – Subscale Stereotype behavior in both experimental and control group.

Experimental group subjects received behavioral interventions on weekly basis for 30–45 min, for the period of 4 months. Control group received standard methods of care.

The session schedules of behavioral interventions [Table 1] were as follows.

## RESULTS

Description of Samples Characteristics.

Percentage distribution of children with ASD according to their background variables in experimental group and control group.

**Table 1: Session schedule on behavioral interventions**

Session	Week and Duration	Behavioral Interventions
Session –I	Week I, 30–45 min	<ul style="list-style-type: none"> <li>• Introduction and Created trust worthy relationship</li> <li>• Antecedent exercise</li> </ul>
Session –II	Week II, 30–45 min	Distraction with objects <ul style="list-style-type: none"> <li>• Clay toys and sensory toys were used as distracting object</li> </ul>
Session –III	Week III, 30–45 min	Removing sensation <ul style="list-style-type: none"> <li>• Auditory, Visual and Tactile undesired stimuli was removed from the ASD Children</li> </ul>
Session –IV	Week IV, 30–45 min	Environmental enrichment <ul style="list-style-type: none"> <li>• Environmental enrichment involves providing free access to high–preference stimuli which compete with the hypothesized stimulation of the target behavior.</li> </ul>
Session –V	Week V, 30–45 min	Continuous access to items of matched stimulation <ul style="list-style-type: none"> <li>• Providing continuous access to items of matched stimulation involves systematically identifying an item which provides the same reinforcing properties as stereotypy or repetitive behaviors.</li> </ul>
Session –VI	Week VI, 30–45 min	Non-contingent access to items of matched stimulation <ul style="list-style-type: none"> <li>• The use of matched stimulation has also been used as a reinforcement-based treatment whereby the item of matched stimulation is provided non-contingently.</li> </ul>
Session –VII	Week VII, 30–45 min	Positive reinforcement <ul style="list-style-type: none"> <li>• Includes smiling, preferred activities like playing with toys, verbal praise and tokens (stars for completed tasks)</li> </ul>
Session –VIII	Week VIII, 30–45 min	Functional communication training <ul style="list-style-type: none"> <li>• Functional Communication Training involves teaching appropriate communicative responses to obtain the desired reinforcer, thus providing the participant with a more efficient method of obtaining the reinforcement, than engaging in challenging behavior.</li> </ul>
Session –IX	Week IX, 30–45 min	Differential reinforcement <ul style="list-style-type: none"> <li>• Differential reinforcement is a reinforcement-based treatment which involves the delivery of reinforcement contingent upon the absence of challenging behavior (DRO); the presence of an alternative, appropriate behavior (DRA); occurrence of a behavior which in incompatible with the target behavior (DRI); low rates of behavior (DRL); and high rates of behavior (DRH).</li> </ul>
Session –X	Week X, 30–45 min	Self-management <ul style="list-style-type: none"> <li>• Participants are taught to manage their own behavior by recording the occurrence and non-occurrence of the target behavior. It may also include self-reinforcement whereby the participant controls their own access to reinforcement for appropriate behavior.</li> </ul>
Session –XI	Week XI, 30–45 min	Stimulus control <ul style="list-style-type: none"> <li>• Behavior occurs in the presence, but not in the absence, of a discriminative stimulus.</li> </ul>
Session –XII	Week XII, 30–45 min	Response interruption and redirection (RIRD) <ul style="list-style-type: none"> <li>• RIRD involves interrupting the response and redirecting the individual to an alternative, topographically similar behavior.</li> </ul>
Session –XIII	Week XIII, 30–45 min	Response cost <ul style="list-style-type: none"> <li>• Response cost involves the removal of a reinforcing stimulus contingent upon occurrences of the target behavior.</li> </ul>
Session –XIV	Week XIV, 30–45 min	O•ercorrection <ul style="list-style-type: none"> <li>• O•ercorrection procedures involve having the student repeat a specified behavior a number of times contingent upon occurrences of the inappropriate behavior</li> </ul>
Session –XV	Week XV, 30–45 min	Extinction <ul style="list-style-type: none"> <li>• Reinforcement is no longer provided contingent upon the occurrence of a behavior which has been previously reinforced</li> </ul>
Session –XVI	Week XVI, 30–45 min	Response blocking <ul style="list-style-type: none"> <li>• The occurrence of the target behavior is blocked to prevent or stop its occurrence</li> </ul>

Post-test was conducted using the same assessment technique at the end of 4<sup>th</sup> month in both experimental and control group

### Experimental Group

According to subjects from age point of view, highest 50% were between 7 and 8 years, 25% were between 9 and 10 years, and 25% were between 5 and 6 years. About 75% of the children with ASD were male and 25% of them were female. Subjects according to their order of birth, highest percentages (75%) were first born and only 25% of them were second born. Type of play showed that majority 75% with individual play and only 25% of the subjects with group play. Parent's age at child's birth reported that 62.5% were 31 years and above, 25% were between 21 and 30 years, and only 12.5% were between 18 and 20 years. Subjects according to residential area showed that 50% were from urban area and 50% were from rural area. Family monthly income showed 37.5% earned Rs. 5000–10,000, likewise 37.5% earned Rs. 10,001–15,000, and only 25% belong to the income group of Rs. 15,001–20,000. Type of family showed that 75% were from nuclear family and only 25% were from joint family.

### Control Group

According to subjects from age point of view, highest 75% were between 7 and 8 years, 12.5% were between 9 and 10 years, and similarly 12.5% were between 5 and 6 years. Majority 87.5% of the children with ASD were male and least 12.5% of them were female. Subjects according to their order of birth, highest percentages (87.5%) were first born and only 12.5% of them were second born.

Type of play showed majority 75% with individual play and only 25% of the subjects with group play. Parent's age at child's birth reported that 75% were 31 years and above, 12.5% were between 21 and 30 years, and similarly, 12.5% were between 18 and 20 years. Subjects according to residential area showed that 50% were from urban area and 50% were from rural area. Family monthly income showed 50% earned Rs. 10,001–15,000, 37.5% earned Rs. 5000–10,000 and only 12.5% belong to the income group of Rs. 15,001–20,000. Type of family showed that 62.5% were from nuclear family and only 37.5% were from joint family.

### The Level of Stereotyped Behavior among Children with ASD

In pre-test, experimental group showed 12.5% with low-frequency level of stereotyped behavior, 62.5% with moderate

frequency level of stereotyped behavior, and 25% had severe frequency level of stereotyped behavior. In post-test, 25% showed low-frequency level of stereotyped behavior, 75% had moderate frequency level of stereotyped behavior, and none of the subjects reported with severe frequency level of stereotyped behavior [Table 2].

In pre-test, control group showed 25% with low frequency level of stereotyped behavior, 62.5% with moderate frequency level of stereotyped behavior, and 12.5% had severe frequency level of stereotyped behavior. In post-test, 12.5% showed low frequency level of stereotyped behavior, 75% had moderate frequency level of stereotyped behavior, and 12.5% of the subjects reported with severe frequency level of stereotyped behavior [Table 2].

Comparison of mean and standard deviation of pre-test stereotyped behavior scores in the experimental group showed  $27.88 \pm 3.87$  and post-test showed  $22.75 \pm 3.11$ . The mean score in experimental group decreased in the post-test and showed significant reduction in the level of stereotyped behavior among children with ASD.

The Paired “*t*”-test value of stereotyped behavior scores showed statistical significance in experimental group ( $t = 9.94$ ). Hence, this result supported the hypothesis [Table 3].

Comparison of mean and standard deviation of pre-test stereotyped behavior scores in the control group showed  $27.75 \pm 3.11$  and post-test showed  $27.38 \pm 2.67$ . The mean score in control group slightly decreased in the post-test and showed statistically non-significant reduction in the level of stereotyped behavior among children with ASD.

The Paired “*t*”-test value of stereotyped behavior scores showed statistical non-significance in control group ( $t = 0.89$ ). Hence, his result does not support the hypothesis [Table 3].

The estimated unpaired *t*-test between experimental and control group post-test scores depicted statistical significance ( $t = 3.19$ ). Based on the mean scores, experimental group mean ( $M = 22.75$ ) showed reduction in the level of stereotyped behavior compared to the control group mean scores ( $M = 27.38$ ) [Table 3].

**Table 2: Frequency and percentage distribution of the level of stereotyped behavior among children with autism spectrum disorder ( $n_1=8$ ,  $n_2=8$ )**

Level of Stereotyped behavior	Experimental Group				Control Group			
	Pre-test		Post-test		Pre-test		Post-test	
	No	%	No	%	No	%	No	%
Low level frequency	1	12.5	2	25	2	25	1	12.5
Moderate level frequency	5	62.5	6	75	5	62.5	6	75
Severe level frequency	2	25	-	-	1	12.5	1	12.5

Association between post-test stereotyped behavior scores and selected background variables among children with ASD in the experimental group reveals that there is no significant association between age, gender, order of birth, type of play, parents age at child's birth, residential area, family monthly income, and type of family [Table 4].

Association between post-test stereotyped behavior scores and selected background variables among children with ASD in control group reveals that there is no significant association between age, gender, order of birth, type of play, parents age at child's birth, residential area, family monthly income, and type of family [Table 5].

## DISCUSSION

Pilot study was done to check the feasibility and time requirement for the main study. From the pilot study findings, it can be concluded that administration of behavioral interventions reduces stereotyped behavior among children with ASD.

This pilot study result was consistent with the study findings of systematic review conducted to examine the quality of experimental studies contributing to the empirical

understanding of function-based behavioral interventions for stereotypic and repetitive behaviors (SRBs) in individuals with ASDs. Systematic review methodology was used to identify relevant articles, to rate the level of evidence and quality of conduct of the studies, and to extract data systematically. Ten single case studies examining 17 participants (14 males, three females; age 2y 11 mo–26y) diagnosed with various ASDs were included in the study. Overall, studies reported decreases in SRBs using behavioral interventions and some collateral increase in desirable behaviors. Only a small number of intervention studies for SRBs explicitly state the function of the behavior; therefore, relatively little is known about the efficacy of SRB interventions in relation to the range of possible behavioral functions. Evidence supporting SRB interventions is preliminary in nature, and caution should be used in choosing and implementing SRB intervention practices for individuals with ASDs.<sup>[14]</sup>

Restricted and repetitive behaviors (RRBs) are a core symptom of ASD. There has been an increased research emphasis on repetitive behaviors; however, this research primarily has focused on phenomenology and mechanisms. Thus, the knowledge base on interventions is lagging behind other areas of research. The literature suggests that there are evidence-based practices to treat "lower order" RRBs in

**Table 3: Impact of behavioral interventions on stereotyped behavior among children with autism spectrum disorder ( $n_1=8, n_2=8$ )**

Variables	Group	Mean	SD	Significance of Paired <i>t</i> - test	Significance of Unpaired <i>t</i> - test
Stereotyped behavior	Experimental Group Pre-test	27.88	3.87	$t=9.94^*$ $P<0.001$	Experimental and Control Group Post-test
	Experimental Group Post-test	22.75	3.11		
	Control Group Pre-test	27.75	3.11	$t=0.89$ $P=0.40$	$t=3.19^*$ $P=0.006$
	Control Group Post-test	27.38	2.67		

Level of Significance-  $P<0.05$

**Table 4: Association between post-test stereotyped behavior scores and selected background variables among children with autism spectrum disorder in experimental group**

Background Variables	df	$\chi^2$	Table value	Level of Significance
Age	1	2.83	3.84	Not significant
Gender	1	1.5	3.84	Not significant
Order of birth	2	1	5.99	Not significant
Type of play	1	2	3.84	Not significant
Parents age at child's birth	2	1.33	5.99	Not significant
Residential area	2	0.5	5.99	Not significant
Family monthly income	2	2.33	5.99	Not significant
Type of family	2	1.77	5.99	Not significant

$\chi^2$  Value with  $P<0.05$

**Table 5: Association between post-test stereotyped behavior scores and selected background variables among children with autism spectrum disorder in control group**

Background Variables	df	$\chi^2$	Table value	Level of Significance
Age	1	0.88	3.84	Not significant
Gender	1	1.95	3.84	Not significant
Order of birth	2	0.44	5.99	Not significant
Type of play	1	1.28	3.84	Not significant
Parents age at child's birth	2	2.33	5.99	Not significant
Residential area	2	3.06	5.99	Not significant
Family monthly income	2	2.33	5.99	Not significant
Type of family	2	2.88	5.99	Not significant

$\chi^2$  Value with  $P < 0.05$

ASD; yet, there is a lack of a focused program of intervention research for “higher order” behaviors. Thus, there is a place for more research on behavioral intervention strategies to address the full variety of repetitive behaviors found in ASD.<sup>[15]</sup>

The occurrence of repetitive motor movements in toddlers (17–37 months) with ASD and atypical development and the relationship between stereotypies and sensory impairment was examined. Children with ASD ( $n = 13$ ) exhibited significantly more repetitive behaviors than the non-ASD group ( $n = 12$ ). Greater percentages of endorsement were evident for the ASD group on nearly all items of the behavior problems inventory-01 stereotypy subscale. More repetitive behaviors tended to co-occur with other stereotypies for the ASD group. A moderate correlation was found between stereotypy severity and sensory deficits. These findings suggest that stereotyped behaviors can be identified at very young ages, negatively affect the behavioral presentation of those with ASDs and should be considered when developing treatment plans.<sup>[11]</sup>

## CONCLUSION

From the pilot study findings, it can be concluded that administration of behavioral interventions tapers stereotyped behavior among children with ASD.

## REFERENCES

1. Waugh I. The Prevalence of Autism (Including Asperger Syndrome) in School Age Children in Northern Ireland. Health do Belfast. Northern Ireland: Northern Ireland Statistics and Research Agency; 2016.
2. Krishnamurthy V. A clinical experience of autism in India. *J Dev Behav Pediatr* 2008;29:331-3.
3. Chauhan A, Sahu JK, Jaiswal N, Kumar K, Agarwal A, Kaur J, *et al.* Prevalence of autism spectrum disorder in Indian children: A systematic review and meta-analysis. *Neurol India* 2019;67:100-4.
4. Singhi P, Malhi P. Clinical and neurodevelopmental profile of young children with autism. *Indian Pediatr* 2001;38:384-90.
5. Jain R, Juneja M, Sairam S. Children with developmental disabilities in India: Age of initial concern and referral for rehabilitation services, and reasons for delay in referral. *J Child Neurol* 2013;28:455-60.
6. Kommu JV, Gayathri KR, Srinath S, Girimaji SC, Seshadri S, Gopalakrishna G, *et al.* Profile of two hundred children with autism spectrum disorder from a tertiary child and adolescent psychiatry centre. *Asian J Psychiatr* 2017;28:51-6.
7. Daley TC, Sigman MD. Diagnostic conceptualization of autism among Indian psychiatrists, psychologists, and pediatricians. *J Autism Dev Disord* 2002;32:13-23.
8. Schieve LA, Rice C, Devine O, Maenner MJ, Lee LJ, Fitzgerald R, *et al.* Have secular changes in perinatal risk factors contributed to the recent autism prevalence increase? Development and application of a mathematical assessment model. *Ann Epidemiol* 2011;21:930-45.
9. Children's National Health System. Placental Function Linked to Brain Injuries Associated with Autism. Rockville: Science Daily; 2019.
10. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4<sup>th</sup> ed. Washington, DC: American Psychiatric Association; 2000.
11. Hattier MA, Matson JL, Macmillan K, Williams L. Stereotyped behaviours in children with autism spectrum disorders and atypical development as measured by the BPI-01. *Dev Neurorehabil* 2013;16:291-300.
12. Freeman RD, Soltanifar A, Baer S. Stereotypic movement disorder: Easily missed. *Dev Med Child Neurol* 2010;52:733-8.
13. Rosenberg RE, Mandell DS, Farmer JE, Law JK, Marvin AR, Law PA. Psychotropic medication use among children with autism spectrum disorders enrolled in a national registry, 2007-2008. *J Autism Dev Disord* 2010;40:342-51.
14. Patterson SY, Smith V, Jelen M. Behavioural intervention practices for stereotypic and repetitive behaviour in individuals with autism spectrum disorder: A systematic review. *Dev Med Child Neurol* 2010;52:318-27.
15. Boyd BA, McDonough SG, Bodfish JW. Evidence-based behavioral interventions for repetitive behaviors in autism. *J Autism Dev Disord* 2012;42:1236-48.



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