Original Article

Effectiveness of applied behavior analysis in the self-help skills and stereotyped behaviors of children with autism spectrum disorder in Isfahan

Bahram Movahedzadeh[1*], Marzieh Jamali Shah-mansouri[2]
[1] Faculty of Psychology, Faculty of Psychology, Payame Noor University, Tehran, Iran
[2] Master of Clinical Psychology, Islamic Azad University, Tehran, Iran
Corresponding author and reprints: Bahram Movahedzadeh. Faculty of Psychology, Faculty of Psychology, Payame Noor University, Tehran, Iran.
Email: movahed208@pnu.ac.ir
Accepted for publication: 15 Jun 2017

Abstract

Background: Applied Behavior Analysis (ABA) is applicable for children and adults with different psychological disorders, developmental disabilities, and learning disabilities. The goal of the present study was to examine the effectiveness of ABA in the increase of self-help skills and reduction of stereotyped behaviors of children with Autism Spectrum Disorder (ASD) in Isfahan, Iran.

Methods: this was a quasi-experimental study. The study population included 512 children diagnosed with ASD in Isfahan, Iran during 2015-2016. Using a convenience sampling method, 26 participants were randomly divided into experimental and control groups (13 participants in each group). The study instruments included: the Self-Help Skills Developmental Chart and the Gilliam Autism Rating Scale that were administered at both pretest and posttest. The experimental group received an ABA intervention for 20 sessions (each session: 2 hours) over 3 months. Data analysis was done using IBM SPSS Statistics for Windows, Version 22.0.

Results: The results showed that there was a significant difference between autistic children in the experimental and control groups in self-feeding (t=7.01, *P*=0.01), personal hygiene (t=11.12, *P*=0.003), mobility impairments and unusual behaviors (t=63.63, *P*<0.001), verbal and non-verbal behaviors (t=11.58, *P*<0.001), interaction with people, objects, and situations (t=11.81, *P*=0.003), and developmental impairments (t=88.28, *P*<0.001).

Conclusion: The ABA appears to be an effective method for increasing self-help skills and reducing stereotypic behaviors in children with ASD. Educational psychologists can use behavioral activation therapy to treat the learning problems of children with ASD.

Keywords: Applied Behavior Analysis; Autistic Disorder; Autism Spectrum Disorder; Developmental Disabilities; Stereotyped Behavior

Cite this article as: Movahedzadeh B, Jamali Shah-mansouri M. Effectiveness of applied behavior analysis in the self-help skills and stereotyped behaviors of children with autism spectrum disorder in Isfahan. SDH. 2017;3(4):141-147. DOI: http://dx.doi.org/10.22037/sdh.v3i3.20958

Introduction

Autism is classified in the category of Pervasive Developmental Disorders (PDDs) (1). They are called pervasive because disorders in this category involve a group of issues and disturbances affecting children's lives. PDDs appear in the early years of childhood, and impairment in social interaction is the central aspect of all the disorders in this category. The central and prominent aspect of autism is "an inability from early childhood to interact with people and situations in a normal

way." According to a definition, autism is characterized by severe and pervasive impairment in several areas of development, including social interaction and relational skills, and the presence of stereotypic behaviors, interests, or activities (2). Other symptoms of autistic children include: impairment in speech and language (including echolalia, language delay, and pronoun reversal), labile mood and affect, and incorrect response to sensory stimuli; all these aspects begin prior to the age of 3 years (3).

One of the general characteristics of people with Autism Spectrum Disorder (ASD) is that their behaviors, interests, and activities are usually very limited, repetitive, and stereotypic. In their childhood, they are attracted to a limited number of toys, interested in arranging things in a special manner, and if someone breaks their routine or prevents them from continuing it, they get very upset and show negative reactions. They also show interest in inanimate objects; treatment centers usually use Applied Behavior Analysis (ABA) to treat this characteristic of autistic children. Various studies have directly shown the effectiveness of ABA interventions in improving autistic behaviors (4-6). In addition, ABA is applicable for children and adults with different psychological disorders, developmental disabilities, learning disabilities, and so on. Using Skinner's conditioning and a special training program, this intervention is applied by trained practitioners on a compact, one-by-one basis, in the highest number of hours possible per week 30 to 40 hours. ABA interventions can be applied by a child's therapist, parents, teachers, or other relatives (7).

A group of skills that can be improved using ABA are self-help skills. These are skills, behaviors, or tasks, such as self-feeding, dressing, personal hygiene, and toileting that a person needs to do in everyday life (8). These children are not capable of performing these tasks, but research indicates that this ability can be improved in these children using ABA and related methods (9, 10). Based on direct observation of the child's behavior and precisely evaluating it, ABA intervention can reveal behavior-environment relationships, and also help identify those environmental aspects that may lead to a new behavior, or reinforce or reduce an existing behavior. However, reviewing the literature on this topic reveals a shortage of studies on the effectiveness of ABA in improving stereotypic behaviors of children with ASD (11). Therefore, the goal of the present study was to examine the effectiveness of ABA in the increase of self-help skills and reduction of stereotyped behaviors of children with ASD in Isfahan.

Methods

A quasi-experimental design was used. The study population included 512 children with ASD in Isfahan in 2015-2016, who had medical records in the Isfahan Autism Association, and had been referred to the association for instruction and treatment. Among these, using Cochran formula, a total of 26 children were selected using convenience sampling method, and were randomly divided into control and experimental groups (13 participants in each group). After receiving permission from the Isfahan's Welfare Organization, 26 children (the study sample) were selected from the Isfahan Autism Association.

Before applying the intervention, the two instruments were administered as pretest. Then, the participants were randomly divided into control and experimental groups. The experimental group received an ABA intervention for 20 sessions (each session took 2 hours) over 3 months; during this period, the control group received no intervention. The study instruments were administered once more to both groups at posttest. Ethical considerations were taken into account; the treatment procedure and research protocol were explained for the parents, and the informed consent was obtained.

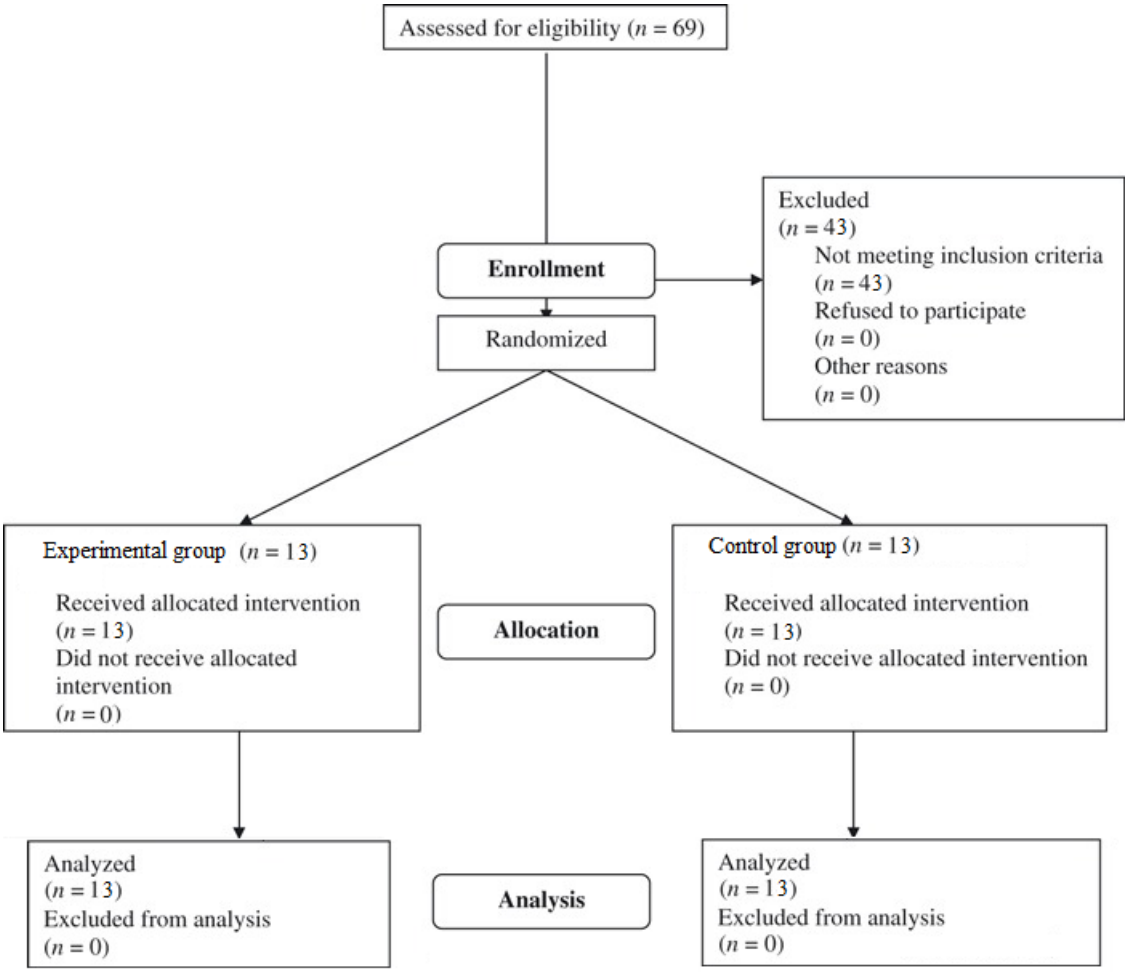

Figure 1. ONSORT Flowchart of participant's recruitment and study flow

The Gilliam Autism Rating Scale (GARS-2): This is a standardized scale for assessing autism and other severe behavioral disorders. The GARS-2 provides normalized information useful in the diagnosis of autism. The selection of items in GARS-2 was based on the definitions of autism adapted from the Diagnostic and Statistical Manuel of Mental Disorders (DSM-IV-TR) (1). The internal consistency of the GARS-2 was assessed using Cronbach's alpha coefficient. Cronbach's alphas of 0.84, 0.86, 0.88, and 0.94 were reported for stereotypic behaviors, communication, social interaction, and the level of autism, respectively. Ahmadi et al. reported Cronbach's alphas of 0.74, 0.92, 0.73, and 0.80 for stereotypic behaviors, communication, social interaction, and developmental disorders, respectively; they also reported an alpha of 0.89 for the total scale, which indicates the high reliability of the GARS-2 and its applicability for diagnosis and treatment purposes (12).

The Self-Help Skills Developmental Chart: This chart was published by the University of Utah in 1992, under the name of Curriculum and Monitoring System (CAMS). It had also been previously used (for 15 years) as an early intervention instrument. This chart is based on the opinions of early childhood experts and teachers, and it can be used in different areas. It specifies the skills children need from birth to five years of age, including self-feeding, dressing, personal hygiene, and toileting. This chart has four categories of skills and totally 81 skills.

Self-help skills are assessed individually, and a child's response is recorded on an evaluation sheet. Psychological questionnaires assess constructs that are not objective or observable, like depression, anxiety, and so on; therefore, their validity and reliability should be examined to make sure they assess the right construct (13).

Descriptive statistics, including mean and standard deviation, were used to describe the data, and analysis of covariance (ANCOVA) and multivariate analysis of covariance (MANCOVA) were used to examine the hypotheses. It is worth noting that all the analyses were performed using IBM SPSS Statistics for Windows, Version 22.0, and the level of significance was set at 0.05 confidence level.

Results

The mean (SD) age of the students in the experimental group was 10.1 (1.34) and 11.7 (1.92) in the control group. In this section, descriptive findings, including the mean and standard deviation of pretest, posttest, and follow-up scores, are provided for both experimental and control groups.

The results indicated that there was a significant difference between autistic children in the experimental and control groups in self-feeding (t=7.01, *P*=0.01), personal hygiene (t=11.12, *P*=0.003), mobility impairments and unusual behaviors (t=63.63, *P*<0.001), verbal and non-verbal behaviors (t=11.58, *P*<0.001), interaction with people, objects, and situations (t=11.81, *P*=0.003), and developmental impairments (t=88.28, *P*<0.001).

Table 1. Mean and standard deviation of self-help skills and stereotypic behaviors scores at pretest and posttest

Variable		Phase	Group	Mean (SD)	t	*P*
Self-help skills	Self-feeding	Pre-test	experiment	13.3 (3.66)	7.01	0.01
			control	14.2 (4.07)		
		Post-test	experiment	22.1 (6.11)		
			control	14.3 (3.92)		
	Dressing	Pre-test	experiment	5.7 (7.43)	3.01	0.09
			control	3.6 (4.60)		
		Post-test	experiment	19.3 (7.35)		
			control	3.8 (4.64)		
	Personal hygiene	Pre-test	experiment	6.3 (5.63)	11.12	0.003
			control	6 (3.48)		
		Post-test	experiment	14.9 (6.37)		
			control	6.4 (3.31)		
	Toileting	Pre-test	experiment	1.3 (1.46)	0.36	0.55
			control	0.2 (0.41)		
		Post-test	experiment	4.2 (1.50)		
			control	0.6 (0.87)		
Stereotypic Behavior	Mobility impairments or unusual behaviors	Pre-test	experiment	40.3 (6.62)	63.63	<0.001
			control	43.6 (9.24)		
		Post-test	experiment	21.8 (2.53)		
			control	43.6 (9.21)		
	Verbal and non-verbal behaviors	Pre-test	experiment	34.3 (7.70)	11.58	<0.001
			control	38.8 (13)		
		Post-test	experiment	28 (6.33)		
			control	38.7 (13.16)		
	Interaction with people, objects, and situations	Pre-test	experiment	35.6 (7.48)	11.81	0.003
			control	45.7 (8.17)		
		Post-test	experiment	30.4 (7.53)		
			control	45.9 (8.16)		
	Developmental impairments	Pre-test	experiment	22.4 (2.21)	88.28	<0.001
			control	22.6 (1.37)		
		Post-test	experiment	17.6 (1.16)		
			control	22.5 (1.33)		

Discussion

The study results indicated that there was a significant difference between autistic children in the experimental and control groups in self-feeding and personal hygiene. In other words, the posttest average score of the experimental group on self-feeding and personal hygiene self-help skills is higher than that of the control group; therefore; this finding is consistent with similar studies. (10, 11).

The results also showed the effectiveness of ABA training in increasing self-help skills, including self-feeding, dressing, personal hygiene, and toileting. Different studies have directly shown the positive effect of ABA intervention on the improvement of autistic behaviors, and ABA seems to have been an effective method for children and adults with different mental disorders and developmental disabilities. Due to the ease of utilization of ABA intervention that can be applied by the child's therapist, parents, teachers, and other relatives (14), and because it involves different learning areas, such as everyday life skills, self-help skills, and professional and personal skills, it can be used as an effective method for improving the behaviors of autistic children. Research evidence shows that this treatment approach at the same time improves several dimensions of psychological development vital for the proper development of every child. The basic presumption of this approach is that all behaviors are learned, and that adaptive behaviors and useful skills are stablished and continued by reinforcement (15-17). If we take a look at the therapeutic effects of other treatment methods for autistic children, we can understand their shortcomings. For example, pharmacotherapy involves complications and is less commonly used for small children, and the sensory integration therapy is focused on sensorimotor skills; these treatment methods and other rehabilitation treatments for ASD barely consider areas like cognitive skills, everyday life skills, self-help skills, and professional and personal skills, and pay less attention to the child's learning process. It is important to note that almost all interventions are somehow based on the theory and application of the scientific principles of behavior analysis, and behavioral interventions like ABA have a key role in improving the quality of life of those with ASD and their family members (18-20).

According to the results, there was a significant difference between autistic children in the experimental and control groups in mobility impairments and unusual behaviors, verbal and non-verbal behaviors, interaction with people, objects, and situations, and developmental impairments. In other words, all components of stereotypic behaviors were lower in the experimental group compared with those of the control group, indicating that the ABA intervention led to a reduction in the mobility impairments and unusual behaviors, verbal and non-verbal behaviors, interaction with people, objects, and situations, and developmental impairments of the experimental group.

ABA interventions not only lead to the improvement of child's behavior, but they also cause neurologic development through enhancing neuroplasticity, which may compensate for developmental delay. The previous studies showed that ABA interventions can help individuals achieve a proper range of cognitive, social, and verbal abilities, and help reduce stereotypic behaviors and behavioral problems; this indicates that in this treatment approach, attention is paid to fundamental domains of development. In the present study, using an ABA intervention, repetitive, and stereotypic behaviors of participant children, including occupation with one or several stereotypic and limited patterns which are abnormal either due to their intensity or their focus, seemingly compulsive adherence to ineffective rituals or actions, stereotypic, and repetitive

movements, like playing with hand or fingers and abnormal body movements, and permanent preoccupation with parts of objects were significantly reduced. Also, using extinction, shaping, and replacing abnormal behaviors with desired ones, the frequency and intensity of symptoms declined. One of the stereotypic behaviors in children is pleasurable vomit eating. An interesting point is that the principles of ABA and behavioral intervention are used as an integral part of every treatment plan for autistic children and adolescents. Therefore, due to the fact that learning the basic skills in early childhood is very essential, ABA should be used along with other treatment methods to maximize the treatment effect. Therefore, ABA should be used along with other treatment methods to maximize the treatment effect.

The present study had some limitations, which should be taken into account: because we had to start the project with children enrolled in the education center, participating children were selected from a limited population of autistic children, we had limited or no access to some educational tools, we could not have a second control group receiving 10 hours of ABA training per week; this could improve the study results, a possible difference between receiving training at home versus receiving it inside the treatment center was not determined, the sample size was small, and some of the children's parents and treatment center's showed inadequate cooperation. Future studies are suggested to further examine the effectiveness of ABA and its correlates, such as age, gender, etc. It is also suggested that training on self-help, relational, and interactional skills be considered along with speech therapy and pharmacotherapy, and team-based treatment be the main approach to work with children with ASD. Moreover, given the positive effects of ABA revealed in the present study, it is gusseted that more rigorous studies with better planning and budget be conducted on this issue.

It can be concluded that the applied behavior analysis appears to be an effective method for increasing self-help skills and reducing stereotypic behaviors in children with ASD.

Conflict of interest

Authors declare no conflict of interests.

Acknowledgements

The authors would like to appreciate all the participants who took part in the present study.

References

1. Sonuga-Barke EJ, Brandeis D, Cortese S, Daley D, Ferrin M, Holtmann M,et al; European ADHD Guidelines Group. Nonpharmacological interventions for ADHD: systematic review and meta-analyses of randomized controlled trials of dietary and psychological treatments. Am J Psychiatry. 2013;170(3):275-89.

2. Christensen DL, Baio J, Van Naarden Braun K, Bilder D, Charles J, Constantino JN, et al; Centers for Disease Control and Prevention (CDC). Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years--Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2012. MMWR Surveill Summ. 2016;65(3):1-23.

3. Wong C, Odom SL, Hume KA, Cox AW, Fettig A, Kucharczyk S, et al. Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum Disorder: A Comprehensive Review. J Autism Dev Disord. 2015;45(7):1951-66.

4. Mohammadzaheri F, Koegel LK, Rezaee M, Rafiee SM. A randomized clinical trial comparison between pivotal response treatment (PRT) and structured applied behavior analysis (ABA) intervention for children with autism. J Autism Dev Disord. 2014;44(11):2769-77.

5. Bishop-Fitzpatrick L, Minshew NJ, Eack SM. A Systematic Review of Psychosocial Interventions for Adults with Autism Spectrum Disorders. J Autism Dev Disord. 2013; 43(3): 687–694.

6. Mohammadzaheri F, Koegel LK, Rezaei M, Bakhshi E. A Randomized Clinical Trial Comparison Between Pivotal Response Treatment (PRT) and Adult-Driven Applied Behavior Analysis (ABA) Intervention on Disruptive Behaviors in Public School Children with Autism. J Autism Dev Disord. 2015;45(9):2899–2907.

7. Roane HS, Fisher WW, Carr JE. Applied Behavior Analysis as Treatment for Autism Spectrum Disorder. J Pediatr. 2016;175:27-32.

8. Bradshaw J, Steiner AM, Gengoux G, Koegel LK. Feasibility and effectiveness of very early intervention for infants at-risk for autism spectrum disorder: a systematic review. J Autism Dev Disord. 2015;45(3):778-94.

9. Lecavalier L, Smith T, Johnson C, Bearss K, Swiezy N, Aman MG, Sukhodolsky DG, Deng Y, Dziura J, Scahill L. Moderators of Parent Training for Disruptive Behaviors in Young Children with Autism Spectrum Disorder. J Abnorm Child Psychol. 2017;45(6):1235-1245.
10. Moskowitz LJ, Walsh CE, Mulder E, McLaughlin DM, Hajcak G, Carr EG, Zarcone JR. Intervention for Anxiety and Problem Behavior in Children with Autism Spectrum Disorder and Intellectual Disability. J Autism Dev Disord. 2017;47(12):3930-3948.
11. Samadi SA, McConkey R. The utility of the Gilliam autism rating scale for identifying Iranian children with autism. Disabil Rehabil. 2014;36(6):452-6.
12. Samadi SA, McConkey R. Screening for Autism in Iranian Preschoolers: Contrasting M-CHAT and a Scale Developed in Iran. J Autism Dev Disord. 2015;45(9):2908-16.
13. Frank K, Esbensen AJ. Fine motor and self-care milestones for individuals with Down syndrome using a Retrospective Chart Review. Journal of Intellectual Disability Research. 2015;59(8):719-29.
14. Zwaigenbaum L, Bauman ML, Choueiri R, Kasari C, Carter A, Granpeesheh D, Mailloux Z, Smith Roley S, Wagner S, Fein D, Pierce K, Buie T, Davis PA, Newschaffer C, Robins D, Wetherby A, Stone WL, Yirmiya N, Estes A, Hansen RL, McPartland JC, Natowicz MR. Early Intervention for Children With Autism Spectrum Disorder Under 3 Years of Age: Recommendations for Practice and Research. Pediatrics. 2015;136 Suppl 1:S60-81.
15. Peterson KM, Piazza CC, Luczynski KC, Fisher WW. Virtual-care delivery of applied-behavior-analysis services to children with autism spectrum disorder and related conditions. Behavior Analysis: Research and Practice. 2017;17(4):286.
16. Welch CD, Polatajko HJ. Applied Behavior Analysis, Autism, and Occupational Therapy: A Search for Understanding. Am J Occup Ther. 2016;70(4):7004360020p1-5.
17. Bagaiolo LF, Mari JJ, Bordini D, Ribeiro TC, Martone MCC, Caetano SC, Brunoni D, Brentani H, Paula CS. Procedures and compliance of a video modeling applied behavior analysis intervention for Brazilian parents of children with autism spectrum disorders. Autism. 2017;21(5):603-610.
18. Chang K, Zaroff CM. Applied Behavior Analysis in Autism Spectrum Disorders in China and Hong Kong. Acta Psychopathol. 2017;3(5):52.
19. Bryson SA, Ostmeyer KF. Increasing the effectiveness of community mental health center social skills groups for children with autism spectrum disorder: a training and consultation example. Adm Policy Ment Health. 2014;41(6):808-21.
20. Guinchat V, Cravero C, Diaz L, Périsse D, Xavier J, Amiet C, et al. Acute behavioral crises in psychiatric inpatients with autism spectrum disorder (ASD): recognition of concomitant medical or non-ASD psychiatric conditions predicts enhanced improvement. Res Dev Disabil. 2015;38:242-55.