Effectiveness of Mindreading Skills Training on the Improvement of Social Behaviors in Children with Autism Spectrum Disorder

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Abstract

Background: The most problematic issue for autistic children is believed to be recognizing lie from reality due to their inability in mind reading. These children have numerous problems in recognizing the feelings and predicting others' emotional states. The present study aimed to examine the effectiveness of mindreading skills training on the improvement of social behaviors of children with autism spectrum disorder.

Methods: We conducted the present study in 2020 in Tabriz, Iran. The method herein was semi-experimental with pre-test and post-test design with control group, such that the statistical population included the children with autism spectrum disorder. A 46-subject sample size was selected. The sampling method was Convenience sampling. The participants were randomly assigned to the intervention (n=23) and control (n=23) groups. For classifying the subjects in the intervention or the control group, a simple random coin-throwing method was employed. In the procedure of data analysis, the Matson's social skills questionnaire was applied. The experimental group received eight 1.5-hour sessions of training based on mind reading. The data was analyzed through ANCOVA method with SPSS version 23.

Results: Following the implementation of treatment sessions, the dependent variables in the intervention group changed, which were different from those in the control group. In this regard, the mean of social behavior (37.73±4.02, P=0.001) increased after the treatment sessions. In contrast, the mean of antisocial behaviors (25.13±2.31, P=0.001), after the treatment sessions, decreased in the intervention group. In fact, mindreading skills training was effective in of the reduction in antisocial behaviors in children with autism spectrum disorder (ASD). Moreover, the mean of aggressions and compulsive behavior (23.87±2.09, P=0.001) decreased in the intervention group after the training sessions in comparison with that in the control group. Additionally, the mean of priority seeking and having high confidence to one self (10.80±3.40, P=0.001) along with relation with peers (27.07±2.32, P=0.001) increased in comparison with those in the control group.

Conclusion: Mindreading skills training is effective in the improvement of social behaviors in children with autism spectrum disorder (ASD).

Keywords: Social behaviors, Autism spectrum disorder, Theory of mind

How to Cite: Piri Sufiyani F, Bafandeh Garamaleki H, Karimi Saraskanrud A. Effectiveness of Mindreading Skills Training on the Improvement of Social Behaviors in Children with Autism Spectrum Disorder. Int. J. School. Health. 2022;9(1):56-62. doi: 10.30476/INTJSH.2022.92394.1168.

1. Introduction

Autism spectrum disorder (ASD) is one of the severe developmental neural disorders that leads to serious deficiency in development process. It results in deep cognitive, behavioral, affective, and social limitations (1). One of the important characteristics in the diagnosis of ASD is continued deficiency in social communication and social reactions (2). Social reaction is referred to as adjusted behaviors that enables an individual to have mutual relations with others by positive reactions and avoidance of improper behavior (3). Poor social skills in children with ASD lead to failure to make friends and ignore others; they behave in a way that the others do not exist (4).

Social skills in interaction with others, like family members, classmates, teachers, and peers, undoubtedly improve social matureness and social competence of a person. Several studies (5, 6) have shown that autistic children have different problems in mindreading and perception of others' feelings. Every difficulty that these children face during developmental period might stem from their problem in mindreading (5).

One of the newest theories in the field of cognition development is the theory of mind, which is prerequisite to perceiving social environment and is of great necessity to be involved in competing social behaviors (6, 7). Theory of mind includes an individual's ability to perceive mental states of other people (thoughts, beliefs, tendencies, purposes, feelings, and dreams), use these data to interpret others' words, understand the reason behind others' beliefs, and predict their

future behavior. It has been also proven that theory of mind is a vital skill for positive and negative social functions (8). Autistic children show the most serious weakness in recognizing lie from reality due to their inability in mindreading. These children have several issues recognizing the feelings and predicting others' emotional states (9).

On the other hand, regarding the importance of social skills in an individual's life and the problems of the children with autism disorder, attempting to improve the social skills of these children is considered as a fundamental component in therapeutic interventions. Among the interventional methods for improving their social skills, we could mention the application of mindreading skills training (10).

According to the findings of the study by Begeer and colleagues (10), the treated children with ASD improved in their conceptual skills associated with theory of mind, but not in their rudimentary understanding, self-reported empathetic skills, or parent-reported social behavior. Despite the benefits on conceptual comprehension, the current study found no significant evidence indicating that theory of mind therapy improves daily mindreading skills.

In addition, Thomeer and colleagues (11) investigated the efficacy of mindreading treatment on emotion decoding and encoding skills, autism symptoms, and social skills in 43 children. They reported that the treatment group performed significantly better in the post-test on three of the four measures of emotion decoding and encoding (compared to the controls); these results were maintained after a 5-week follow-up. In the post-test and follow-up, ASD symptoms were also considerably reduced. Due to the lack of research literature and contradictory research in this area, we conducted the current research to investigate the effectiveness of mindreading skills training on the improvement of social behaviors in children with autism spectrum disorder.

2. Methods

The present work is a semi-experimental study. Our statistical population included all the children with autism spectrum disorder below the age of 12 in the autism centers of Tabriz, Iran in 2020. A 46-subject sample size was selected for the present study. The sampling was done utilizing the Convenience sampling method. The participants were randomly assigned to the intervention (n=23) or control (n=23) groups.

The specified sample size was selected according to G*Power statistical software with an effect size of 85%, a test power of 0.8, and a significance level of 0.05 (12, 13). For classifying the subjects to the intervention or the control groups, a simple random coin-throwing method was used.

The process of training for the children was performed by a psychologist. It consisted of eight sessions and each session lasted for 40 minutes.

The participants were informed about the objectives of the study and provided signed informed consent. The Ethics Committee approved this work with the code of IR.TBZMED.REC.1400.984. After the ethical approval, we distributed the questionnaires among the participants.

The inclusion criteria were consenting to enter the study, having an average rate of ASD, and being below the age of 12 years old. The exclusion criteria included existence of any serious mental disorders (schizophrenia).

2.1. Measures

Social Skills Scale: This scale comprises 55 parent's items and five teacher's items. It was first proposed by Matson and co-workers (14) 1983 in order to measure 4 to 18-year-old children and adolescents' social skills and has three forms of parent, teacher, and student. In this study, regarding the age of the subjects, just parent's and teacher's forms were used.

Parent's form consists of 55 items and teacher's form has five general items of Matson and co-workers (14) social skill main factors. Each item should be read and answered (1=never, 5=always). In Iran, standardization of this scale was carried out by Yusefi and Khayer (15) and Cronbach's alpha coefficient was obtained to be 86%. These researchers measured the scale validity using the method of factor analysis. They recognized five sub-scales in the frame of five separate factors and measured Cronbach's alpha coefficients. They also recognized five sub-scales in the frame of five separate factors and reported alpha coefficients in the components of teacher's form including proper social behaviors (73%), antisocial behaviors (77%), aggressions and compulsive behaviors (76%), priority seeking and having high confidence to one self (68%), and relation with peers (80%). In teacher's form, alpha coefficient was reported as follows: proper social behaviors

(82%), antisocial behaviors (76%), aggression and compulsive behavior (87%), priority seeking and having high confidence to one self (80%), and relation with peers (76%). The sub-scales included proper social behavior, antisocial behavior, aggression and compulsive behavior, antisocial behavior, aggression and compulsive behavior, having high confidence to one self, and relation with peers. In this scale, in addition to the subject's score in every sub-scale, a total score is calculated based on the total scores of sub-scales as social skills.

2.2. Summary of Mindreading Skills Training Sessions

Mindreading skills training package trains four mental states, namely emotion (A), purpose (B), desire (C), and false belief (D); in every mental state, four pictorials stories are presented for the children. We conducted eight instructional sessions, each lasting 40 min that was one session per week.

Session 1: Introduction, establishing a relationship between children and educator, explanation of how the sessions are conducted, implementation of emotion stories (A1), intention (B1), desire (C1), false belief (D1), correction of children's wrong answers by the researcher. **Session 2:** Review of the stories of the first session, performance of the stories of the second session of emotion (A2), intention (B2), desire (C2), false belief (D2). **Session 3:** Review of the stories of the second session, performance of the stories of the third session, excitement (A3), intention (B3), desire (C3), false belief (D3). **Session 4:** Review of the stories of the third session, performance of the stories of the fourth session, excitement (A4), intention (B4), desire (C4), false belief (D4). **Session 5:** Review of the stories of the fourth session, performance of the stories of the fifth session, excitement (A5), intention (B5), desire (C5), false belief (D5). **Session 6:** Review of the stories of the fifth session, performance of the stories of the sixth session, excitement (A6), intention (B6), desire (C6), false belief (D6). **Session 7:** Review of the stories of the sixth session, performance of the stories of

the seventh session, excitement (A7), intention (B7), desire (C7), false belief (D7). **Session 8:** Performing the stories of the eighth session: Excitement (A8), Intention (B8), Desire (C8), False Belief (D8) and Post-Test. (16, 17).

The SPSS version 23 was used for the analysis of the statistical data. In the pre-test, the means of the groups were compared utilizing an independent t-test. We employed ANCOVA for comparing the post-test and follow-up scores. P value<0.05 (usually 0.05) was considered to be statistically significant in this study.

3. Results

The participants herein comprised 46 children with ASD, who were assigned to 23 subjects in the control group and 23 in the experimental group.

In the intervention and control groups, the mean and standard deviations of the participants' age were 8.33±4.47 and 8.25±4.11, respectively. Their age in the two groups did not differ significantly (P=0.566). The means and standard deviations of the participants' social-economic states (SES) in the intervention and control groups were 65.42±6.69 and 64.01±6.10, respectively, according to the descriptive results. There were no significant differences in terms of SES between the two groups (P=0.853). Moreover, the means and standard deviations of the severity of autism in the intervention and control groups were 57.89±2.43 and 56.98±2.25, respectively. There were no significant differences concerning the severity of autism between the two groups (P=0.549).

3.1. Pre-test

Based on Table 1, no significant differences were found between the two groups concerning the social behavior (P=0.24), antisocial behaviors (P=0.14), aggressions and compulsive behavior (P=0.22), priority seeking and having high confidence to one self (P=0.11), and relation with peers (P=0.34).

Table 1: Comparison of the mean scores of the groups in the pre-test

Variables	Groups		Comparison
	Intervention Mean±SD	Control Mean±SD	
Social behavior	32.40±2.63	32.60±2.05	P=0.24
Antisocial behaviors	42.27±3.07	42.73±3.03	P=0.14
Aggressions and compulsive behavior	32.12±3.2	32.67±3.4	P=0.22
Priority seeking and having high confidence to one self	10.80±3.40	10.13±3.36	P=0.11
Relation with peers	22.47±2.66	22.1±2.54	P=0.34

Table 2: Comparison of the mean scores of the groups in the post-test

	Variables	Groups		Comparison
		Intervention Mean±SD	Control Mean±SD	
	Social behavior	37.73±4.02	32.87±4.08	P=0.001
	Antisocial behaviors	25.13±2.31	42.53±3.26	P=0.001
Post-test	Aggressions and compulsive behavior	23.87±2.09	33.27±2.21	P=0.001
	Priority seeking and having high confidence to one self	16.73±3.14	10.47±2.69	P=0.001
	Relation with peers	27.07±2.32	22/3±2.46	P=0.001

3.2. Post-test

Table 2 represents that following the implementation of the treatment sessions, the dependent variables in the intervention group changed, which were different from those in the control group. Accordingly, the mean of social behavior (37.73±4.02) increased after the treatment sessions; this difference was significant in comparison with the control group (P=0.001). In contrast, the mean of antisocial behaviors (25.13±2.31) significantly decreased in the intervention group in comparison with that of the control (P=0.001). Thus, the mindreading skills training sessions were effective in decreasing antisocial behaviors in children with ASD. Furthermore, the mean of aggressions and compulsive behavior (23.87±2.09) was significantly reduced in the intervention group compared to that of the control group (P=0.001). Additionally, the mean of priority seeking and having high confidence to one self (10.80±3.40) as well as the mean of relation with peers (27.07±2.32) saw a significant rise (P=0.001) in comparison with those of the control group (P=0.001 and P=0.001, respectively).

4. Discussion

Our results shed light on the fact that mindreading skills training has positive and significant effects on increasing the rate of social behaviors in children with autism spectrum disorder. Regarding the components, mindreading skills training contributed to an increased proper social behavior and relation with peers and decreased antisocial behavior, aggression, and having high confidence to one self.

There are only two randomized controlled trials (RCTs) that explicitly looked at the effectiveness of developing theory of mind (ToM)-related abilities. Fisher and Happe (18) investigated 6 to 15-year-olds with ASD who had varied cognitive capacities and weak theory of mind skills. The treated subjects, whose condition ranged from mentally challenged to normal intelligence, exhibited significant improvements in

theory of mind tests when compared to the control group; this result remained constant at the follow-up, after between 6 and 12 weeks. When compared to the control group, those aged six to 18 with ASD and varying cognitive capabilities showed an improvement in emotion detection in cartoons and second-order theory of mind reasoning; meanwhile, no changes were observed in facial emotional expression recognition (19). In addition, the results of Begeer and colleagues (10) revealed that compared to the controls, there was an increase in the conceptual theory of mind skills in the treated children with ASD. However, their elementary comprehension, self-reported empathetic skills, or parent reported social conduct remained unchanged. Despite the benefits on conceptual comprehension, Begeer and colleagues found no significant evidence implying that a theory of mind therapy improves daily mindreading skills (10).

These findings are fairly consistent with ours. In the primary level of mindreading, after the treatment, children with ASD would be able to identify simple and complex emotions, imitation and feign (20). In the secondary level, they acquire certain abilities, such as adopting various approaches to complex and simple shapes, distinction between imagination and reality, understanding by seeing, true and false beliefs, and prediction of act. Moreover, in a progressive level of mindreading, children with ASD indicate an improvement in perception of fun and scoffing. A number of studies have shown that children with ASD do not achieve progressive and secondary levels of mindreading skills and the primary skills are achieved more quickly. It seems as if the cause of these problems is the lack of language evolution. In other words, language evolution has a critical role in theory of mind evolution (20-28); for example, Astington and Jenkins (29) suggested that theory of mind depends on the language. That is because one of the basic problems in children with ASD concerns communication, which can create interference in learning the skills associated with the progressive level of mindreading.

Generally, it could be said that having the ability of theory of mind results in individual's appropriate functioning in the situations that require real and true explanation; they can show proper reactions and avoid improper ones (21). The ability of theory of mind helps individuals pay attention to the incorrect and irrational situations and try to have the best explanation in one certain situation, explain and predict the situations and people's behaviors correctly, have the most proper reaction, and avoid improper answers (30-32). Wellman and co-workers (33) believed that theory of mind is pre-requisite to perceive social environment and is necessary to be involved in competing social behaviors.

4.1. Limitations

In present study, we used self-report questionnaires for data collection, which could cast doubt on the accuracy of the data.

5. Conclusion

All in all, mindreading skills training is effective in the improvement of social behaviors in children with ASD. Mindreading skills training can help this group pay attention to incorrect and irrational situations and try to have the best explanation in a certain situation, explain and predict the situations and people's behaviors correctly, have the most proper reaction, and avoid improper answers.

Acknowledgements

Ethical Approval

The Ethics Committee approved this work with the code of IR.TBZMED.REC.1400.984. Also, the participants were informed about the objectives of the study and provided written informed consent.

Conflict of Interest: None declared.

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