

A Randomized Controlled Trial of Peer-mediated Intervention for ASD Children Using Siblings as Therapists

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ABSTRACT

Background: Peer-mediated interventions (PMI) promote social interactions and communication along with functional play skills among preschool children with autism spectrum disorder (ASD). However, ASD Siblings spend most of the day with siblings with autism than do their typically developing peers. Moreover, using typically developing siblings as therapists promotes maintenance practice opportunities in natural settings, family support, and encourages generalization of trained skills.

Method: This study was conducted to evaluate the effectiveness of a PMI in ASD by comparing two groups of preschool children diagnosed with ASD and were admitted to our autism Centre, each group composed of fourteen children. PMI was applied to the first group during play therapy sessions for 9-months duration in our autism Centre, where their peer coaches were fourteen-typically-developing siblings of ASD children who received sessions of peer coach training and were encouraged to interact with the fourteen ASD children of the first group using the strategies they learned. Additionally, the PMI was between the ASD child and the sibling of another ASD child, not his sibling. The second group of ASD children received ordinary rehabilitation sessions in our autism Centre during the same period of time. A standardized measurement tool assessed the children of both groups before and after the intervention.

Results: Results showed a functional and statistical significant relation between the peer-mediated intervention and the improvement of social interaction, communication and functional play which has been implicated by a statistical significant difference between the two groups of our study.

Conclusions: This study contributes to and extends the existing PMI research by using siblings of ASD children with normal intellectual and social-communication abilities in a preschool stage.


Keywords: Peer-mediated, intervention, Autism spectrum disorder, Children, Siblings, Therapist.

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INTRODUCTION

Autism spectrum disorder (ASD) is a severe neurodevelopmental disorder that impacts how a person perceives and socializes with others, causing difficulties in social interaction and communication along with restricted repetitive patterns of behavior. The expensive nature of ASD services and special needs programs can bankrupt families. Despite the financial burden, families with ASD should find means to manage and adapt to ASD challenges.¹ Autism Spectrum Disorder is a life-long disorder that causes considerable affliction in individuals, their families, school systems, and communities drastically, as costs and resources for treatment increase in demand.²

For many years, research has investigated the role that typically developing peers may be able to play in the social learning of children with autism spectrum disorders. As a result, there are currently many evidence-based social skills training paradigms that involve training peers to work as "buddies" or "tutors" with their classmates on the autism spectrum. Generally, children can benefit from peer-initiated tuition that encourages typical peers to organize play, share, help, and praise their peers with ASD. These behaviors encourage the development of communication, language, and basic social skills.³ Regarding, spending ASD Siblings a significant proportion of their daily life with their siblings

than their typically developing peers; therefore, sibling-mediated interventions should be a major part of the rehabilitation used to aid children with autism to develop social skills.

Past investigations that attempted to assess normally developing siblings' and peers' contributions to improving social skills in others who have ASD found that these developmentally healthy children have the ability to learn and utilize behavior modification strategies to improve their social interactions with their friends or brothers and sisters who have ASD.⁴ In this light, many investigations have been conducted with siblings as mediators. However, a limited number of researches has investigated the effectiveness of sibling-mediated interventions on developing social competence in children with ASD.⁵

Therefore, this study will examine validated sibling-mediated interventions and discuss their effectiveness in improving social and communication interaction as well as functional play in children with autism spectrum disorder through play-therapy sessions. Given the above, siblings may take on a number of duties, such as modeling appropriate behaviors, implementing prompting procedures, and reinforcing target behaviors.

METHODS

Ethics: The study has been approved by the ethical committee of academic affairs of northwestern armed forces Hospital (NWAFFH). Written informed consent was provided by the legal guardians of the three groups children.

Study Design and Statistical Methods

A randomized controlled study has been conducted in our autism center. A quasi-experimental group design was employed. Independent t-tests were used to assess between-group differences (PMI vs. control) on specific scales on a comprehensive assessment tool for children with Autism and an instructions guide (CATCA)⁶ at intake and again at the nine-month assessment. Also, a t-test was used to evaluate within-group differences for both groups at intake and again at the nine-month follow-up. Descriptive statistics were used for both ASD groups, and siblings group.

Participants

Who were recruited for this study: a play therapist, an educationalist, and a psychiatrist. Two parallel groups of children diagnosed with ASD and have been admitted at our autism Centre for an early intervention program; therefore, the comparison has been conducted to evaluate the effect of Peer-mediated intervention regarding social interactions, communication, and functional play skills. In addition to one group of typically-developing siblings of ASD children who have worked as peer coaches.

The PMI Group: 14 ASD children were in different chronological ages (ranging from 3–5 years old) enrolled in our Autism Centre and exposed to peer-mediated intervention by typically developing children who are siblings of other ASD children.

Peer coach group: 14 typically-developing siblings of other ASD children aged from 6–8 years old.

Compare group: 14 ASD children who were receiving the ordinary rehabilitation sessions in our autism Centre. They were of the same ages as the PMI group.

Settings

The study took place at the Autism Centre in northwestern armed forces Hospital (nwafh) in Tabuk region, kingdom of Saudi Arabia,

affiliated to Prince Mohammed Ben Salman Program for Autism and Neurodevelopmental Disorders, during the period from May 2019 to the end of January 2020.

Training sessions for peer coaches and intervention sessions have took place in play therapy room during play therapy sessions; each session was approximately 30-minute long and has been supervised by the play therapist who trained the peer coaches associated with an educationalist who specialized in ASD and worked as an observer for children response from both learners and coaches. The play therapy room had a tunnel structure, picnic tables, sports equipment, basketball hoops, paved areas, a tent, and a grass field. A play therapist has prepared an assessment and long-acting plan for ASD children by using a comprehensive assessment tool for children with Autism and an instructions guide (CATCA).⁶ CATCA tool was used for assessment of the control group.

Additionally, the play therapist has developed and used goal monitoring tool for observation during sessions. The goal-monitoring tool includes: (a) participants receiving interventions, (b) proposed goals, (c) intervention procedures, (e) number of trials, and (f) rate of response.

Various procedural aspects had been prepared before each session. Observation of beneficial change in specific dimension of behavior including social interactions and communication along with functional play skills had been documented. Certainty of evidence was evaluated by considering the difference between the main findings in measurement tool before and after the intervention.

Peer Coach Training and Intervention Procedures Includes

However, the trained peer coaches were siblings of ASD children; we did not pair any peer-coach with his ASD sibling. Moreover, we considered a number of factors to augment the effect of this intervention:

- a) A prior identification of mutual interests for both peer coaches and the ASD child. This was included as a part of the training because mutual enjoyment means friendship for children⁷.
- b) A brief feedback provided to peer coaches by the play therapist during intervention appeared to be an important as observing and then providing feedback allowed the researcher to guide the coaches in quickly editing the initial strategic problems in dealing with ASD children.
- c) Suggestion of one to one intervention is better than the inclusion of multiple peer coaches. This was implied in that presence of more peers can cause confusion and distractibility to ASD child. Additionally, playing of one peer coach with ASD child makes him/her more confident and enjoyed engaging with ASD children.

Exclusion criteria for the three groups of children included: (a) a history of significant disruptive behavior that could contradict participation due to safety concerns. (b) having a chronic medical disease that affects the general condition of the child or limits his/her attendance regularly e.g., asthma. (c) having an intellectual disability.

Measurement & Tools

The CATCA is a semi-structured, standardized assessment of availability for learning skills, communication, social interaction, fine & motor skills, daily life skills and independence for children who have been diagnosed with autism spectrum disorder.

The CATCA tool differs from the other tools as it is not based on developmental data and therefore only looks at current behavior and skills. The CATCA can be used to evaluate children at different developmental levels and chronological ages, from individuals with no speech to those who are verbally fluent. All observations were 30min in duration. In general, an observation session began as soon as a participant with ASD started playing with a peer coach.

RESULTS

Statistics: All the data was entered in SPSS v.25. Frequency and percentage of the gender of participants in different groups are presented in tabulated form. The age of participants in different groups was presented by means and Standard deviations. Independent sample t-test was applied to check any mean difference in the scores of PMI and control groups in each parameter of the study tool, both in before and after intervention groups. Paired sample t-test was used to check any improvement in the scores of the parameters in PMI and Control groups individually, before and after interventions. P-values less than 0.05 were considered statistically significant.

The frequencies and percentages of the participants' demographic features are listed in Table 1.

Within-group comparisons: As predicted in table 2, the peer-mediated intervention group showed statistically significant

improvement in post-intervention assessment regarding overall items of functional play, social interaction, and communication on CACTA scale. As can be seen in table 3, children in the control group demonstrated also improvement on all CACTA scale's items after the nine-month follow up.

Between-groups comparison: Intake data for the two groups is presented in Table 4. As can be seen, the groups did not differ by scores or statistically on any measure at intake; however, the data for the two groups at the nine-month follow-up differed statistically by significant values. Obviously, children in the PMI group scored significantly higher on all CATC scales as compared to the children receiving ordinary rehabilitation, which is statistically significant.

The overall performance change in functional play, social interaction, and communication in children with autism in the PMI group after the nine-month duration of intervention was significantly greater than the change in the control group during the same period, which is statistically significant. Variables examined were Functional play (Imaginary, competitive and Shared play, Rules following, waiting, Proper use of toys, Fetch and return and Toys exploration), Social interaction (initiation, Proper response, Possessions Recognition, Possessions Recognition, Pictures Recognition, Emotion sharing and Interests' sharing) and Communication (Requesting, Sorting and matching, Verbal imitation and Physical imitation).

Table 1: Demographic data of ASD children of both PMI and control groups and their siblings (peer coaches)

	Peer-mediated intervention (n = 14) group		Control group (n = 14)		Siblings group (peer coaches) (n = 14)	
Age (years)						
Min. – Max.	3 -5		3-5		5 – 8	
Mean ± SD.	4.7 ± 0.91		4.28 ± 1.13		6.21 ± 0.89	
Median	4		4		6	
Gender						
Male	10	71	10	86%	8	57%
Female	4	29	4	14%	6	43%
Total	14	100%	14	100%	14	100%

Table 2: The peer-mediated intervention group change scores before and after intervention.

PMI GROUP STATISTICS	BEFORE Intervention		AFTER Intervention		T Statistics	p-value
	Mean	Std. Deviation	Mean	Std. Deviation		
Functional play						
Imaginary	21.43	12.31	50.00	15.19	-10.41	0.00
Competitive	20.00	13.59	55.71	16.04	-11.54	0.00
Shared	22.86	10.69	65.71	12.23	-22.08	0.00
Rules Following	30.00	10.38	65.71	14.53	-15.69	0.00
Waiting	27.14	12.67	78.57	12.31	-18.74	0.00
Proper use of toys	20.00	15.69	50.00	32.11	-3.86	0.00
Fetch and return	22.86	10.69	68.57	17.03	-13.99	0.00
Toys exploration	22.86	13.26	72.86	16.84	-18.03	0.00
Social interaction						
Initiation	18.57	12.31	71.43	15.12	-15.61	0.00
Proper response	20.00	11.09	81.43	12.31	-18.66	0.00
Possessions Recognition	17.14	13.26	71.43	10.27	-21.66	0.00
Pictures Recognition	27.14	14.90	90.00	13.01	-22.00	0.00
Emotion sharing	22.86	7.26	78.57	9.49	-24.48	0.00
Interest sharing	17.14	13.26	68.57	12.92	-18.74	0.00
Communication						
Requesting	21.43	12.31	78.57	14.60	-29.44	0.00
Sorting and matching	30.00	15.19	84.29	13.99	-16.62	0.00
Verbal imitation	14.29	9.38	70.00	13.01	-18.00	0.00
Physical imitation	20.00	7.84	82.86	10.69	-32.38	0.00

Table 3: The control group change scores before and after ordinary intervention.

CONTROL GROUP STATISTICS	BEFORE Intervention		AFTER Intervention		T Statistics	p-value
	Mean	Std. Deviation	Mean	Std. Deviation		
Functional play						
Imaginary	15.71	8.52	35.71	8.52		
Competitive	20.00	13.59	35.71	11.58	-6.90	0.00
Shared	20.00	11.09	40.00	7.84	-9.54	0.00
Rules Following	24.29	11.58	41.43	9.49	-8.83	0.00
Waiting	25.71	14.53	47.14	9.94	-8.45	0.00
Proper use of toys	17.14	15.41	32.86	18.58	-6.90	0.00
Fetch and return	18.57	9.49	40.00	11.09	-15.00	0.00
Toys exploration	21.43	12.31	41.43	9.49	-9.54	0.00
Social interaction						
Initiation	21.43	14.60	45.71	12.23	-10.67	0.00
Proper response	22.86	13.26	50.00	10.38	-10.21	0.00
Possessions Recognition	18.57	12.31	44.29	13.99	-7.87	0.00
Pictures Recognition	22.86	13.26	45.71	12.23	-11.78	0.00
Emotion sharing	22.86	10.69	42.86	10.69		
Interest sharing	18.57	12.31	40.00	13.59	-15.00	0.00
Communication						
Requesting	21.43	12.31	47.14	12.67	-7.87	0.00
Sorting and matching	30.00	15.19	57.14	10.69	-6.82	0.00
Verbal imitation	14.29	9.38	48.57	12.92	-10.49	0.00
Physical imitation	20.00	7.84	52.86	14.90	-9.71	0.00

Table 4: Comparison of PMI group with control group regarding outcome measures

PARAMETERS	Groups	BEFORE INTERVENTION				AFTER INTERVENTION			
		Mean	SD	T-Statistics	P-Value	Mean	SD	T-Statistics	P-Value
Functional play									
Imaginary	PMI	21.43	12.31	1.43	0.17	50.00	15.19	3.07	0.01
	Control	15.71	8.52						
Competitive	BMI	20.00	13.59	0.00	1.00	55.71	16.04	3.78	0.00
	Control	20.00	13.59						
Shared	PMI	22.86	10.69	0.69	0.49	65.71	12.23	6.62	0.00
	Control	20.00	11.09						
Rules Following	PMI	30.00	10.38	1.38	0.18	65.71	14.53	5.24	0.00
	Control	24.29	11.58						
Waiting	PMI	27.14	12.67	0.28	0.78	78.57	12.31	7.43	0.00
	Control	25.71	14.53						
Proper use of toys	PMI	20.00	15.69	0.49	0.63	50.00	32.11	1.73	0.10
	Control	17.14	15.41						
Fetch and return	PMI	22.86	10.69	1.12	0.27	68.57	17.03	5.26	0.00
	Control	18.57	9.49						
Toys exploration	PMI	22.86	13.26	0.30	0.77	72.86	16.84	6.08	0.00
	Control	21.43	12.31						
Social interaction									
Initiation	PMI	18.57	12.31	-0.56	0.58	71.43	15.12	4.95	0.00
	Control	21.43	14.60						
Proper response	PMI	20.00	11.09	-0.62	0.54	81.43	12.31	7.30	0.00
	Control	22.86	13.26						
Possessions' Recognition	PMI	17.14	13.26	-0.30	0.77	71.43	10.27	5.85	0.00
	Control	18.57	12.31						
Pictures Recognition	PMI	27.14	14.90	0.80	0.43	90.00	13.01	9.28	0.00
	Control	22.86	13.26						
Emotions' sharing	PMI	22.86	7.26	0.00	1.00	78.57	9.49	9.35	0.00
	Control	22.86	10.69						
Interests' sharing	PMI	17.14	13.26	-0.30	0.77	68.57	12.92	5.70	0.00
	Control	18.57	12.31						
Communication									
Requesting	PMI	21.43	12.31	0.00	1.00	78.57	14.60	6.08	0.00
	Control	21.43	12.31						
Sorting and matching	PMI	30.00	15.19	0.00	1.00	84.29	13.99	5.77	0.00
	Control	30.00	15.19						
Verbal imitation	PMI	14.29	9.38	0.00	1.00	70.00	13.01	4.37	0.00
	Control	14.29	9.38						
Physical imitation	PMI	20.00	7.84	0.00	1.00	82.86	10.69	6.12	0.00
	Control	20.00	7.84						

DISCUSSION AND CONCLUSIONS

The main aim of this study was to evaluate the effectiveness of a playbased, peer-mediated intervention in preschool children with autism, using siblings of ASD children as peer coaches and comparing them with the control group of ASD children to confirm the effectiveness. Results displayed improvement overall in targeted autistic features (social interaction, functional play, and communication) in children with autism during the intervention, which are harmonious with the results of many studies^{8,9} which includes verbal and non-verbal communication behaviors related to the emotional, social, and communicative aspects of social interaction.

Social dysfunction may be the most significant feature of children with autism. Therefore, developing social competence should be a major focus for parents and educationalists of ASD children.¹⁰ Therefore, several studies have highlighted social interventions, such as peer-mediated strategies, as effective in enhancing social behaviors in children with autism.¹⁰⁻¹²

There are numerous positive impacts for the peers and rehabilitation Centres involved in the peer-mediated intervention, such that it encourages teamwork in rehabilitation to develop social skills for helping their ASD peers. Additionally, it promotes understanding and awareness of those that are different and may even play a role in reducing bullying.¹³

There is a progression of research demonstrating the effectiveness of Peer-mediated interventions (PMIs) in ASD children for increasing social interactions and academic engagement for children with autism spectrum disorder (ASD) in various settings.¹⁴

Several studies have highlighted social interventions, such as peer-mediated strategies, as effective in enhancing social behaviors in children with autism.¹¹

One study involved training developmentally normal children to implement joint attention related to behaviors such as providing responses and establishing eye contact with their brothers and sisters diagnosed with autism have suggested that in general, children with autism have improved the targeted behavior, although not every child with autism improved in every area.¹⁵ In another study, typically growing children were instructed to utilize instruction, role-play, and modeling with their brothers or sisters with autism. Results have revealed an improvement in social interaction in children with autism.⁴

This study adds to the existing PMI research and extends that research by including siblings; as sibling-mediated interventions (SMI) are based on initiating social interactions using typically developing siblings who were trained previously. However, very little research has investigated the effectiveness of sibling-mediated interventions on developing social competence in children with ASD.¹⁶

However, while our study as a small-randomized controlled study in PMI has shown promising results, a randomized controlled trial that utilized a contemporary description of pragmatic language, defining it as behavior encompassing the social, emotional, and communicative aspects of social language in ASD children has confirmed our results that suggested potential efficacy for this purpose.¹⁷

Parents reported that sibling-mediated training strategies facilitated the maintenance and generalization of targeted skills at the Centre, the principle that we can use to compensate for the

Shortage of educationalists and help those who are on the waiting lists.

To our knowledge, the first intervention that enrolled siblings as mediators was conducted over 40 years ago.¹⁸ Several such studies have followed including systematic reviews, yet the present study is statistically investigating the effectiveness of PMI by using siblings. Overall, the results of this present analysis showed that when normally developing siblings are trained, they can also train or enable their brothers or sisters who have autism to develop skills in numerous areas which include play skills and functional skills while decreasing unwanted behaviors. Our results are matching with the results of one meta-analysis of sibling-mediated intervention.¹⁸

A meta-analysis of peer-mediated instructional arrangement which included 13 studies about ASD children found that typically developing peers can teach other children who have autism to improve their skills in areas of communication and behavior.¹⁹

Results across the studies of a meta-analysis of sibling-mediated intervention for brothers and sisters who have autism spectrum disorder showed that sibling-mediated intervention has medium effect size and can be used as a method to improve many skills which include social and communication skills.²⁰

In addition to the reports on the gains of children with autism, data also suggest that most siblings acquired sufficient knowledge to implement the different interventions with their brothers or sisters with autism. This finding indicates that children of both genders can be trained as mediators to intervene with their brothers and sisters who have developmental disabilities. Regarding social validity, siblings reported that trainings have made a positive effect on their siblings with autism at post-intervention¹⁸. The study of Bass and Mulick has explained that using siblings as rehabilitation agents have several benefits, including continued availability in the natural setting, parental support, and an elevated chance of generalization of skills learned.²¹

In the current study, our tool has been used to assess the skills of the ASD children before and after the training course, which is more accurate than collecting observations during sessions of training. There is a considerable debate in research that calculates Improvement Rate Difference (IRD)²², one of the most commonly used and interpretable methods, as an index of behavior change from baseline to intervention and from intervention to follow-up.

In the present study, the Peer coach is a sibling of ASD child but peer training was done with another ASD child as a reciprocal training to avoid jealousy feeling of his/her sibling or interpretation of training as a mandatory job towards siblings at home. During the intervention, the peer coaches can understand more about autism and feel sympathy towards ASD children and then can practice the same at home with their siblings. Parents and siblings reported high satisfaction with the intervention and indicated significant changes from pre to post-treatment. These results suggest that sibling-implemented reciprocal training may be a promising intervention for young children with autism.¹⁶

As we preferred one-to-one peer coaching, this was not in agreement with the study of others like Hughes et al., 2013 who proposed that inclusion of multiple peer coaches may contribute to positive outcomes; as it is suggested that more trained peer coaches do not feel like a "job or a chore." In addition, having multiple peer coaches reduced the responsibility for each

individual peer coach.²³ The difference between this study and our study is that our study has dealt with preschool children and the other one was with high school students; so the change in results can be contributed to the ages and interests of peer coaches.

LIMITATIONS AND FUTURE CONSIDERATIONS

Despite the robust and positive indicators, the benefit of using siblings is that siblings live with their brothers or sister with autism permanently. Some limitations were found across the study. One limitation is the fact that the roles of individual siblings were not clearly defined in the intervention phases and that some siblings were passive mediators.²⁴ Some siblings were also taught the same skills alongside their brothers with autism. In this light, it was suggested that when possible investigators should pair appropriately siblings with the right type of intervention or right play setting. Further investigations that include more specific factors related to siblings are encouraged.²⁵ Although the training in this study was of 30 minutes, it is conceivable that even less training might have been sufficient to achieve similar outcomes.²³

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