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The Effectiveness of Symbolic Play Training on Social Interaction in Children with High Performance Autism Disorder: Single-subject Study

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Abstract: The purpose of this study was to determine the effectiveness of symbolic play on the social interaction of children aged 4-6 years with high-performance autism disorders. This research has been carried out within the framework of a single-subject experimental design. Three children with high performance autism were selected through targeted sampling. Training sessions were arranged in 36 one and a half hours' sessions, for 4 days per week. To measure the dependent variable, the Autism Treatment Evaluation Checklist (ATEC) was completed by instructors. In order to analyze the data, baseline, intervention, and follow-up positions of each subject was plotted on the graph. The visual analysis, change reliability index, and recovery percentage index, percentage of non-overlapping data, and percentage of overlapping data were used to interpret these graphs. Based on the results of the visual analysis of the data, the intervention has been effective in improving the social interaction of all three participants. Reliability index Change in the intervention phase was 3.74, 7.1 and 6.4, all of which are significant ($P < 0.05$). Based on the findings of this study, early intervention in the teaching of symbolic play skills can be used as an effective interventional method for improving social skills in pre-school children with autism spectrum disorder.

Keywords: Autism spectrum disorder, Play-based interventions, Symbolic Play, Social interaction

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Introduction

Autism spectrum disorder is a neurodevelopmental disorder that impairs children's growth and development process, characterized by sustained failures in communication and social interaction and behavior patterns, tendencies, and repetitive activities(American Psychiatric Association, 2013). Symptoms of Autism Spectrum Disorder begin in the first two years of life(Lord & McGee, 2001; Zwaigenbaum, Bryson, & Garon, 2013), and affect all aspects of childhood development(Jiao et al., 2011). All children of any race or nationality may develop autism. The prevalence rate of this disorder is increasing, and according to epidemiological studies, one in 59 people is affected(Baio et al., 2018). The prevalence of this disorder in boys is two to four times more common than in girls(Simonoff et al., 2013). A child with autism usually needs to receive intervention and training to improve long-term personal, social, and educational skills.

In the field of etiology, numerous studies show that autism spectrum disorder has a genetic and environmental aspect(Egger et al., 2014; Ratajczak, 2011). For example, mutations in the genes REELIN and SHANK2

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(Berkel et al., 2010), and SLC6A4 (Wiggins, Swartz, Martin, Lord, & Monk, 2014), have been identified to cause autism spectrum disorder and severe social deficits in this disorder. Environmental factors affecting autism spectrum disorder can include maternal infectious diseases, medications such as antidepressants, Valproic Acid and alcohol during pregnancy, exposure to poisons, parental age, malnutrition, exposure to air pollution(Chaste & Leboyer, 2012; Grant & Cannell, 2013; Lyall, Schmidt, & Hertz-Picciotto, 2014). It has been recognized, however, that autism rooted in the complex interaction between a person's genetic profile and the environment in which he or she is exposed(Volk et al., 2014).

One of the major shortcomings agreed by researchers in the field of autism spectrum disorder is a defect in social interaction (Kasari, Freeman, & Paparella, 2006), that can negatively impact other developmental aspects(Lieberman, Hatrak, & Mayberry, 2014). These children have problems in social interaction including impairments in social-emotional interaction, approaching others abnormally, failing to share their interests, emotions and feelings, and inappropriately responding to others' interests, emotions, and feelings. To match different social situations, it is difficult to find, reduce or imitate the behavior of others(American Psychiatric Association, 2013).

Failure in social skills can lead to behavioral abnormalities such as self-injuring and attacking others, and other damaging outcomes that can be attributed to stereotyped and repetitive behaviors, anxiety, depression, rejection, and peer abuse(Mash, 2006), therefore, improving social skills in children with autism spectrum disorder is an essential component of treatment for these children.

Findings indicate that autism is associated with a general defect in play (Baron-Cohen, 1987; Rutherford, Young, Hepburn, & Rogers, 2007; Volkmar, Chawarska, & Klin, 2005). Play is a set of stages in which the child develops and acquires essential developmental skills in interacting with play tools and playmates(Pierce-Jordan & Lifter, 2005). But children with autism have major problems in playing skills, especially symbolic play (Hobson, Lee, & Hobson, 2009). Significant deficits or delays in symbolic play skills and persistence of sensory-motor and / or ritual play are characteristics of the autism spectrum disorder and are considered in diagnostic criteria for children with autism spectrum disorder(Lord, Luyster, Guthrie, & Pickles, 2012). As a result, children with autism will have limited opportunities to interact with peers, learn appropriate play, and other essential skills(MacDonald, Sacramone, Mansfield, Wiltz, & Ahearn, 2009). Symbolic play, commonly seen in young children, has been recognized as one of the most important basic skills because of its relationship to cognitive, social, and emotional development(Copple & Bredekamp, 2009; McCune, 2010; Piaget, 2013; Vygotsky, 2016). Therefore, symbolic play is an important skill for training in early intervention programs(Lee, Feng, Xu, & Jin, 2019).

The play begins with the simple manipulation of objects (such as mouthing, shaking, banging, throwing and exploring objects with fingers) in the second half of the first year of life. This type of play, called motor sensory play, involves manipulating objects to practice and master the schemas(Piaget, 2013). The symbolic play appears between 18 and 24 months. The first simulation of a symbolic play is a functional play that the child shows at about 12 months of age. Functional play is the application of real or small objects according to their function in real life(Lee et al., 2019; Leslie, 1987). The level of functional play increases between the ages of 12 and 18 months, and qualitative changes are manifested in the play; at this stage, play activities are focused on the child's body(Stagnitti, 2004); and the child is able to perform similar tasks for several purposes, and integration into play activities is began(Wilson et al., 2017). The child is able to perform deferred imitation

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and symbolic play between the ages of 18 and 24 months, the child can represent aspects of the environment and objects in the form of mental imagery. As a result, play transcends the physical and functional properties of objects(Baron-Cohen, 1987).

Symbolic play is the peak of childhood games. This type of play has a key role in the growth and life of a child. The importance of symbolic play is that deficiency in this area is associated with deficits in other skills. Symbolic play facilitates child learning, speaking ability, and language(Lang et al., 2014). Symbolic play is also an important indicator of children's cognitive development(Lillard et al., 2013), and leads to abstract thinking, rational thinking and problem-solving. Adaptive behaviors learning(Reddy, Files-Hall, & Schaefer, 2016), is another of the benefits of symbolic play for the child. The symbolic play predicts verbal and non-verbal communication skills(Heimann, Laberg, & Nordøen, 2006; Kasari, Paparella, Freeman, & Jahromi, 2008; Maddox, 2010), interaction and social competence(Josefi & Ryan, 2004; Manning & Wainwright, 2010), reduced stereotypical behaviors and emotional self-regulation(Lang et al., 2010), in children with autism spectrum disorder. Based on the connection between symbolic play skills and developmental skills, researchers and therapists have developed symbolic play-based therapies.

In this regard, several researchers have designed and applied different interventions to improve symbolic play skills and reported positive and sustained results. In a study, Uren and Stagnitti (2009), attempted to reinforce the symbolic play skills of a 5- to 7-year-old autistic child. The results showed that at the end of the intervention, child acquired play skills, and the results showed the effectiveness of the intervention based on the training of play skills, pretending on the skills and social competence of child with autism spectrum disorder. In another study by Stanley and Konstantareas (2007), the results showed that social communication and expressive language were associated with symbolic play skills in children with autism. However, no research has been conducted in Iran on the role of symbolic play skills in social communication in children with autism spectrum disorder.

Regard to the importance of symbolic play skills and its impact on language, cognitive and social skills and need to early therapeutic interventions to improve the play skills of children with autism spectrum disorder, the purpose of the present study was to investigate the effectiveness of symbolic play skills training on social interaction in children with autism.

Material and Method

Participants and Location: The statistical population of this study included all children with autism spectrum disorder in Sabzevar city, Iran who 3 children aged 4 to 6 years were selected by purposeful sampling method. Inclusion criteria were: 4-6 years of age, score of 85 or more on the Gilliam Autism Diagnosis Scale, no other disorders such as severe convulsion, attention deficit / hyperactivity disorder, mental retardation and physical and motor disability. Participants were evaluated and subjected to intervention for 4 months. The first participant was 4.5 years old. According to Gilliam's autism scale, his autism rate was 71 and its probability autism was mild. The second participant was 5 years old. His total score was 70 in Gilliam's test subscales, so the probability of his autism was mild. The third participant was 6 years old. For this participant, the sum of the scores on the Gilliam's subscales was 79 and the probability his autism was mild.

Dependent variables and data collection: The dependent variables in this study were social interaction. The research tool for collecting data in this field was the Autism Therapy Assessment Checklist (ATEC) designed

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by Remland and Adelson to assess any type of autism treatment and it has sufficient sensitivity to measure changes in autism and treatment status in child. The tool consists of 77 items that are false, partially correct and completely correct for each choice item with a score of 0-1-2. This test has 4 subscales and a total score. The four subscales included cognitive sensory awareness (18 items on activity and level of sensory awareness and cognitive empowerment), socialization (20 items on socialization), speech-communication-language (14 items on speaking, Language and communication) and physical and behavioral health (25 items on health, physical status, and individual behaviors), which measures cognitive, social, communicative, and repetitive and stereotyped behavioral variables, respectively. Cronbach's alpha of each subscale was 0.92, 0.83, 0.87, 0.81 respectively and 94% for the total score(Baker & Pangborn, 1999). also obtained a reliability of 0.92 for this scale. For the purpose of the study, the socialization subscale of this tool was used.

Gilliam Autism Rating Scale - Second Edition (GARS-2) was used to assess the severity of autism. GARS-2 was designed by Gilliam in 1995. The GARS-2 test was designed for 3 to 22 year olds. This scale consists of four subscales of stereotypical behavior, communication, social interaction, and developmental disorder. Its scoring is a Likert scale (never, rarely, sometimes, very much). The maximum score for each subscale of is 42 and at least zero. Each person's total score is between zero and 142. Cronbach's alpha coefficient for stereotyped behavior was 0.90, for communication was 0.89, for social interaction was 0.93, and for developmental disorder was 0.88. In the Persian version of the Gilliam test, the alpha coefficient for stereotypical behavior was 0.47, for communication was 0.73, for social interaction was 0.73, and for developmental disorder was 0.80 (Ahmadi, Safari, Hemmatiyan, & Khalili, 2012).

Experimental Design: This study was conducted as a single-subject experimental design using A-B design. The design consisted of three baseline, intervention and follow-up stages that target behavior was observed under natural conditions in the baseline phase of the study, and after several baseline sessions, the experimental phase was performed. In this phase, the effect of the independent variable on target behavior was examined. In the follow-up phase, observation of target behavior was performed in natural conditions again. After the above phases, the results of all three steps were plotted and final results were analyzed. Visual analysis of graphs and trending index, stability, Percentage of Non-Overlapping Data (PND) and Percentage of Overlapping Data (POD) were used for data analysis.

Methods: In this study, the baseline on the Social Interaction Scale was drawn using the Autism Therapy Assessment Scale. Data were completed by a children instructor at the Autism Center; prior to this step, the parents of the children were informed on the aims of the study and the course of the study was explained to them. A written consent was obtained from parents to participate in their research. The content of the training were arranged in 36, 4 days per week. At the end of the training sessions, the social interaction scale was again completed by the instructor. The scale was completed again in follow-up phase four weeks after the last evaluation phase. In the present study, symbolic play training sessions consisting of several play situations were prepared and implemented based on the criteria presented by Karen Stagniti: Play theme, Sequence of play actions, Object substitution, Social interaction, Role play, Doll/teddy play.

Results

Table 1 shows the effectiveness of symbolic play training on 3 participants social interaction (PND = 100%). Jacobson and Trojan (1991) proposed the Reliability of Change Index (RCI) method to avoid overestimation

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of the cut-off point due to overlap and non-overlap of normal population distributions and for greater confidence in clinical trial data as well as better performance measurement. If the rate of change or difference before treatment with after treatment is greater than 1.96 (alpha 0.05), it can be concluded that with a 0.05 error probability, the change and improvement resulting from therapeutic intervention is not accidental. The reliability index of change for the "first" participant is 3.74, which is greater than 1.96, which is significant at the 0.05 level. As a result, changes in the first participant are significant.

The recovery percentage index is also used to measure changes in therapeutic targeting to a level almost similar to normal. It should be noted that according to Blanchard's formula of percent recovery, 50 percent improvement in symptoms is considered as treatment success, 25-49 percent is considered as slight improvement and eventually decrease or increase symptoms below 25 percent is considered as treatment failure. The percentage of recovery achieved by the first participant was 54%, indicating appropriate improvement and success in treatment.

Table 1. Effectiveness of symbolic play training on 3 participant's social interaction

Participant	Phase	Mean	SD
First	Baseline	21.33	1.52
	Intervention	14.37	1.68
	Follow up	15	1.25
Second	Baseline	26	1
	Intervention	17	3.16
	Follow up	19.50	1.29
Third	Baseline	23	1
	Intervention	15	2.97
	Follow up	16.25	1.70

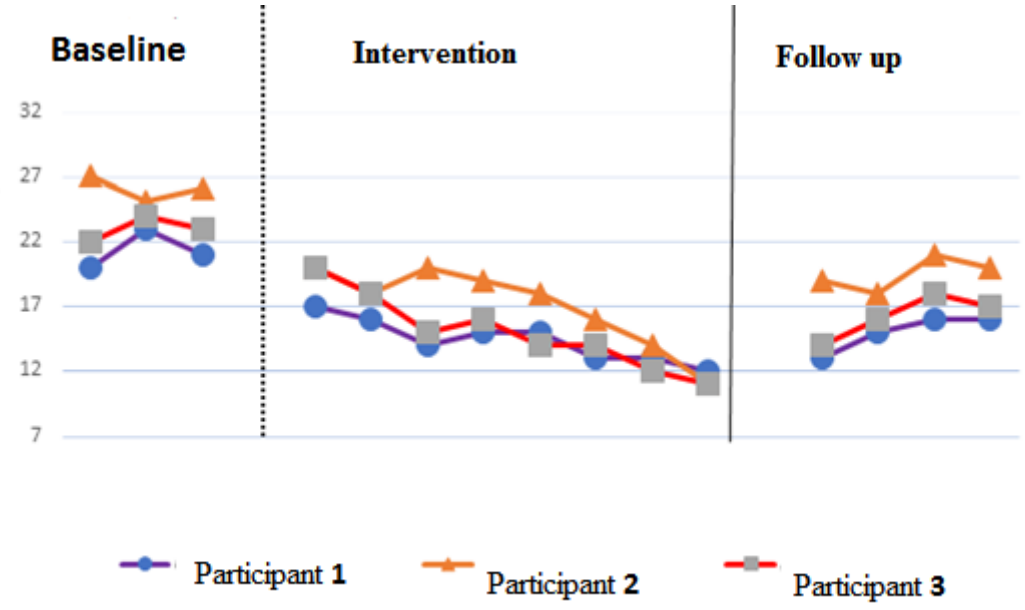


Figure 1. The effect of symbolic play training on participants' social interaction

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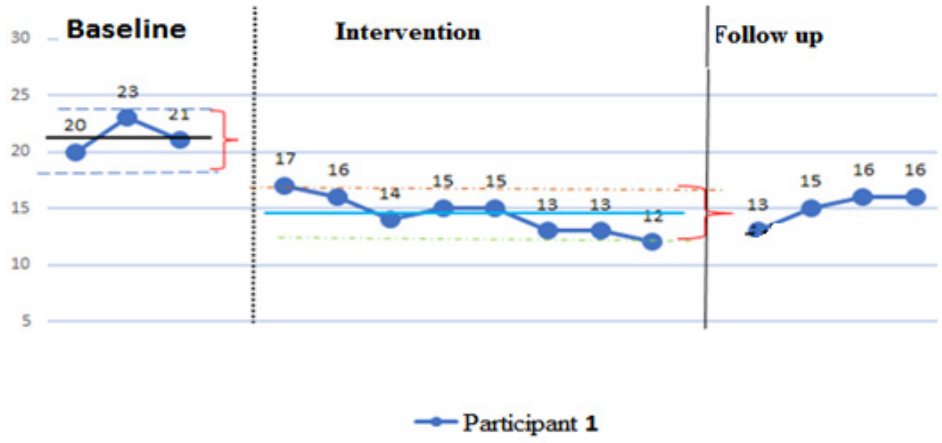


Figure 2. In situ chart of symbolic play training on first participant social interaction

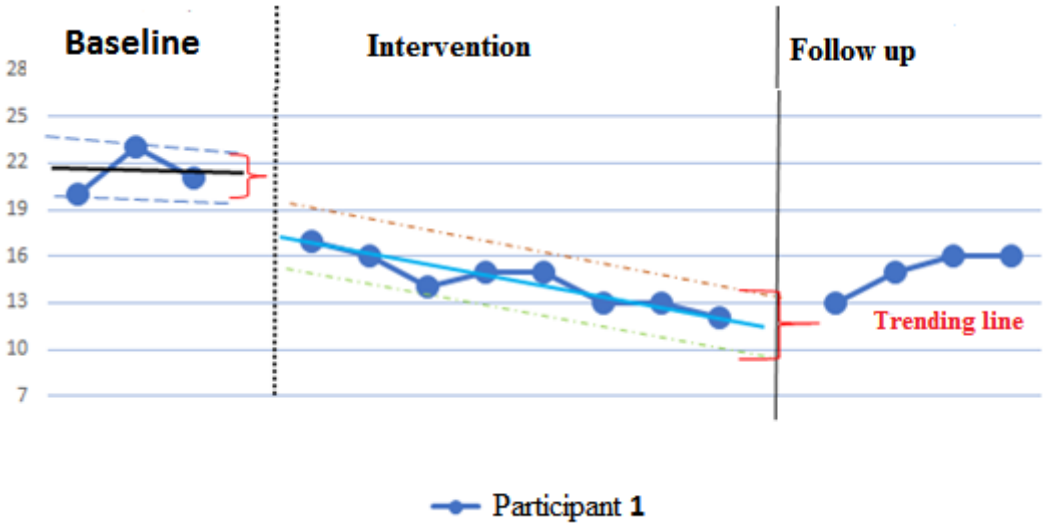


Figure 3. Trending line of symbolic play training on first participant social interaction

Concerning the second participant, the results indicate a change in the mean level at baseline (26) compared to intervention (17). The percentage of non-overlapping data (100%) and overlapping data was equal to (0), so the intervention was effective. The reliability index of change for the "second" participant is 7.2, which is greater than 1.96, which is significant at the 0.05 level. Consequently, changes in the second participant are significant. The percentage of recovery achieved for the second participant was 51%, indicating appropriate

improvement and success in treatment.

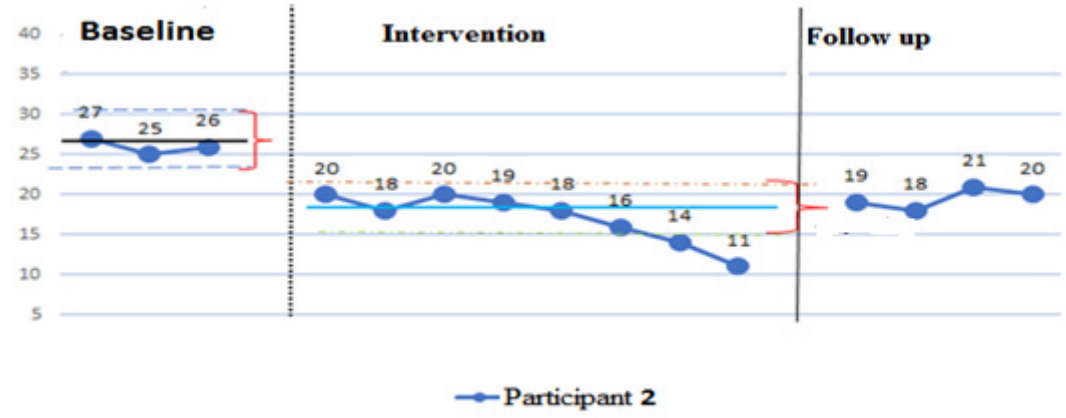


Figure 4. In situ chart of symbolic play training on second participant social interaction

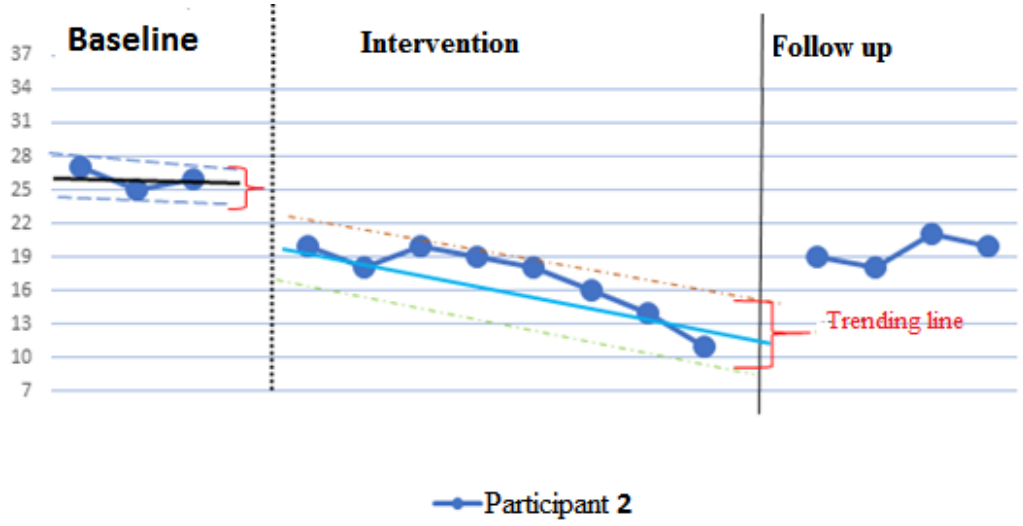


Figure 5. Trending line of symbolic play training on second participant social interaction

In relation to the third participant, we see the effectiveness of symbolic play training on third participant social interaction. The results show the mean level change at baseline (23) compared to the intervention (15). The percentage of non-overlapping data (100%) and data overlap percentage was (0.0). The reliability index of change for the "third" participant is 6.4, which is greater than 1.96, which is significant at 0.05 level. Therefore, changes in the third participant are significant. The percentage of recovery achieved for the third participant was 53%, indicating a good recovery.

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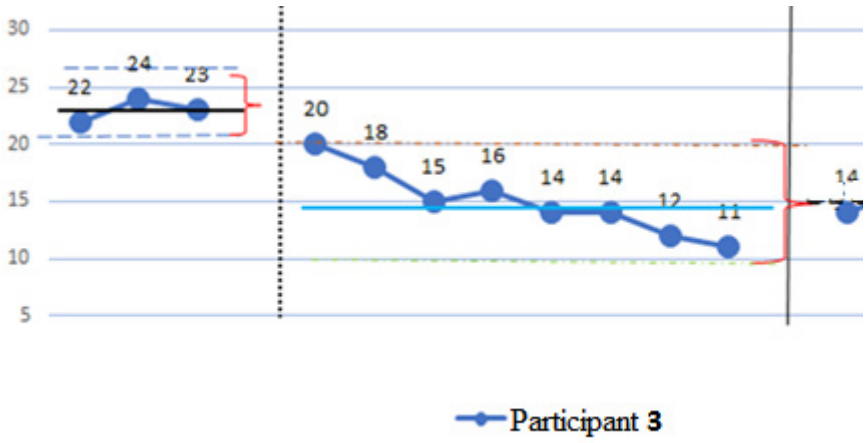


Figure 6. In situ chart of symbolic play training on third participant social interaction

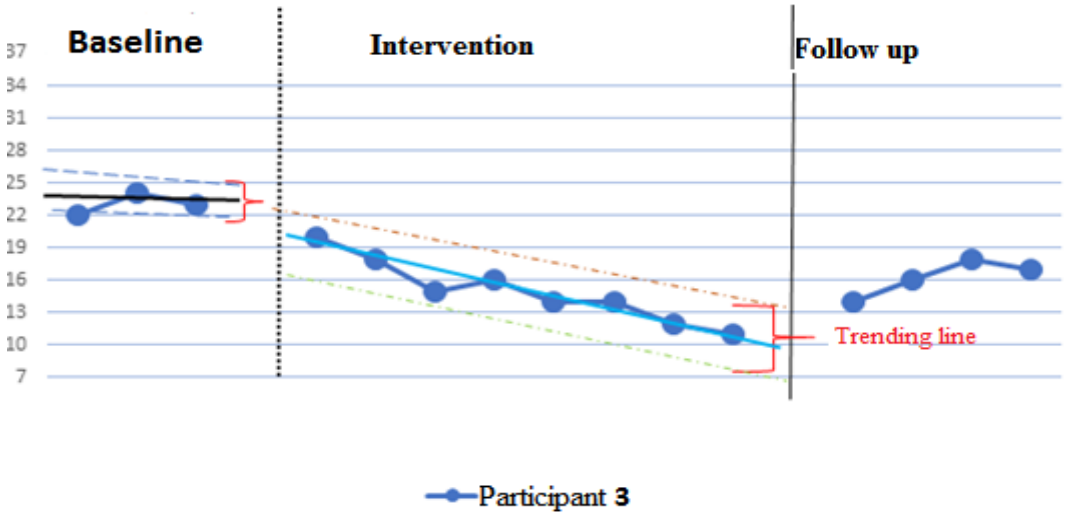


Figure 7. Trending line of symbolic play training on third participant social interaction

As can be seen in the graphs presented, the mean and level of social interaction scores of all 3 participants were improved by symbolic play training. That is, the first participant, the second participant, and the third participant show improvement in the treatment and follow-up phase compared to the baseline stage. Also,

based on the data overlap criterion (Fisher et al., 2004), participants in the first, second, and third predictor lines are above the trend line (at least 3 points) and it can be said that the three participants had an effective intervention. Also, according to the values of the indices of change for all three participants in the intervention phase, were 3.74, 7.2, and 6.4, respectively, all of which are significant at the 0.05 level of significance. These values indicate changes in the process of social interaction scores. In addition, given that the overall recovery rate for all three participants was 53 %, which it is a good value based on Blanchard's treatment success index. Therefore, it can be stated that symbolic play training is effective on participants' social interaction.

Discussion

The problem in social interaction is the main and most important feature of autism disorder which can have a negative impact on other aspects of development(White, Keonig, & Scahill, 2007). Therefore, improving social skills in children with autism is an essential component of therapeutic interventions for these children. Research background supports a lot of play-centered interventions. Experiences gained within playing improve social interactions, language and speech skills(Josefi & Ryan, 2004). Play has been accepted as an integral part of growth and devotes a large proportion of the time to growing children(Boutot, Guenther, & Crozier, 2005; Sigman & Ungerer, 1984).

Children with autism often have a significant delay in the development of play behavior(Baron-Cohen, 1987). In fact, these deficiencies in the definition of autism (Diagnostic and Statistical Manual of Mental Disorders, 1994) are one of the main components of autism diagnostic (such as the Autism Diagnostic Observation Schedule (ADOS), Autism Diagnostic Interview (ADI)). As a result, children with autism will have limited opportunities to interact with peers, learn appropriate play, and other essential skills(Jung & Sainato, 2013). Since play behavior deficits can exacerbate the social and communication delays experienced by children with autism, play skills has an important role in early intervention(Jarrold, Boucher, & Smith, 1993).

The results of this study showed that symbolic play skills training was effective in improving deficits in social skills and socializing of children with autism and all three participants showed an upward trend toward goal (social interaction improvement) after intervention. Therefore, it can be concluded that the experimental intervention (Symbolic play Training) reduced the children's scores on the subscale of social interaction deficits on the ATEC scale and reflected the effects of Symbolic Play Training on enhancing social skills. Accordingly, the child interacts with his peer through play and imitation activities, and such exchanges create opportunities that the child can use during social interaction. This is an important and effective strategy in developing children's social skills. The findings of this study are in line with other research conducted to investigate the role of symbolic play training in autistic children and its impact on social skills. The results of previous studies show that symbolic play deficits in children with autism are associated with social and communication skills deficits(Kasari et al., 2006; MacDonald et al., 2009).

Uren and Stagnitti (2009), showed that children who participated in a symbolic play-based intervention improved social interaction and decreased their destructive behaviors over a six-month period. They were more related to their peers, while the comparison group had more socially unpleasant behavior and did not interact with their peers.

Children with autism spectrum disorder do not have sufficient motivation to respond to environmental stimuli, especially engaging in social interactions with others. Applying motivational variables such as the use of natural reinforces or a combination of continuous and then discrete reinforces increases the likelihood of perform-

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ing the desired behavior. The natural consequences for playing behavior depend on the adult. For example, if a child slaps an empty bowl with a spoon and says, “Ice cream” is the natural reinforcement to immediately shake the spoon in a bowl and say, “Oh! Can I eat a little?” “We’re making ice cream.” However, some children may require direct and explicit feedback (continuous reinforcement), especially when teaching more complex play behaviors. Continuous reinforcement involves providing rewards after target behavior occurs. The facilitator can be used in a variety of ways, such as obtaining the desired instrument or verbal encouragement from the instructor(Hine & Wolery, 2006). It is a description that tells the child that he or she has done the right thing (for example, “I see you feeding the doll or” Yeah, you put a hat on your head “). Therefore, reinforcement of the child’s play activities is the consequence that will enable new skills to be acquired more quickly. Some argue that approaches that involve environmental reinforcement do not teach play, but instead teaches the child to imitate play(Luckett, Bundy, & Roberts, 2007), because the game is self-motivated and free. It is selective and has an intrinsic motivation(Wolfberg, DeWitt, Young, & Nguyen, 2015), and children with autism lack it.

Early intervention has a positive impact on the development of autism children under 5 years of age(Koegel, Koegel, & Camarata, 2010). Research has shown that early intervention has positive effects on autism symptoms and the development of social, linguistic and cognitive skills(Dawson et al., 2010). Early childhood is critical for children with autism for various reasons. First, pre-school years are a dynamic period of brain development and have a much higher level of flexibility compared to later ages. Second, during the second and third years, an increase in brain volume and abnormal connections associated with autism appears, but neuronal flexibility during this period provides significant potential for developmental pathway alteration (Dawson, 2008; Pujol, Pellissier, Clément, Becker, & Le Merrer, 2018). With early intervention, some children with high-functioning autism have made significant progress so that the criteria for autism are not met at a later age. Also in the teaching of symbolic play, children with autism spectrum disorder must possess imitative skills, interested in playing with objects and lacking severe self-stimulating behaviors. Although some educational strategies may be effective for some children with severe autism(MacDonald et al., 2009), they should be combined with additional strategies(Dauphin, Kinney, Stromer, & Koegel, 2004; Hine & Wolery, 2006). Therefore, it is necessary to examine how the severity of autism affects the impact of symbolic play training and the maintenance and generalization of skills.

It is essential for children with autism to generalize the skills learned during play with materials and peers. Some studies have shown the generalized effects of playing skills in different environments, with different materials or different individuals after the intervention(Baker & Pangborn, 1999; Dauphin et al., 2004; Wong, Kasari, Freeman, & Paparella, 2007). In this study, the follow-up phase indicates the maintenance of treatment effects after 3 months. However, no more long-term effects were assessed. Although it has been suggested that play is critical for children’s development, there are few studies on the long-term effects of play on the development of children with autism. Future studies are needed to investigate the long-term effects of play skills training on the development of educational, social, and communication skills in children with autism. The present study also has the limitation of the sample being single-sex, which limits the generalization of the results. It is therefore suggested that future research should consider these issues.

Symbolic play may act as a key skill, meaning that achieving this area of growth brings many benefits to the child, so assessment and striving to improve it, is important. Considering the fact that a wide range of research

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backgrounds have reported positive and lasting results and the importance of developing this skill and its impact on learning social, linguistic and cognitive skills, there is a necessity of using therapeutic interventions to improve symbolic play in children's autism spectrum disorder in Iran. Given the growing interest in play-based training programs(Wilson et al., 2017), there is a need to provide evidence of the benefits of such training programs. It is recommended that this study be replicated in a larger sample and at other levels of autism. Future research will also examine the usefulness of play-based educational programs for a wider group of autistic children.

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Declaration of Conflicting Interests

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