

Changes in Peer Preferences in Preschoolers with and without Autism Spectrum Disorder Following a Preschool-Based Motor Intervention Program: A Feasibility Case Series

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Abstract

Background: In addition to the social-communication difficulties that characterize autism spectrum disorder, children with this diagnosis often demonstrate additional motor difficulties. Motor ability and social function are related in children who are typically developing; however, the extent to which motor experiences relate to social impairments in children with autism spectrum disorder is not well understood. The purpose of this paper was to describe changes in peer preferences in children with and without autism spectrum disorder following participation in a preschool-based movement activity program.

Methods: Pre- and post-intervention acceptance, rejection and reciprocated playmates were measured using child and teacher ratings of preferred and non-preferred playmates for eight children with and without autism.

Results: Data showed that most children with and without autism improved social status following the intervention.

Conclusion: This study offers preliminary evidence that children with and without autism may benefit from participation in preschool-based programs that use movement to encourage social interactions.

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Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by difficulties with social interactions and communication and demonstration of repetitive behaviors [1]. The social-communication and behavioral deficits of ASD impact multiple areas of a child's life. Children with ASD often experience learning and social difficulties at school and issues with planning, organizing, and coping may lead to problems transitioning to independence as an adult [1]. In addition, young adults with ASD are 3 to 14 times more likely to be socially isolated when compared to young adults with an intellectual disability, emotional disturbance, or learning disability [2]. Adaptive and self-care skills are often lower than expected for a child's intelligence level [1]. Currently, 1 in 68 children in the United States is diagnosed with ASD [3].

Many studies suggest that children with ASD have motor deficits, including delayed gross motor milestones, differences in walking pattern, and difficulties with balance and coordination [4,5]. When researchers control for cognitive ability, children with ASD continue to demonstrate greater delays in motor skills than typically developing peers [6]. The prevalence of motor milestone delays in children with ASD ranges from 33%-100% [7-11].

Historically, motor skills have been viewed as a relative strength of children with ASD, with most interventions focusing directly on communication, social, and cognitive impairments rather than on motor skills. The dynamic systems theory of development suggests that specific perceptual and motor capabilities of the child create experiences that allow for the development of social interaction, problem solving, attention, and communication skills [12]. Thus, if a child's quality of movement experiences affect communication, social, and cognitive skills during development, it is possible that providing opportunities for enhanced movement experiences may provide social

benefits for this population. The effects of therapeutic movement approaches such as hippotherapy [13,14], aquatic/swimming therapy [15,16] and therapeutic ice skating [17] have been examined in previous studies and have shown positive benefits on a variety of aspects of development; however, it is still uncertain what, if any, social benefits these types of interventions may provide. This study aimed to explore the relationship between social function and participation by evaluating peer acceptance and rejection and reciprocated play mates after a movement program. Previous studies delivered interventions using either a direct therapist-child approach or a small group approach consisting of only children with ASD; however, we were interested in examining the benefits of an inclusive intervention for children with and without ASD. Including children with and without disabilities together is consistent with best practice in the field of education. Laws and regulations such as the *Individuals with Disabilities Education Act* in the United States promote inclusion by mandating that children are educated in the least restrictive environment [18]. Therapeutic approaches, however, are often tested in groups of children with ASD only. The purpose of this descriptive case series was to 1) to describe changes in social acceptance and rejection and reciprocated playmates in children with and without ASD following participation in the program and 2) to examine the feasibility of implementing a preschool-based movement program to children with and without ASD in an inclusive setting.

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Materials and Methods

Case design

This study utilized a case series design. Case series reports describe a group of patients with the same diagnosis who undergo the same intervention over time [19,20]. Because this design lacks a control group, causal inferences cannot be made; however, case series reports are useful to describe new or innovative intervention approaches for the purpose of generating new hypotheses to be tested [19,20]. As noted earlier, most studies we found utilized 1-on-1 interventions or small groups of only children with ASD; we were interested in the feasibility of implementing a structured intervention for a group of children with and without ASD. Thus, the study included a feasibility analysis to address this issue. Feasibility studies are useful to identify whether or not an intervention is suitable for further testing [21].

Participants and setting

The study took place at a preschool program in the United States for children with and without ASD. The school offers a comprehensive early learning program for children 2-6 years old with ASD and their typically developing peers. The school offers 4 classrooms divided by age and a separate 1-on-1 instruction program for students with ASD who require more individual attention. Students participate in the 1-on-1 program until they gain skills to participate in a classroom setting. The school also offers an after-school program for children who need continued care after school hours have ended. During the after-school program, children from all classrooms are combined. This study took place during the after-school program at the school. Inclusion criteria included 1) children between the ages of 4-5 years old (48-71 months) and 2) attendance at the school's after-school program. Since we were interested in including typically developing peers, children with and without ASD were invited to participate in the study. Children were excluded if they utilized the 1-on-1 instruction program offered by the school because it was felt that these children would have a more difficult time participating in the group movement program.

Ten children met inclusion criteria for the study and eight children chose to participate. Four children had been previously diagnosed with ASD by an appropriate licensed health care professional and 4 were considered typically developing. All 8 children completed all testing measures. Three of the 4 children with ASD used verbal communication, while 1 child used a combination of single words, pictures, and signs to communicate. The age of participants in the study ranged from 48-65 months, with an average age of 66 months. Table 1 describes the children who participated in the study.

Child	Age (Mths)	Gender	Diagnosis	PDMS-2 GMQ
1	54	M	ASD	91
2	53	M	ASD	76
3	57	M	ASD	74
4	65	M	ASD	61
5	63	M	TD	96
6	53	F	TD	102
7	48	M	TD	83
8	55	M	TD	85

Table 1: Description of Participants.

Data collection and measurement

The Institutional Review Board at the university approved this study and parents provided consent for children to participate. Written assent was waived due to the age of children participating; however, all children provided verbal assent. The intervention period was 8 weeks in length with baseline and outcome measures collected before and after the intervention period. Measures included the Peabody Developmental Motor Scales 2nd Ed (PDMS-2) [22] and sociometric nominations [23,24] from the children and after-school teacher.

Gross motor ability: During the week before the motor program began, each child participated in an individual assessment of motor skills using the gross motor subtests of the *Peabody Developmental Motor Scales 2nd Edition* (PDMS-2) [22]. The Gross Motor Subtests of the PDMS-2 consist of the Stationary, Locomotion, and Object Manipulation scales. The PDMS-2 is a valid measure of gross motor skills [22] and is widely used by physical and occupational therapists to assess motor ability. All motor assessments were completed by the same pediatric physical therapist with more than 10 years of clinical experience.

Peer acceptance and rejection and reciprocated playmates: The researchers measured peer acceptance and rejection and reciprocated playmates using sociometric nominations. Sociometric nominations offer a simple method of measuring peer preferences from the child's perspective. The original protocol used by McCandless and Marshall [23] asked each child to select the 3 children they most like to play with and the 3 children they least like to play with. We modified this protocol slightly due to the young age of participants to increase understanding. Children were shown a display board with pictures of all 8 children in the study. The researcher asked each child to choose the child they most liked to play with at the after-school program. The researcher removed the chosen picture from the board and repeated the question until the child selected their 3 preferred playmates at aftercare. The peer acceptance rating for each child was calculated as the number of times the child was selected as a preferred peer for play. Children were also asked to select the picture of the child they do not like to play with at aftercare. The researcher repeated this question until 3 children were nominated. The peer rejection rating for each child was calculated as the number of times a child was selected to not be played with. In addition, the researchers calculated reciprocated playmates as the number of matched nominations out of 3 for each child. Preschoolers' reliability to rate sociometric nominations has been shown to be acceptable ($r=.79$) [25]. Teacher sociometric nominations were used as a secondary measure of peer acceptance and rejection and reciprocated playmates. The primary after-school teacher viewed pictures of the children in the study and selected the 3 children each participant played with most frequently and the 3 children he played with least frequently at aftercare. The teacher ratings of peer acceptance and rejection and reciprocated playmates were compared with the child ratings. Reliability of teacher ratings has been shown to be acceptable ($r=.79$) [25].

Attendance and participation in intervention sessions: To assess the feasibility of implementing a motor-based activity intervention in an inclusive preschool setting, we measured the number of sessions attended and the attrition rate for the study. Attendance was recorded at the start of each session. A child was counted as present if he or she remained present and participated in group activities for at least half of the 45-minute session.

Movement-Based Intervention

Throughout the eight-week program, children with ASD participated in two 45-minute motor activity sessions together with their peers without ASD each week. A physical therapist assisted by eight graduate and undergraduate student volunteers led each session. The number of session leaders ranged from 2-5 per session. Sessions began with a 5-minute warm up period involving general stretching and warm up activities. The warm-up period was followed by 3 to 4 gross motor activities that targeted imitation, interaction, and turn taking. The goal was to select games and activities that are commonly played in preschool settings so as to increase the social validity of the intervention as well as the ease of implementation in a preschool setting. Sessions ended with a brief calming activity to assist with the transition back to the classroom. Objective knowledge of motor abilities gathered in the pre-intervention assessment allowed the researchers to tailor the intervention sessions to the ability levels of the children. Activities were planned prior to the session, but were modified according to child preferences for the day. Table 2 shows session activities from a sample week.

Day 1	Day 2
Stretching Warm-Up	Stretching Warm-Up
Kid Yoga	Statues
Parachute Play	Hide-N-Seek
Modified Red Rover	Duck Duck Goose
Calm/Cool Down: Seated Simon Says	Calm/Cool Down: Stretches

Table 2: Sample Week Intervention Activities.

Data analysis

Following the intervention, data were analyzed to examine participation and feasibility and to look for changes in peer acceptance and rejection and reciprocated playmates. Sessions attended and frequency of nominations for peer acceptance and rejection and reciprocated playmates were calculated for each child.

Results

Attendance and participation: Overall, the sample attended an average of 11.25 (80.4%) of 14 sessions (range 5-14 sessions). Children with ASD attended an average of 10.5 (75%) sessions (range 5-14) while children without ASD attended an average of 12 (85.7%) sessions (range 11-13). Pre- and post-testing measures were completed for all 8 children. While some children required encouragement to engage in intervention activities at times, no children dropped out of the study.

Changes in peer acceptance: Results from the sociometric nominations for peer acceptance are shown in Figures 1a and 1b. Peer acceptance ratings increased for 1 child with ASD (Child 3) when rated by other children and for 2 children with ASD (Child 3 and Child 4) when rated by the teacher. Ratings decreased for 2 children with ASD (Child 1 and Child 2) when rated by the children, but only 1 child (Child 2) when rated by the teacher.

For children without ASD, peer acceptance nominations increased for 2 participants (Child 5 and Child 6) when rated by the children and for 2 children (Child 6 and Child 7) when rated by the teacher. Nominations for Child 8 remained the same, but were high before and after the intervention regardless of whether the children or the teacher were nominating.

Changes in peer rejection: Results from the sociometric nominations for peer rejection are shown in Figures 2a and 2b. Ratings for peer rejection mirrored peer acceptance findings in most cases. Ratings decreased for 1 child with ASD (Child 4) when rated by the children or the teacher. Ratings increased for 2 children with ASD (Child 1 and Child 2) when rated by the children, but only 1 child with ASD (Child 2) when rated by the teacher.

For children without ASD, 1 participant's (Child 7) rejection ratings decreased when rated by children or the teacher. The rejection rating of two children without ASD (Child 6 and Child 8) increased when rated by the children, while only 1 (Child 6) increased rejection (Child 6) when rated by the teacher.

Changes in reciprocated playmates: We also analyzed the data to examine the number of reciprocated playmates. Reciprocated playmates referred to the frequency with which a child's preferred playmate also selected him. The maximum number of reciprocated playmates a child could receive was 3, meaning that all 3 children selected as a preferred playmate by a child also selected that child. Results for reciprocated playmates are shown in Figures 3a and 3b. The data from the child nominations show that 3 children with ASD (Child 1, 2, and 4) decreased reciprocated playmates while Child 3 maintained 1 playmate before and after the intervention. When rated by the teacher, 2 children with ASD (Child 1 and Child 4) increased reciprocated playmates. One child with ASD (Child 3) maintained the maximum number of reciprocated playmates before and after the intervention, while 1 child with ASD (Child 2) decreased.

For children without ASD, 2 children decreased reciprocated playmates (Child 7 and Child 8) while 2 maintained 1 playmate (Child 5 and Child 6) when rated by the children. When rated by the teacher, 2 children without ASD (Child 6 and Child 7) increased playmates from 0 to 1 while the other 2 children without ASD (Child 5 and Child 8) maintained the maximum number of reciprocated playmates.

Discussion

Overall, children with and without ASD demonstrated high attendance and participation in the intervention, indicating that an inclusive, preschool-based intervention is practical and feasible. Inclusion is considered best practice in education for children with disabilities; however, therapeutic interventions are often not delivered in an inclusive setting. Since we were interested in the potential impact of movement on social interactions and peer relationships, we felt the inclusion of typically developing peer role models was especially important. Given that previous studies looking at movement or motor related interventions have focused on individual therapist-child approaches or a small groups approach consisting only of children with ASD, we sought to determine the feasibility of using an inclusive approach within the preschool setting.

The only study we could find that used an inclusive intervention group had mixed results [15]. That study used an aquatic therapy program with a group of children with and without a variety of disabilities, only one of which had ASD. The study reported overall increases in peer acceptance for the group of children with disabilities following the intervention, but the authors reported a decrease in happiness and in the ability to function at school in the group of children with disabilities. In our study, only 1 child with ASD decreased reciprocated playmates and acceptance following the motor program. The children in our study are in inclusive classrooms at the preschool daily, thus, they may have been more accepting of one another prior to the start of the study. Acceptance of children with

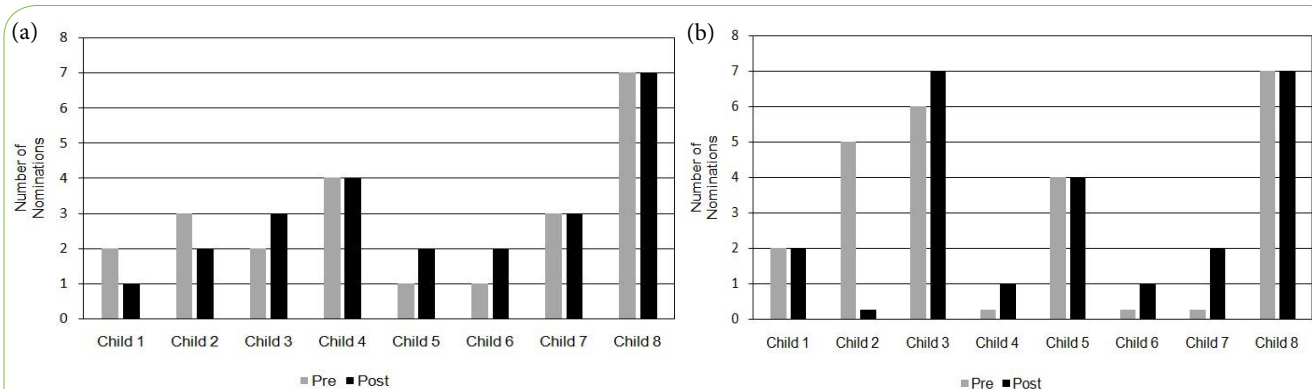


Figure 1: Peer Acceptance Nominations. (a) Frequency of nominations for peer acceptance per child from the child ratings and (b) the teacher ratings.

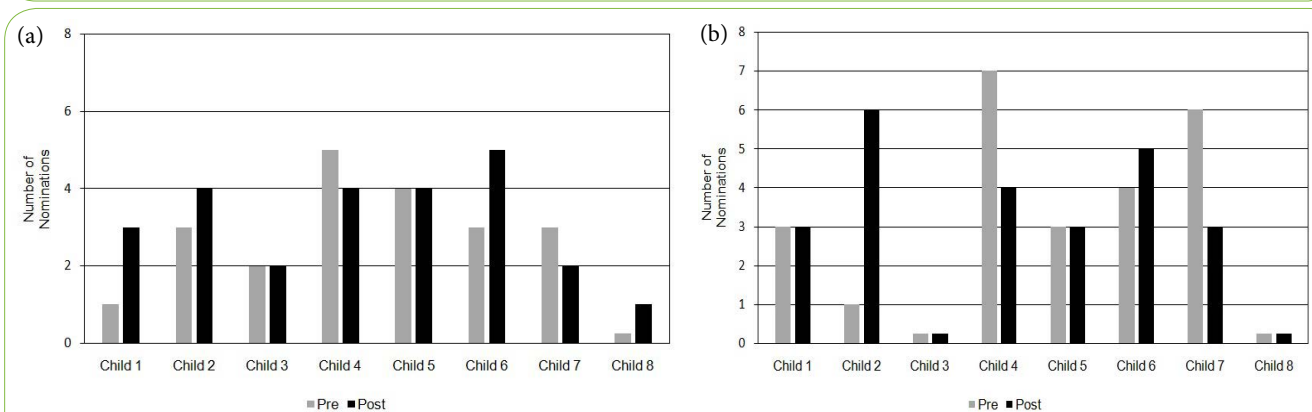


Figure 2: Peer Rejection Nominations. (a) Frequency of nominations for peer rejection per child from the child ratings and (b) the teacher ratings.

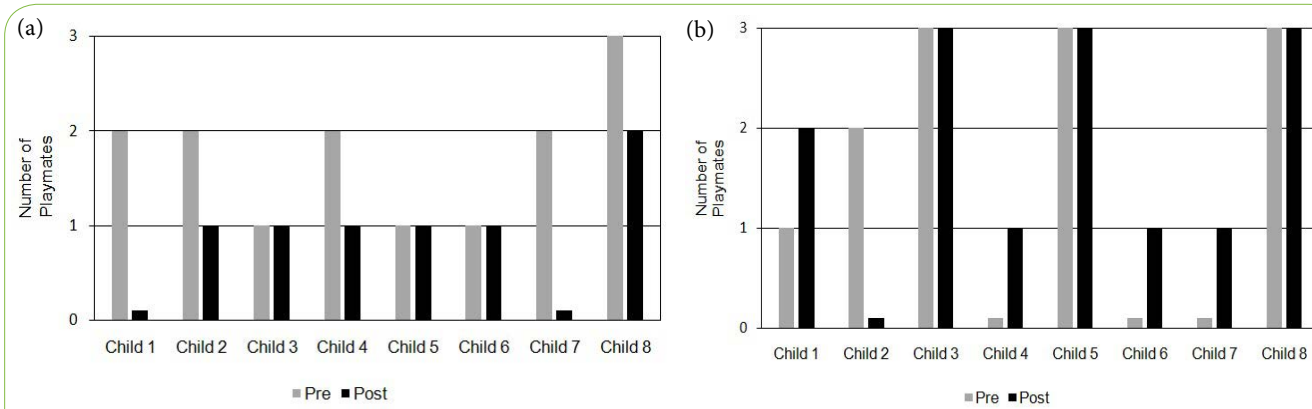


Figure 3: Reciprocated Playmates. (a) Number of reciprocated playmates per child from the child ratings and (b) the teacher ratings.

disabilities is an important aspect of social participation and future studies should consider methods for inclusion in the research design.

Our results also showed that many children with and without ASD demonstrated positive changes in preferences and acceptance following the movement program, especially when rated by the teacher. In children with mixed or negative findings interesting observations were noted. For example, Child 2 showed negative changes in acceptance, rejection, and reciprocated playmates, whether rated by the teacher or other children. Child 2 displayed more difficulties transitioning between activities than the other children and frequently became upset or sat out of activities, which affected his participation and may have impacted his ratings. It is possible that

this type of intervention may not be beneficial for children who have more difficulty transitioning between activities. In another case (Child 1), ratings for acceptance, rejection, and reciprocated playmates from peers were negative following the intervention period when rated by the children, but positive when rated by the teacher. Attendance for Child 1 was low, particularly toward the end of the intervention period, due to reduced need for attendance in the aftercare program. This may have impacted the children's nominations if they nominated based on who they most recently played with rather than who they prefer to play with under typical circumstances.

Some children without ASD also had mixed or negative findings. For example, ratings for Child 6 were mixed. Child 6 increased peer

acceptance and also increased peer rejection when rated by the children and teacher. For reciprocated playmates, Child 6 maintained 1 playmate by child nominations and increased from 0 to 1 on teacher nominations. Child 6 was the only female in the study and it is likely that the study group did not include her usual after school playmates. Child 8 also demonstrated mixed findings. Child ratings of peer rejection increased from 0 to 1 and reciprocated playmates decreased from 3 to 2, while teacher ratings remained more consistently positive. Given that Child 8 showed the highest ratings for peer acceptance, we were unable to determine a possible reason for the inconsistencies.

Based on our findings, we feel that the use of movement activities to facilitate social interactions for children with ASD warrants further investigation. Many studies that have focused directly on improving motor outcomes have seen secondary benefits in the social domain, indicating that benefits beyond improvements in motor ability may exist. For example, one study found positive changes in socialization following an intensive motor intervention based on pivotal response teaching [26]. Studies by Ennis et al. [27] and Pan [16] also found positive changes in social skills following water skills and swimming programs. Other studies using horse-back riding have also reported positive changes in social skills [13,14]. Improvements in social areas such as cooperation and empathy were also reported following participation in a Fundamental Motor Skills program in children with ASD [28]. Findings from these studies, and the current paper, suggest that further research is needed in this area.

Limitations of Current Study

We acknowledge there were several limitations of this study. Our study included a small sample of only 4 children with ASD and 4 without. Our sample size was limited by the number of children who attended the after-school care program at the preschool. Most of the studies we found that utilized a group intervention used similar sample sizes, indicating that this is a difficult area for this type of research. For future studies, the use of multiple intervention waves or intervention sessions at multiple sites to increase the number of participants should be explored in order to determine the effects of the intervention.

Additionally, we chose to focus on peer relationships and did not collect data on other areas of social function and participation, which may have also changed. Also, despite previous findings that child and teacher ratings for sociometric nominations in preschoolers are in high agreement [25], there were differences in ratings from the children and the teacher in our study. Future studies should consider the use of additional measures to explore children's perceptions of playmates as well as to look at social function and participation in the home as well as the classroom setting.

Lastly, we utilized classifications made by the school from prior diagnosis to group our participants in the ASD or non-ASD group. Thus, our study lacked an objective description of the severity of ASD diagnosis for our participants. Future studies should consider the use of validated measures to quantify the severity of ASD diagnosis to help determine if motor interventions are more effective for children with certain degrees of severity of ASD.

Conclusion

Further exploration into the benefits of motor intervention in young children with ASD is important to help inform new interventions or modify existing approaches. Despite limitations, the findings have generated important hypotheses regarding the potential impact of a

movement-based activity program to facilitate social interaction amongst preschoolers with ASD. In addition, the results from this study suggest that a motor-based activity program delivered in an inclusive preschool-based setting is feasible and may have positive social and peer acceptance benefits for young children with ASD that warrant further exploration.

Competing Interests

The authors declare that they have no competing interests.

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