

Teaching Typically Developing Children to Promote Social Play

With Their Siblings with Autism

BY

C2009

Misty L. Oppenheim

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James Sherman, Ph.D., Co-chairperson

---

Jan Sheldon, Ph.D., J.D., Co-chairperson

---

Claudia Dozier, Ph.D.

Date Defended: \_\_\_\_\_

The Thesis Committee for Misty L. Oppenheim certifies  
that this is the approved Version of the following thesis:

Teaching Typically Developing Children to Promote Social Play  
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Committee:

---

James Sherman, Ph.D., Co-chairperson

---

Jan Sheldon, Ph.D., J.D., Co-chairperson

---

Claudia Dozier, Ph.D.

Date Approved: \_\_\_\_\_

## CONTENTS

Table of Contents .....	iii
Dedication .....	iv
Acknowledgements .....	v
List of Tables .....	vii
List of Figures .....	viii
Abstract .....	xi
Introduction .....	1
Methods .....	11
Results .....	28
Discussion .....	47
References .....	55
Appendix A .....	61
Appendix B .....	65

Dedicated in the Memory of

Joseph Jerome

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## List of Tables

Table 1. Task Analysis of Target Skills

Table 2. Social Behaviors of Sibling with Autism

Table 3. Inter-observer Agreement on role-play, generalization, and free-play probes

Table 4. Acquisition and Maintenance (Average and Range Percent Correct) of  
Target Skills

Table 5. Parental Social Validity Results

Table 6. Free-play Social Validity Results

## List of Figures

Figure 1. Percent of steps completed correctly by Jared for role-play and generalization probes for inviting your sibling to play, asking your sibling to share their toys, and asking what your sibling wants to play.

Figure 2. Percent of steps completed correctly by Amanda for role-play and generalization probes for inviting your sibling to play, asking your sibling to share his toys, and providing play related instructions.

Figure 3. Percent of steps completed correctly by Amanda for role-play and generalization probes for inviting your sibling to play, asking your sibling to share their toys, and providing play related instructions

Figure 4. Social behaviors exhibited by Jared's sibling with autism, Eric, on generalization probes for playing with others, sharing toys, and choosing a play activity. Open circles below zero represent probes in which there was no opportunity for Eric to engage in appropriate social behaviors.

Figure 5. Social behaviors exhibited by Amanda's sibling with autism, Lonny, on generalization probes for playing with others, sharing toys, and following play related instructions. Open circles below zero represent probes in which there was no opportunity for Lonny to engage in appropriate social behaviors.



Figure 6. Social behaviors exhibited by Evan's sibling with autism, Tanner, on generalization probes for playing with others, sharing toys, and following play related instructions. Open circles below zero represent probes in which there was no opportunity for Tanner to engage in appropriate social behaviors.

Figure 7. Percent of intervals that Jared and Eric engaged in cooperative play, parallel play, independent play, and negative interactions during each free-play session.

Figure 8. Percent of intervals that Amanda and Lonny engaged in cooperative play, parallel play, independent play, and negative interactions during each free-play session.

Figure 9. Percent of intervals that Evan and Tanner engaged in cooperative play, parallel play, independent play, and negative interactions during each free-play session.

Figure 10. Average percent of intervals that Jared and Eric engaged in cooperative play, parallel play, independent play, and negative interactions during each phase of the study (i.e., during baseline, following teaching of first skill, following teaching of second skill, and following teaching of third skill).

Figure 11. Average percent of intervals that Amanda and Lonny engaged in cooperative play, parallel play, independent play, and negative interactions during each phase of the study (i.e., during baseline, following teaching of first skill, following teaching of second skill, and following teaching of third skill).

Figure 12. Average percent of intervals that Evan and Tanner engaged in cooperative play, parallel play, independent play, and negative interactions during each phase of the study (i.e., during baseline, following teaching of first skill, following teaching of second skill, and following teaching of third skill).

## Abstract

Siblings are generally the most important “peer” in children’s lives.

Unfortunately, children with autism often do not play or interact a great deal with their typically developing siblings, largely because the children with autism do not have the necessary language and social skills to do so and because their siblings do not know how to facilitate play with their brother or sister. The purpose of this study was to teach three typically-developing children (ages 4-6) skills that were likely to increase the amount and quality of social play interactions with their brothers who have autism. Using a teaching interaction procedure, the typical children were taught how to (a) provide clear instructions, (b) prompt, and (c) reinforce play related behaviors such as joining into a play activity, sharing preferred toys, and appropriate toy play. All three children learned the targeted skills during role-plays with a teacher and, to a large part, generalized the skills when they played with their brothers with autism. In addition, for some children, learning these skills increased the children’s levels of positive interactions and decreased levels of negative interactions during a free play period.

## Teaching Typically Developing Children to Promote Social Play with Their Siblings with Autism

### Introduction

One of the defining characteristics of autism is impairment in social interaction, ranging from lack of eye contact to inability to develop peer relationships (DSM IV-TR, 2000). Additionally, these deficits, if not addressed, may have significant long-term detrimental effects on the life of a person with autism. There are, for example, a number of studies that have found that a lack of appropriate social skills displayed by children with autism or other disabilities is correlated with fewer friendships, increased levels of loneliness (as measured by self-reports), and increased levels of depression (e.g., Bauminger & Kasari, 2000; Stewart, Barnard, Pearson, Hasan, & O'Brien, 2006)

The social deficits inherent in autism can also affect the quality of sibling relationships; the literature is mixed, however, as to how having a sibling diagnosed with autism affects the sibling relationship as well as the development of the non-disabled sibling (Howlin, 1988; Orsmond & Seltzer, 2007). On one hand, there is some evidence from comparison studies that siblings of children with autism interact less with their siblings with autism (El Ghoroury & Romanczyk, 1999; Knott, Lewis, & Williams, 1995; Knott, Lewis, & Williams, 2007), are less involved with and supportive of their siblings as adults (Orsmond & Seltzer, 2007), and have more behavior problems (Hastings, 2003b; Rodrigue, Geffken, & Morgan, 1993; Verté, Roeyers, & Buysse, 2003) than siblings of children with Down's Syndrome or no

disability. On the other hand, several studies have not found significant negative effects of having a sibling with autism (Hastings, 2007; Kaminsky & Dewey, 2002).

In view of the possible negative effects of the limited appropriate social skills demonstrated by children with autism towards peers and siblings, it is not surprising that a number of studies have attempted to increase appropriate social behaviors of children with autism (Weiss & Harris, 2001). In the available literature, three different types of mediating agents have been used to increase social behaviors of children with autism: adults, peers, and a special type of peer, siblings.

#### *Adult-Mediated Interventions*

In most of the initial studies, adults (e.g., teachers or parents) mediated social interactions between children with autism and their peers. That is, adults implemented interventions using direct instruction of social skills (see Matson, Matson, & Rivet, 2007, for a thorough review) as well as prompting and reinforcing appropriate social behaviors during social interactions with peers (Strain, Shores, & Kerr, 1976). Adult-mediated interventions have included such teaching strategies as discrete-trial teaching, video modeling, social stories, and teaching interactions. Discrete-trial teaching strategies generally involve dividing skills into component parts and then using instructions, prompting, and reinforcement to teach each component of a social behavior (e.g., Gena, Krantz, McClannahan, & Poulson, 1996). Video modeling involves the learner watching a video of him/herself or others engaging in appropriate social behaviors (e.g., Charlop & Milstein, 1989). Social stories involve reading the learner a story about how to engage in appropriate social behaviors and then asking

the learner questions to check for comprehension (e.g., Gray & Garand, 1993). Teaching interactions involve the teacher describing the skill to be taught, providing rationales for why the learner should engage in the social behavior, describing cues and characteristics as to when the learner should engage in the social behavior, dividing the skill into small steps and describing the steps, and modeling the behaviors of each step. The learner then role-plays the skill with the teacher and the teacher provides the learner with feedback based on the learner's performance (e.g. Leaf et al., 2008).

While adult-mediated interventions have been successful at teaching social skills to children with autism, it has been suggested that adult-mediated interventions often lead to child dependence on adult prompts (Odom, Hoyson, Jamieson, & Strain, 1985) and to more unnatural social interactions (McGee et al., 1992), are very time-consuming to implement (Strain, Cooke, & Apolloni, 1976), and often do not maintain in the teacher's absence (Strain, et al., 1976). To address the limitations of adult-mediated interventions, researchers have focused on teaching peers to be mediating agents to increase and teach appropriate social behavior (e.g., Disalvo & Oswald, 2002; Kohler, Strain, & Goldstein, 2005; Strain, 1981; Strain, 1985a; Strain et al., 1976; Strain & Fox, 1981).

#### *Peer-Mediated Interventions*

In 1981, Tremblay, Strain, Hendrickson, and Shores observed the interactions of 61 preschool and kindergarten children. They found several social behaviors common in typical children's interactions, including play organizers (e.g., "come play

ball”), sharing (e.g., “can I see your toy”), and providing assistance (e.g., “let me help you”). Subsequently, Strain (1985b) compared the interaction styles of children with handicaps who received high sociometric ratings by peers and those with low sociometric ratings by peers and found that children who engaged in the behaviors described in the Tremblay et al. (1981) study received higher ratings from their peers. Strain hypothesized that engagement in these behaviors are associated with positive, satisfying, reciprocal interactions between peers. Since these findings, peer-mediated social skills interventions for children with autism have often focused on teaching typically-developing peers to increase the amount of play organizers, sharing of materials, and assistance during play. Two common forms of peer-mediated interventions that often focus on these skills are peer initiation and peer prompting and reinforcement procedures (Odom & Strain, 1984).

*Peer initiations.* Peer-initiation techniques involve teaching peers general techniques of initiating interactions (e.g., by making requests to play, sharing toy materials) with a child with autism (Odom et al., 1985; Odom & Strain, 1986; Strain & Fox, 1981; Strain, Shores, & Timm, 1977). Strain et al. (1977) taught two typically developing preschool boys to initiate social interactions with peers diagnosed with autism. They measured various types of interactions (i.e., initiations and responses, positive and negative motor-gestural behaviors, and vocal-verbal behaviors) between target children with autism and peer confederates before and after peer training. The results of this study indicated that teaching peers to increase initiations led to increased levels of social interactions between children with autism and the trained

peer. In a follow-up study, Odom, Hoyson, Jamieson, and Strain (1985) taught four typically developing preschool children to initiate social interactions with three children diagnosed with autism during structured play activities. The authors found results similar to previous studies demonstrating that social initiation training led to increased positive interactions between children with autism and trained peers. Peer training led to increased levels of initiations by trained peers and increased levels of responding by the child with autism. They found, however, that interactions were largely initiated by the typically developing peer and dependent on adults providing prompts and reinforcement to the trained peer for using the social initiation strategies. Several follow-up studies have also reported these limitations of peer-initiation strategies (e.g., Odom & Watts, 1991; Sainato, Goldstein, & Strain, 1993).

*Peer prompting and reinforcement.* Prompting and reinforcement techniques involve teaching peers to prompt social behaviors of other children and reinforce their occurrence (Gurlanick, 1976; Lancioni, 1982; Strain, Kerr, & Ragland, 1979; Wahler, 1967). In 1967, in one of the first empirical investigations of peer-mediated interventions, Wahler demonstrated that peer attention could be effectively used to increase appropriate social behaviors such as doll play and cooperation and decrease inappropriate behaviors such as aggression among five typically developing preschool children. Thus, Wahler showed that social attention of peers can be used as reinforcers to change the social behavior of other children in the classroom. Gurlanick (1976) was one of the first researchers to investigate the effects of peer prompts (modeling) combined with social reinforcement. Gurlanick found that a peer



modeling procedure alone was not effective in increasing the social play and verbalizations of two preschoolers with mild intellectual disabilities. Once the children's peers were taught to socially reinforce as well as model the targeted social behaviors, however, the children's social play and verbalizations increased.

Strain et al (1979) compared the effectiveness of peer-initiation strategies and prompt/reinforce strategies at increasing positive interactions between children diagnosed with autism. In this study, a typically developing child was taught to either initiate interactions with the children with autism or prompt and reinforce appropriate social behaviors from the children with autism during play. Both interventions were equally effective at increasing positive motor-gestural and vocal-verbal behaviors of the children with autism in the presence of the trained peer. Neither strategy, however, resulted in an increase in interactions once the peer trainer was removed and two of the children with autism were instructed to play alone together.

#### *Sibling-Mediated Interventions*

While there have been numerous studies investigating the use of peers to increase appropriate behaviors of children with autism, few studies have been conducted examining the effects of sibling-mediated interventions. The first studies showing that typically developing siblings can be taught to utilize behavior modification techniques to change their sibling's behavior focused on academic tasks (Schreibman, O'Neill, & Koegel, 1983), self-help skills (Lobato & Tlaker, 1985; Swenson-Pierce, Kohl, & Egel, 1987), and arbitrary tasks such as dropping poker chips through one of three holes in a box (Cash & Evans, 1975). It has been

suggested, however, that play activities and social skills may be a more appropriate forum for sibling training than academic or self-help skills, especially when the children are younger (Celiberti & Harris, 1993). Sibling-mediated social skills interventions generally utilize one of the two strategies used in peer-mediated interventions: initiation strategies (Strain & Danko, 1995; Tsao & Odom, 2006) or prompt/reinforce procedures (Celiberti & Harris, 1993; James & Egel, 1986).

Tsao and Odom (2006) taught four young siblings of children with autism several general initiation strategies (e.g., establishing eye contact, suggesting play activities, initiating conversations). The authors measured levels of joint attention and interaction between the children during 10-minute free-play periods prior to, during, and following sibling training. Training siblings in initiation strategies resulted in modest increases in joint attention and overall levels of interaction for three out of four sibling dyads. Similar to most previous peer-mediated interventions, however, the authors found that while initiation training led to a higher level of social initiations by the typically developing child, it did not necessarily lead to higher levels of social initiations or appropriate social behaviors by the child with autism.

Celiberti & Harris (1993) taught three typically developing girls, ages 7-10 years old, to use behavior modification techniques such as providing play-related instructions, prompts, and reinforcement during play sessions with their younger sibling with autism. All three typically developing children were able to learn the behavior modification techniques and maintain the skills during follow up probes 3, 6, and 16 weeks following training. In addition, each sibling with autism showed an

increase in desired responding (e.g., following their siblings instructions) following sibling training. The types of instructions that the typically developing siblings were taught to deliver were simple toy manipulations (e.g., “Put the farmer on the horse”) or play-related speech (e.g., “Make the sound of the horse”); It is unknown whether typically developing siblings can be taught to use techniques such as instructions, prompting, and reinforcement to evoke or teach more complex social behaviors (e.g., sharing) from their siblings with autism and whether learning these skills would affect the frequency of interactive play given a more natural, free-play situation.

Several studies have examined whether sibling training generalized to more natural settings by recording sibling behaviors during free-play sessions before and after sibling training (James & Egel, 1986; Tsao & Odom, 2006). For example, James and Egel taught three typically developing children how to initiate interactions, prompt responses, and reinforce social behaviors of their preschool-aged siblings with severe intellectual disabilities. Sibling training led to increased levels of social interactions (i.e., social initiation of one child immediately followed by response of other child) between the sibling dyads during a five-minute free-play period and during follow-up. Most of the interactions, however, were initiated by the typically developing sibling, even after a social-initiation training was implemented with the sibling with disabilities.

#### *Possible future research*

The previous research on adult-, peer-, and sibling-mediated interventions to increase social skills in children with autism has shown us that typically developing

adults and children are generally able to learn and use behavior change techniques to increase social interactions between children with autism and their peers. There are, however, a number of issues that still need to be addressed. One issue is that adult prompts frequently were required to produce sustained and meaningful interactions, regardless of the primary mediating agent (i.e., adult, peer, sibling). Most studies that measured the effects of peer or sibling training on play interactions between the sibling/peer and the child with autism reported continued levels of frequent teacher prompts (Celiberti & Harris, 1993; Goldstein, 1992; Hendrickson, 1982; Kohler, Greteman, Raschke, & Highnam, 2007; Strain, 1995) or reinforcement (Goldstein, 1992; Kamps et al., 2002; Odom & Strain, 1986; Odom & Watts, 1991; Strain, 1995) to the typically developing child for demonstrating the appropriate intervention techniques. Further, once adult prompts and reinforcers were removed, interactions between children with autism and peers often returned to baseline levels (e.g., Odom et al., 1985; Odom & Watts, 1991). Thus, it seems important to develop and assess procedures that promote appropriate social behaviors between children with and without autism independent of adult prompts or reinforcement.

Second, in the published studies, children's interactions were often observed in relatively controlled situations, where the children were told to play with specific play materials and were redirected back to the play area if they left (Celiberti & Harris, 1993; Strain & Danko, 1995). Therefore, it is not known whether the children would independently choose to stay together and interact without this adult redirection.

Third, several studies involved a form of priming, in that free-play sessions always directly followed teaching sessions (Odom & Watts, 1991; Schafer, Egel, & Neef, 1984; Tsao & Odom, 2006). It seems important to assess whether interventions can have more delayed effects on free-play interactions.

Fourth, most sibling-mediated intervention studies included the child with autism during sibling teaching sessions (e.g., Celiberti & Harris, 1993; Goldstein & Wickstrom, 1986; James & Egel, 1986; Strain & Danko, 1986; Tsao & Odom, 2006). Furthermore, in several additional studies, when the children with autism were not involved in the initial stages of sibling teaching, teachers immediately prompted siblings to use strategies once the child with autism was brought in (e.g., Tsao & Odom, 2006). Thus, we do not know whether typically developing children would have been able to generalize from role-play situations to their siblings with autism or if it is necessary to include the children with autism in the training sessions.

A final issue is how proficient the typically developing siblings are at using prompting and reinforcement techniques with their siblings with autism. The study by Celiberti and Harris (1993) is noteworthy in that they measured the ability of the typically developing siblings to use behavior modification techniques appropriately. Most often, however, it is not recorded whether typically developing siblings accurately used the behavior modification techniques they were taught to use to promote specific social behaviors from the children with autism. Instead, most studies provide a general measure of social interactions such as rate of initiations and

responses within a free-play period and do not provide more information on the type of initiations and responses made.

### *Purpose*

This study examined whether typically developing preschool siblings of children with autism learned how to prompt and reinforce complex social behaviors of their brother with autism. The behaviors that the siblings were taught to promote were playing with others, sharing preferred toys, following play-related instructions, and choosing play activities. In addition, we assessed whether the siblings generalized skills taught in a role-play situation to their siblings with autism, without any additional training. Finally, we examined the effects of this training on the children's natural play interactions, free of adult prompts or reinforcement.

### Methods

#### *Participants*

Three sibling dyads participated in this study. A sibling dyad consisted of a typically developing child and the child's sibling with autism. Throughout the remainder of the text, the term "target child" will refer to the typically developing sibling and the term "sibling" will refer to the sibling diagnosed with autism.

The first sibling dyad consisted of Jared, a typically developing five-year-old boy, and his brother Eric, a four-year-old boy diagnosed with autism. Eric had conversational speech and exhibited many appropriate play skills. Eric, however, had difficulty when attempting to engage in play with others. He often was disruptive (e.g., messing up play materials) and had difficulty awaiting his turn. Additionally,

Eric frequently engaged in self-stimulatory behaviors such as body rocking, hand flapping, and bouncing. Eric also displayed tantrums and aggressive behaviors, but these occurred very rarely. Jared engaged in frequent problem behaviors such as noncompliance with adult requests and aggression towards Eric.

The second sibling dyad consisted of Evan, a typically developing four-year-old boy, and his brother Tanner, a seven-year-old boy diagnosed with autism. Tanner had less than ten distinct vocalizations, most of which were approximations to words. Tanner communicated mostly by gestures and had very few appropriate play skills. Tanner frequently engaged in self-stimulatory behaviors such as mouthing and body rocking and maladaptive behaviors such as crying. Evan occasionally engaged in non-compliant behaviors, such as refusal to leave a preferred activity.

The third sibling dyad consisted of Amanda, a typically developing five-year-old girl, and her brother Lonny, a four-year-old boy diagnosed with autism. Lonny had conversational speech, although he often was repetitive. Lonny also demonstrated some appropriate play skills, although his play was often repetitive and ritualistic with a frequent obsession on letters and numbers. Lonny engaged in frequent tantrums to gain access to tangibles and activities and to escape unwanted demands. Amanda also engaged in occasional tantrums, screaming, and noncompliant behaviors.

### *Materials and setting*

All probe and teaching sessions were conducted in a playroom of the home of each of the sibling dyads. The playrooms were located in the basement of each home

and contained an assortment of toys and games. Play materials available each day were based on preferences of the two children, which were determined by either parental report or by asking the children before each session block what toys they would like to play with. Play materials often changed from day to day and usually included games (e.g., candyland), pretend play toys (e.g., Mr. Potato Head, Cars), and manipulative toys (e.g., legos). Probe and teaching sessions were held two or three times each week, based on family availability, and each session block was approximately 30 to 45 min in duration; length of each session block differed depending on the current phase of the study, the number of probes to be conducted that day, and compliance of the children. Probe sessions ranged from approximately 10 to 30 min in length; teaching sessions ranged from approximately 20-30 min in length. Present during all probe and teaching sessions were the target child, the teacher (the first author), and an assistant (an undergraduate student). The purpose of the assistant was to help during role-play probes and teaching sessions (described below). The sibling with autism was present only during generalization and free-play probes.

### *Target skills*

Each target child was taught three skills. Skills for each target child were determined by the first author's direct observations of the interactions between the target child and his/her sibling and were based on the target behaviors identified by Tremblay et al. (1981). Each skill was divided into several steps (or components) for purposes of teaching. Specific skill steps are listed in Table 1. Amanda and Evan



Table 1  
Task Analysis of Target Skills

Step	Inviting to Play	Asking to Share	Play instructions	Choosing activity
1.	Approach sibling	Approach sibling	Face sibling (2 sec)	Approach sibling
2.	Face sibling (2 sec)	Face sibling (2 sec)	Say sibling's name	Face sibling (2 sec)
3.	Say sibling's name	Say sibling's name	Provide a play-related instruction	Say sibling's name
4.	Ask sibling to come play	Ask to see toy	Make sure the instruction is simple	Ask what sibling wants to play
5.	Wait 2 seconds for response	Wait 2 seconds for response	Wait 2 seconds for response	Wait 2 seconds for response
6.	Provide verbal prompt (if appropriate)	Provide a prompt	Provide a prompt	Provide a prompt
7.	Provide physical prompt if needed	Keep providing more intrusive prompts until successful	Keep providing more intrusive prompts until successful	Keep providing more intrusive prompts until successful
8.	If sibling still won't come, offer to play with him	Provide praise	Provide praise	Provide praise
9.	Play with sibling	Offer sibling a different toy to play with	Appropriate voice tone throughout	Go play chosen activity
10.	Provide praise	Attempt to return the toy		Appropriate voice tone throughout
11.	Appropriate voice tone throughout	Appropriate voice tone throughout		
12.		Refrain from grabbing toy		

were taught how to get their brothers to play with them, how to get their brothers to share toys with them, and how to provide play-related instructions (e.g., “roll the car”). Jared was taught how to get his brother to play with him, how to get his brother to share toys with him, and how to find out what his brother wanted to play and play with him. Each skill taught involved the target child providing (a) requests to their sibling (e.g., “come play with me”), (b) physical or verbal prompts for their sibling to complete the action (e.g., physically prompting them to come to the play area), and (c) praise for appropriate behavior (e.g., “good job” or “I like when you play with me”).

#### *Motivational System*

The target children were each provided with a personal notebook in which they could collect stickers. Stickers were earned throughout teaching sessions for sitting appropriately, answering questions, and correctly role-playing the skill. At the end of the teaching session, the number of stickers earned was counted and the target child was allowed to “cash in” their stickers for a reward. Rewards were small toys (e.g., \$1-\$5) that the target child had previously said were preferred items. Items were put into two bins: the first bin contained smaller, lesser preferred items and cost fewer stickers; the second bin contained larger, more preferred items and cost more stickers. Sticker amounts were assigned with the expectation that, contingent on good behaviors, each target child should be able to earn a toy from the lesser bin on a daily basis and it should take about two days to earn a toy from the larger bin. Following a

brief reminder of the token system, the teacher began the teaching interaction procedure for a particular skill.

*Teaching of target children*

*Didactic Teaching.* First, the teacher briefly described what skill would be taught that day (e.g., “Today we are talking about asking Tanner to play.”) and provided a meaningful rationale of why the target child should engage in the behavior (e.g., “We should ask Tanner to play with us because then we have someone to play with.”). The teacher then asked the target child to state some additional rationales (e.g., “We should also ask Tanner to play with us because then he will learn how to play more games.”). If the target child had difficulty coming up with additional rationales, the teacher asked leading questions (e.g., “How would it make Tanner feel if you asked him to play with you?”) until the target child was able to come up with at least one additional rationale. Then the teacher described situations when the target child should engage in the target skill (e.g., “We should ask Tanner to play with us when he is playing by himself.”). Finally, the teacher described the steps of the skill one step at a time. For each step, the teacher asked the target child to say the step as well as describe what he or she needed to do in the step. When response variability was desired, the target child was asked to provide at least two different response options (e.g., “What are some other things you might say besides ‘good job’?”). Throughout the entire didactic process, the target child received verbal praise and one sticker for each question correctly answered.

*Modeling.* After didactic teaching, the teacher role-played and modeled the skill with the assistant playing the role of the sibling with autism. During the initial role-play, the teacher omitted one or more of the steps of the skill. The target child was then asked to evaluate the teacher's performance (e.g., "You did a bad job" or "You did a good job") and explain why the teacher did a bad or good job. If the target child stated accurately what steps of the skill were omitted, he or she was rewarded with a sticker; if the target child gave an incorrect response, the teacher prompted the target child by asking specific questions about the performance (e.g., "Did I say 'good job'?"). Then, the teacher would role-play the skill again, this time correctly. The same question, reinforcement, and feedback process occurred as before.

*Role-plays.* Following the teacher model, the teacher asked the target child to role-play the skill with the assistant playing the part of the sibling. The role-play started with the teacher playing with the target child for about two minutes and then asking the target child to engage in the skill (e.g., "Get Tanner to come play with us."). Following the completion of the role-play, the teacher praised the target child for steps he or she completed correctly and provided feedback for the steps he or she needed to improve. If the target child did not perform the skill at 100% accuracy, he or she was asked to role-play again with the assistant, using the same reinforcement and feedback process. If the target child still did not perform at 100% accuracy during the second role-play, he or she was asked to practice one more time, and the teacher verbally prompted the target child through the task. The target child received three stickers for correctly performing the task on the first role-play, two stickers for

correctly performing the task on the second role-play, and one sticker for correctly performing the task on the third role-play, whether independent or prompted by the teacher. The teacher then engaged the target child in a game/activity for 5-10 minutes, at which time the teacher would once again provide the discriminative stimulus (e.g., “Get Tanner to come play with us.”) letting the child know that he or she should engage in the behavior. The same role-play and feedback cycle as before was implemented. Thus, the participant had at least two opportunities to engage in role-plays each teaching session. After the second role-play, the session was ended and the child was allowed to cash in his or her stickers.

### *Probes*

Three types of probes were conducted throughout the study. Probes were situations set up by the experimenter to examine the effects of training on the children’s behavior without any prompts or reinforcement from the teachers. All data collection for the target children and their sibling with autism were done during probe sessions. Probes were conducted in the same way across all phases of the study.

*Role-play probes of each skill with assistant.* Daily role-play probes were used to determine mastery of skills taught to the target child; mastery criterion was set at three consecutive role-play probes with all skill steps performed at 100% accuracy. Prior to beginning any role-play probes, the target child was told that he or she should pretend that the assistant was the sibling with autism. The teacher engaged the target child in a game/activity while the assistant arranged herself in a situation that should set the occasion for the target behavior (e.g., sitting across the room playing with a

preferred toy for the sharing probe). At some point during the activity, the teacher would ask the target child to engage in one of the target skills (e.g. “go play with Lonny”). No further prompting was given and no consequences for the target child’s behavior were provided. At the end of the probe, the teacher simply returned to the game/activity without commenting on the target child’s performance. For all probes, the probe was ended if the target child had not begun to engage in the target skill within one minute, the target child stopped engaging in the skill for one minute, or the target child completed the target skill. In order to provide the target child with the opportunity to engage in all steps of the task analysis of each skill, the assistant always waited until after the target child provided a prompt for her to engage in the appropriate social behavior (e.g., holding out a hand as a prompt for assistant to hand over the toy during sharing probes). The teacher repeated this process until all skills had been probed.

*Generalization probes of each skill taught with sibling.* Generalization probes were conducted to determine if the target child was able to generalize skills learned during teaching to his or her sibling with autism without any additional instruction. Generalization probes were identical to role-play probes except that the sibling with autism was present. While the teacher engaged the target child in a game/activity, the assistant now prompted the sibling with autism into a situation that should set the occasion for the target behavior (e.g., sitting across the room playing with a preferred toy for the sharing probe). Once again, at a random point during the activity, the

teacher would ask the target child to engage in one of the target skills (e.g., Go play with Lonny's). No further prompting or consequences were provided.

*Free-play probes with sibling.* The purpose of the free-play probes was to determine if teaching the target skills to the target children would increase levels of play and interaction between the target child and his or her sibling, independent of adult prompting. Prior to each free-play probe, the children's play room was arranged with 3-4 preferred activities of both children, each about 4 feet apart. A video camera in the corner recorded the children's interactions; all measures were taken from the videotapes. The free-play probes began when the children were brought downstairs and told to "go play together." No other instructions or prompts to interact were provided. The teacher always sat in the corner pretending to do paper work. If one of the children came to the teacher during the probes, the teacher said "go play" and provided no further attention or interaction. Free-play probes were 7 min long and always preceded any role-play or generalization probes, in an attempt to ensure that participants were not primed to engage in certain behaviors. The children's behavior was scored for the last five minutes only, allowing the children two minutes to get adjusted to the situation and begin acting as they normally would.

For one sibling pair (Amanda and Lonny), after no effect of teaching was seen during the free-play probes, a priming condition was implemented. Prior to the free-play probe, the teacher and the target child quickly reviewed the three skills that were taught (e.g., "You learned about asking Lonny to play, sharing, and helping Lonny play better."), when she should remember to use these skills (e.g., "anytime I am

playing with Lonny”), and why it was important to remember the skills (e.g., “so that I will have someone to play with and so that Lonny will get better at playing with me”). The priming lasted less than five minutes, and the target child was reinforced with stickers for correctly answering questions. Following the priming, the teacher put out the toys for the day, called the sibling with autism to come downstairs, and ran a free-play probe exactly as before.

### *Sequence of Probes*

Role-play and generalization probes for all target skills were conducted prior to teaching each skill, during teaching of each skill, and following teaching of each skill.

*Baseline probe phase.* The purpose of the baseline probe phase was to determine the target child’s levels of skills not yet taught and to test for maintenance of skills previously taught. At least three probe sessions were conducted each baseline probe phase. During the first three sessions in each baseline probe phase, all three types of probes were presented in the following order: a free-play probe, generalization probes for each target skill with the sibling with autism, and role-play probes for each target skill with the assistant. If the teacher was unable to conduct all of the probes scheduled in a day, due to time constraints or the children indicating that they wanted to stop, the probes were made up on a later day.

*Teaching phase.* Sessions during the teaching phase always began with role-play and generalization probes for the current skill, except for the first day of the teaching phase. Occasionally, the child with autism was not available during the



teaching phase so generalization probes were not conducted. In addition, role-play and generalization probes for all skills not yet taught and skills previously taught were conducted at least once each teaching phase in order to determine continued baseline or maintenance levels. Once all probes of the day were completed, teaching with the target child began.

### *Dependent measures*

*Acquisition of skills.* During role-play probes, observers scored whether the target child engaged in each step of the targeted skill (as determined by the task analysis) (see Table 1). For all target skills, “faces sibling” was only scored if the target child faced their sibling with autism prior to saying their sibling’s name and “provides praise” was only scored if the praise followed the sibling with autism engaging in the appropriate social behavior (prompted or independent). Accuracy was determined by dividing the number of steps that the target child displayed correctly by the total number of steps in the task analysis. Mastery criterion was set at 100% accuracy of all skill steps across three consecutive role-play probes.

*Generalization of skills.* Generalization probes were scored the same way as role-play probes; however, accuracy was determined by dividing the number of correct steps in which the target child engaged by the total number of steps in which he or she had the opportunity to engage, since opportunity was partially determined by the behavior of the sibling. For example, if during a sharing probe, the sibling did not hand over a toy to share with the target child within 2 sec of the target child asking to play with the toy, there was an opportunity for the target child to prompt the

sibling to do so. On the other hand, if during a sharing probe, the sibling handed over the toy after the target child asked to play with the toy, there was no opportunity for the target child to engage in prompting, but there was an opportunity to praise the sibling with autism.

*Social behaviors of child with autism.* In addition, the targeted social behaviors of the children with autism during generalization probes were assessed. For each generalization probe, the sibling with autism received a score of “0”, “1”, or “2”, depending on whether the target child provided an opportunity for the sibling with autism to engage in play and, if an opportunity was presented, how the child with autism responded, as shown in Table 2.

*Levels of engagement during free play.* To determine if the intervention affected the participants level of engagement with each other during free-play, levels of engagement were scored during the last 5 min of the 7-min free-play probes. Free-play probes were scored using a 10-s partial interval recording system; four different types of play could have been scored during each interval. Independent play was scored if, for 3 consecutive sec within an interval, the children were not engaging with the same play materials or if the children were playing with the same play materials but more than 3 ft away from each other. Parallel play was scored if, for 3 consecutive sec within the interval, the children were within 3 ft of each other and playing with the same play materials but not interacting. Cooperative play was scored if, for 3 consecutive sec within the interval, the children were within 3 ft of each other and playing with the same play materials and interacting (e.g., sharing materials,

Table 2

## Social Behavior of Sibling with Autism

Score	Playing with others	Sharing toys	Following play instructions	Choosing a play activity
0	Sibling did not play with target child after target child asked him to play	Sibling did not share his toy with target child after target child asked to see toy	Sibling did not follow play instruction given by target child	Sibling did not choose play activity when asked to do so by target child
1	Sibling allowed target child to play at his game or went to target child's game/activity only after a prompt from the target sibling	Sibling shared his toy only after a prompt from target child	Sibling followed play instruction only after prompt from target child	Sibling chose play activity only after a prompt from target sibling
2	Sibling independently went to play at target sibling's game/activity after target sibling asked him to come play and prior to the target sibling providing a prompt	Sibling independently shared toy after target child asked to play with it and prior to the target child providing a prompt	Sibling independently followed play instruction after target child gave instruction and prior to the target child providing a prompt	Sibling independently chose play activity after target child asked him to do so and prior to the target child providing a prompt

commenting on play activities, providing instructions, taking turns within the context of a game, working towards a common goal). Cooperative play was also scored if the children were interacting with each other absent of any play materials (e.g., rough and tumble play, piggy back rides, chase, sitting and talking, etc.). Negative interactions were scored if one child yelled at the other (e.g., elevated voices, negative voice tone), emitted negative phrases toward towards the other (e.g., “get away from me,” “I hate you”), or engaged in any physical aggression towards the other child (e.g., pushing, hitting, kicking). Negative interactions were not scored if one child was crying, but no yelling or aggression was directed at his/her sibling (e.g., a child was crying because he got hurt or toy was broken).

#### *Social validity*

Two types of social validity were collected. The first type was a parent survey asking how happy parents were with the skills their children had learned and how much change they had observed in their children’s interactions since their beginning participation in this study.

The second type of social validity involved asking outside observers to rate the play behaviors of the children during free-play probes (i.e., ability to play together, happiness, interest in each other, cooperation). The last three minutes of the three baseline and three post-intervention video tape clips of free-play probes were put into one of two random sequences for each sibling dyad. Each observer then looked at and scored one of the random sequences for each sibling dyad. Observers were told that one of the siblings in the videos had autism, and they were to rate how

well the children interacted with each other. Thus, observers were blind to which child had autism, which condition they were viewing, and the purpose of the study. In addition, any possible order effects were minimized because the orders were randomly chosen and in two possible orders. Sample surveys filled out by parents and free-play observers, including questions asked and scales used, are in Appendix A.

#### *Experimental design*

A multiple-probe experimental design (Horner & Baer, 1978) across skills was used. Functional control is demonstrated in this design if participants start to display a skill when and only when teaching of the skill began.

#### *Reliability*

*Role-play and generalization probes.* Reliability was evaluated by doing a point-by-point comparison of whether each of two observers recorded the occurrence or non-occurrence of steps completed by the target sibling. Reliability recording was assessed by having two observers record data simultaneously and independently during an average of 50% (range 33-67%) of all probe and teaching conditions. Reliability results for role-play and generalization probes are in Table 3.

*Free-play probes.* Reliability was calculated by dividing the number of intervals where the two data takers agreed on the type of play that occurred by the number of agreements plus disagreements multiplied by 100. Free-play reliability was assessed via video tapes for 33% of all sessions, across children and phases.

Reliability results for free-play probes are in Table 3.

Table 3

Inter-observer Agreement on role-play, generalization, and free-play probes

Sibling dyad	Skill one role-play and generalization probes	Skill two role-play and generalizations probes	Skill three role-play and generalization probes	Free-play probes
Jared and Eric	96.32%	96.68%	97.28%	88.25%
Amanda and Lonny	98.03%	93.9%	96.31%	97.8%
Evan and Tanner	94.43%	92.83%	93.61%	100%

*Treatment Fidelity.* The teacher followed a specified protocol for teaching (see Appendix B). Treatment fidelity was calculated by taking the number of teacher behaviors the observer recorded divided by the number of behaviors listed in the protocol. Treatment fidelity was scored via videotapes for 45% of sessions across all participants and skills. Treatment fidelity was 98.9% (range 80-100%).

## Results

### *Mastery of skills*

All three target children mastered and maintained the skills taught, as determined by role-play probes. In addition, all three target children generalized the skills to their sibling with autism to a fairly high degree, as determined by performance on generalization probes. Figures 1, 2, and 3 show the percent of the skill steps correctly performed on role-play and generalization probes for the target children, Jared, Amanda, and Evan, respectively. For each figure, each panel represents a different skill taught to the target child. Closed circles represent role-play probes with the undergraduate student and open squares represent generalization probes with the sibling with autism.

Table 4 shows the number of sessions required for each target child to master each target skill as well as the amount of maintenance and generalization following mastery of each target skill. Some of Jared's maintenance and generalization levels are low (especially for the skill of inviting your sibling to come play with you), but his maintenance and generalization levels increased as successive skills were taught and the last two probes of maintenance and generalization for all three skills ranged





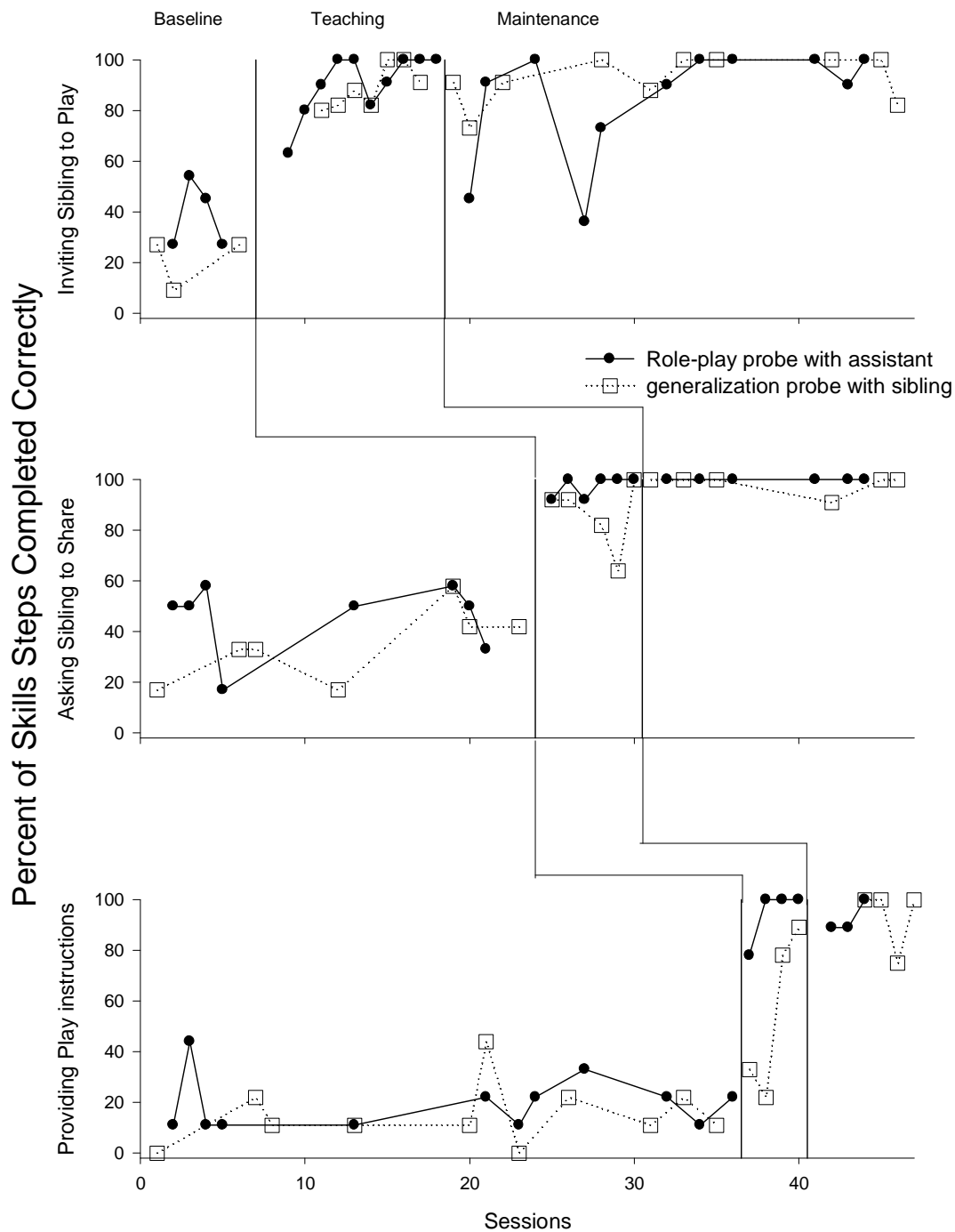


Figure 2. Percent of steps completed correctly by Amanda for role-play and generalization probes for inviting your sibling to play, asking your sibling to share his toys, and providing play related instructions.

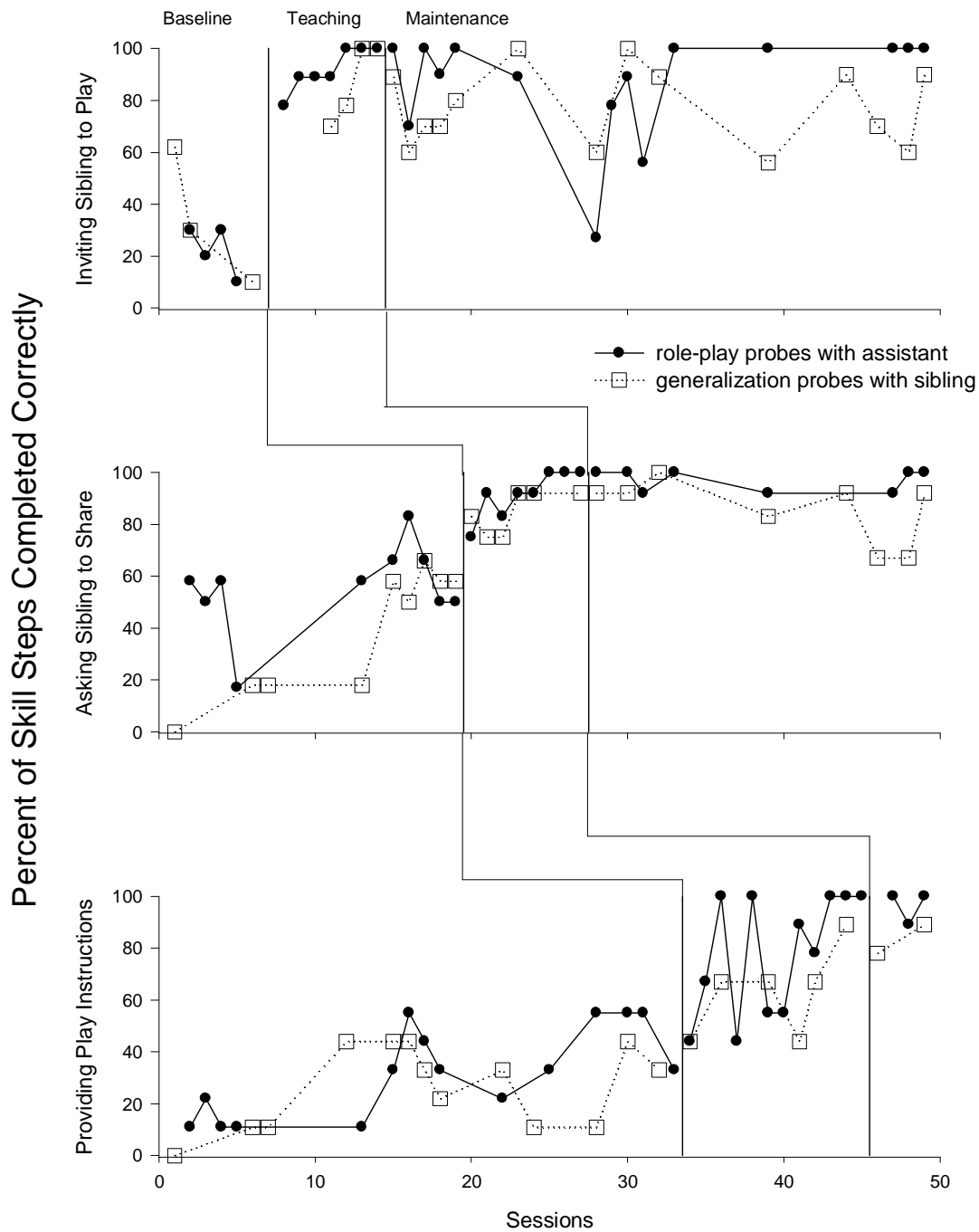


Figure 3. Percent of steps completed correctly by Evan for role-play and generalization probes for inviting your sibling to play, asking your sibling to share his toys, and providing play related instructions.

Table 4

## Acquisition and Maintenance (Average and Range Percent Correct) of Target Skills

Target child/Skill	# of teaching sessions to mastery	Maintenance during role-play probes following mastery	Maintenance during generalization probes following mastery
Jared			
Inviting to play	6	75% (9-100%)	41.9% (9-82%)
Sharing	5	97% (92-100%)	66% (8-92%)
Choosing activity	3	97% (90-100%)	87% (80-91%)
Amanda			
Inviting to play	10	84% (36-100%)	92.5% (73-100%)
Sharing	6	100%	98.5% (91-100%)
Following instructions	4	93% (89-100%)	93.75% (75-100%)
Evan			
Inviting to play	7	86.6% (27-100%)	77% (60-100%)
Sharing	8	97% (92-100%)	86% (67-100%)
Following instructions	12	96% (89-100%)	83.5% (78-89%)

from 80-100% of skill steps completed, except for one generalization probe for inviting your sibling to play.

*Social behaviors of children with autism*

The intervention was also effective at increasing the amount of target social behaviors that the siblings with autism displayed with the target children. Figures 4, 5, and 6 display the behaviors of the siblings with autism, Eric, Lonny, and Tanner, during all generalization probes. The horizontal axis displays the number of probes; the vertical axis displays the amount of behavior displayed by the sibling with autism, using the “0”, “1”, or “2” scale, during probes in which they had the opportunity to engage in social behaviors,. Open circles below the zero line represent probes in which the sibling with autism did not have the opportunity to engage in the targeted social behavior because the target child failed to set the occasion for them to do so.

All of the siblings with autism rarely engaged in any of the targeted social behaviors during baseline generalization probes. The target children, however, also rarely set the occasion for the siblings with autism to engage in those targeted social behaviors during baseline probes. Following intervention, the siblings with autism had more opportunities to engage in social behaviors and engaged in frequent social behaviors. Following intervention, Eric, Tanner, and Lonny engaged in the targeted social behaviors following a prompt from the target child on 33%, 62%, and 48% of probes, respectively; Eric, Tanner, and Lonny independently engaged in the targeted social behaviors on 42%, 28%, and 52% of all probes, respectively.

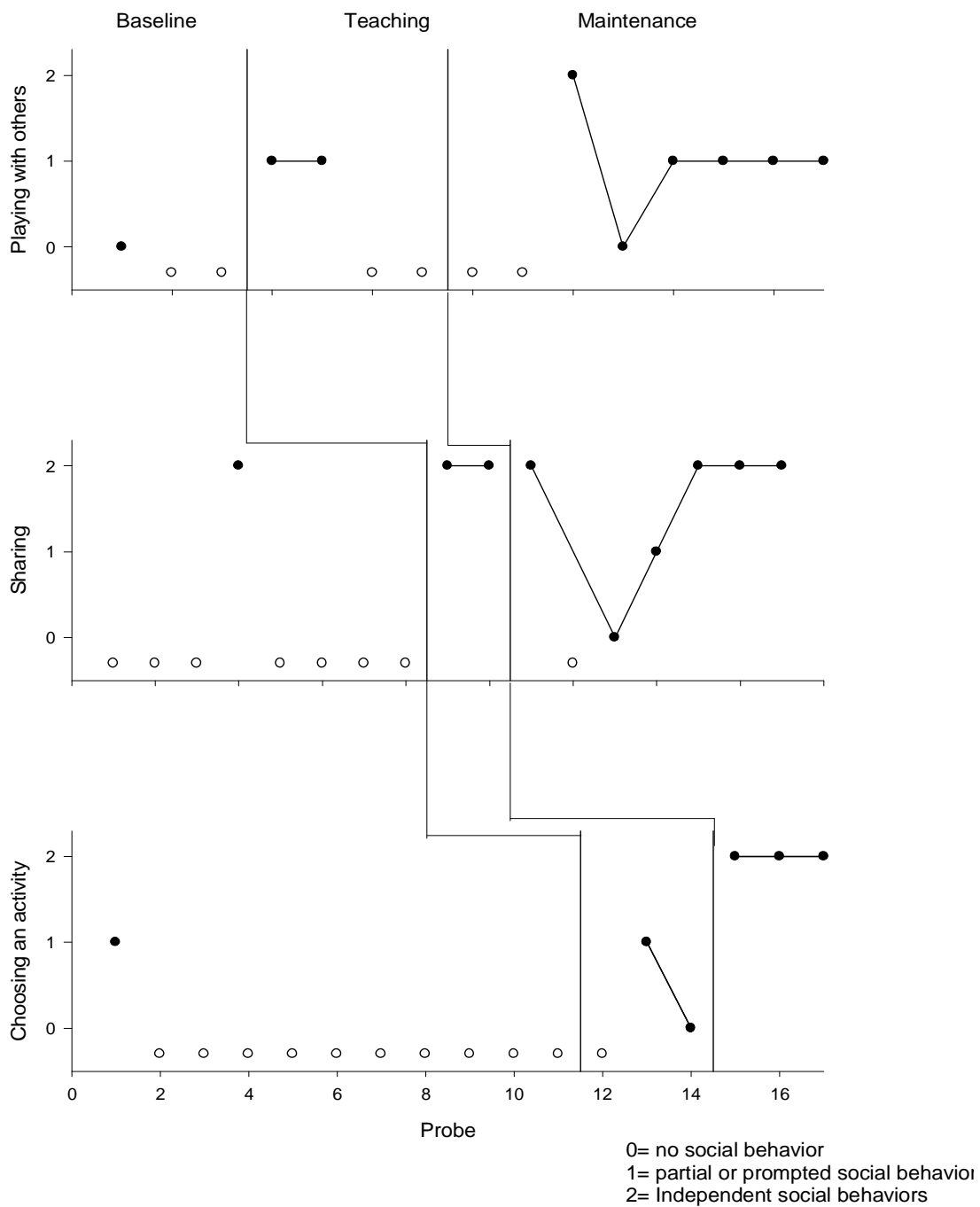


Figure 4. Social behaviors exhibited by Jared's sibling with autism, Eric, on generalization probes for playing with others, sharing toys, and choosing a play activity. Open circles below zero represent probes in which there was no opportunity for Eric to engage in appropriate social behaviors.

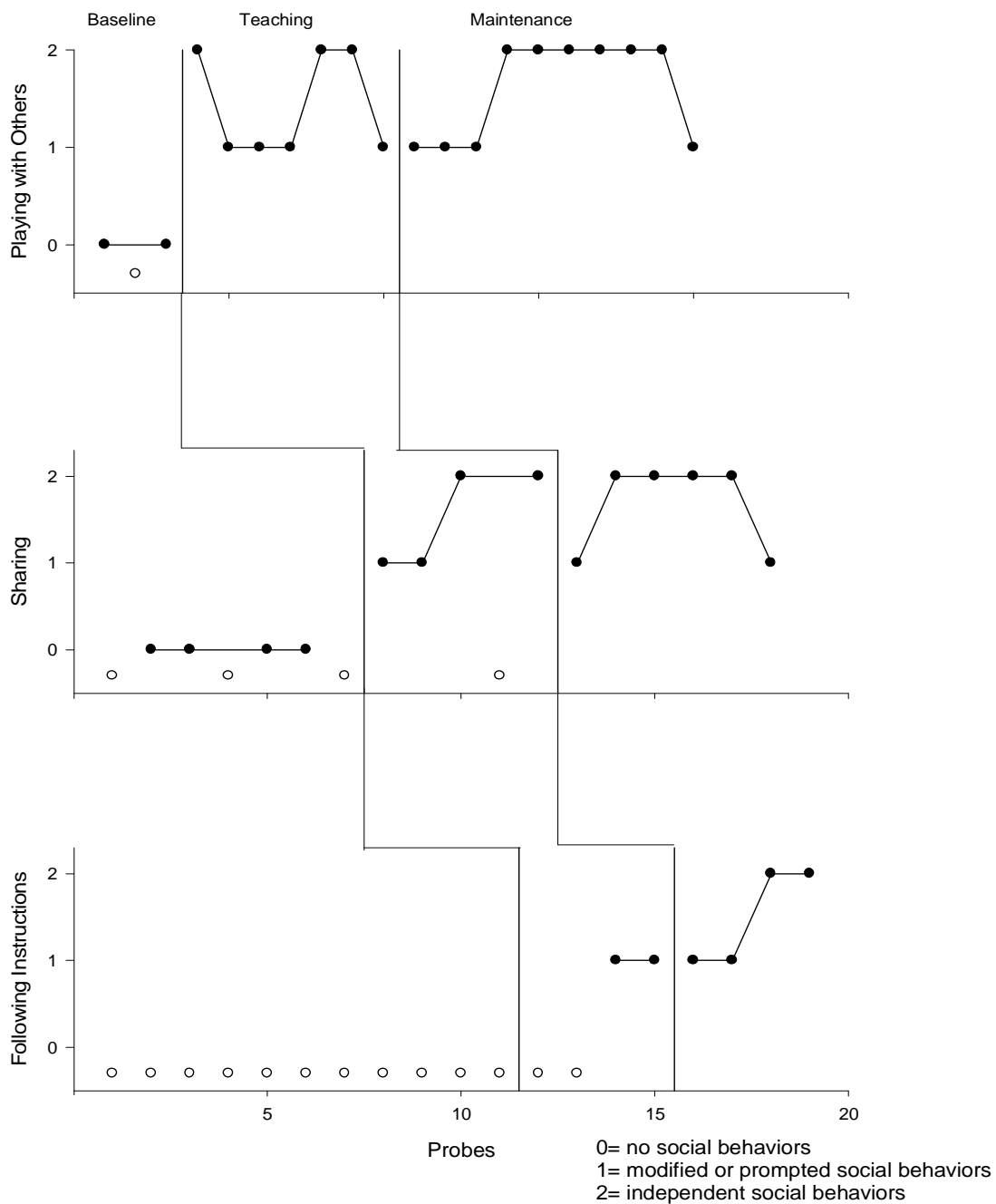


Figure 5. Social behaviors exhibited by Amanda's brother with autism, Lonny, on generalization probes for playing with others, sharing toys, and following play related instructions. Open circles below zero represent probes in which there was no opportunity for Lonny to engage in appropriate social behaviors.

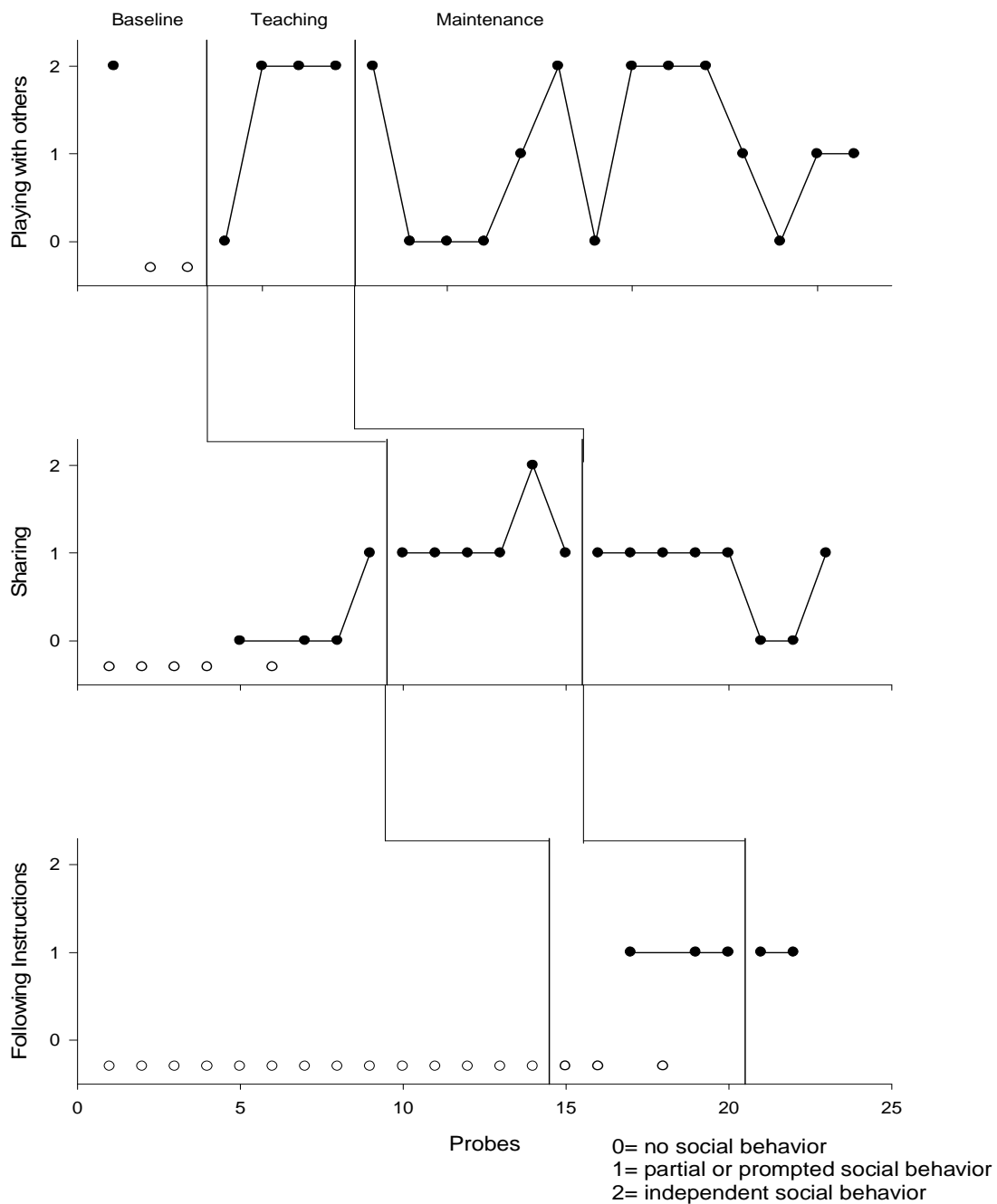


Figure 6. Social behaviors exhibited by Evan's brother with autism, Tanner, on generalization probes for playing with others, sharing toys, and following play related instructions. Open circles below zero represent probes in which there was no opportunity for Tanner to engage in appropriate social behaviors.

### *Free-play probes*

The children showed different effects of the intervention in the free-play probes. Figures 7, 8, and 9 show the probe by probe free-play results for Jared, Amanda, and Evan, respectively. For figures 7, 8, and 9, the closed circles represent percent of intervals the children engaged in cooperative play, the closed squares represent percent of intervals the children engaged in parallel play, the open circles represent percent of intervals the children engaged in independent play, and the open triangles represent percent of intervals the children engaged in negative interactions. The horizontal axis displays the number of probes; the vertical axis displays the percent of intervals that the children engaged in each level of play. Figures 10, 11, and 12 summarize the results from figures 7, 8, and 9 by showing the average level of play that Jared, Amanda, and Evan engaged in during free-play across each phase (e.g., baseline, after teaching the first skill, etc.). The horizontal axis displays the condition; the vertical axis displays the percent of intervals that the children engaged in each level of play.

Following intervention, sibling dyad one, Jared and Eric, increased the amount of time spent in cooperative play and parallel play and decreased the amount of time spent in independent play and negative interactions from baseline levels. Unfortunately, one of the free-play probes for Jared and Eric during the probe phase following teaching of the first skill was unable to be scored because of technical difficulties with the video; therefore, data are only reported from two free-play probes



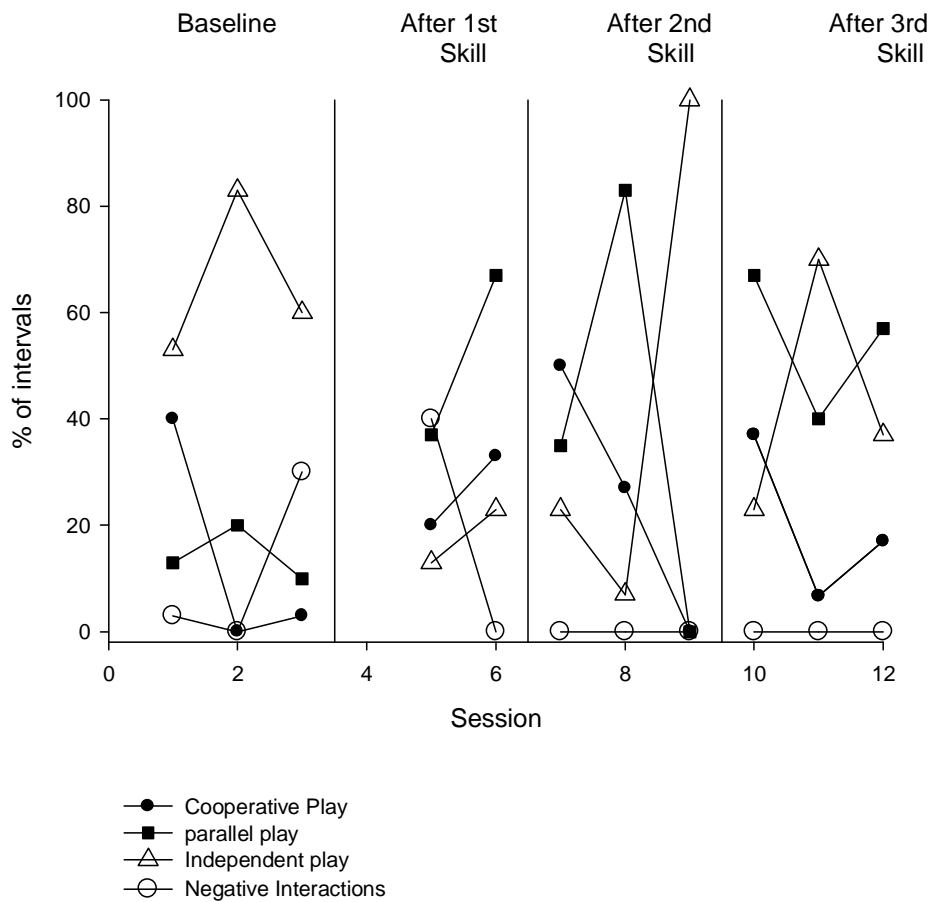


Figure 7. Percent of intervals that Jared and Eric engaged in cooperative play, parallel play, independent play, and negative interactions during each free-play session.

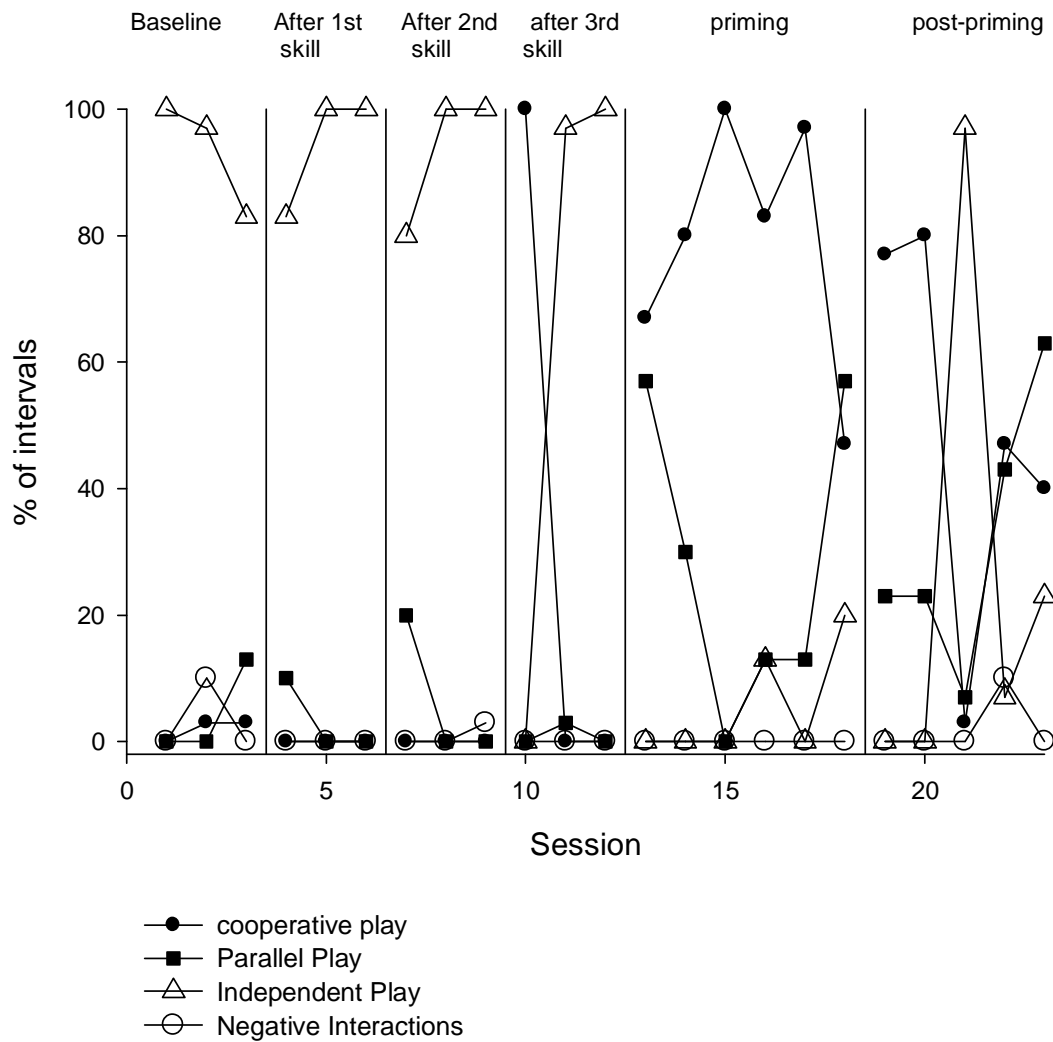


Figure 8. Percent of intervals that Amanda and Lonny engaged in cooperative play, parallel play, independent play, and negative interactions during each free-play session.

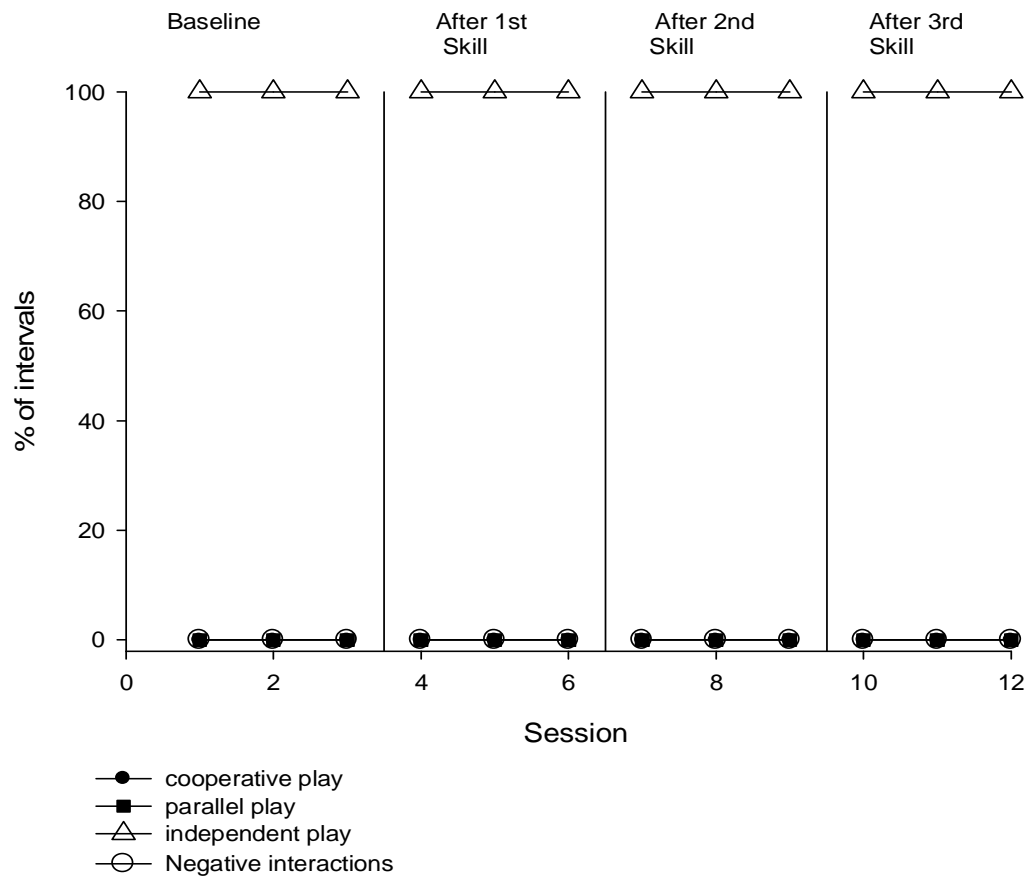


Figure 9. Percent of intervals that Evan and Tanner engaged in cooperative play, parallel play, independent play, and negative interactions during each free-play session.

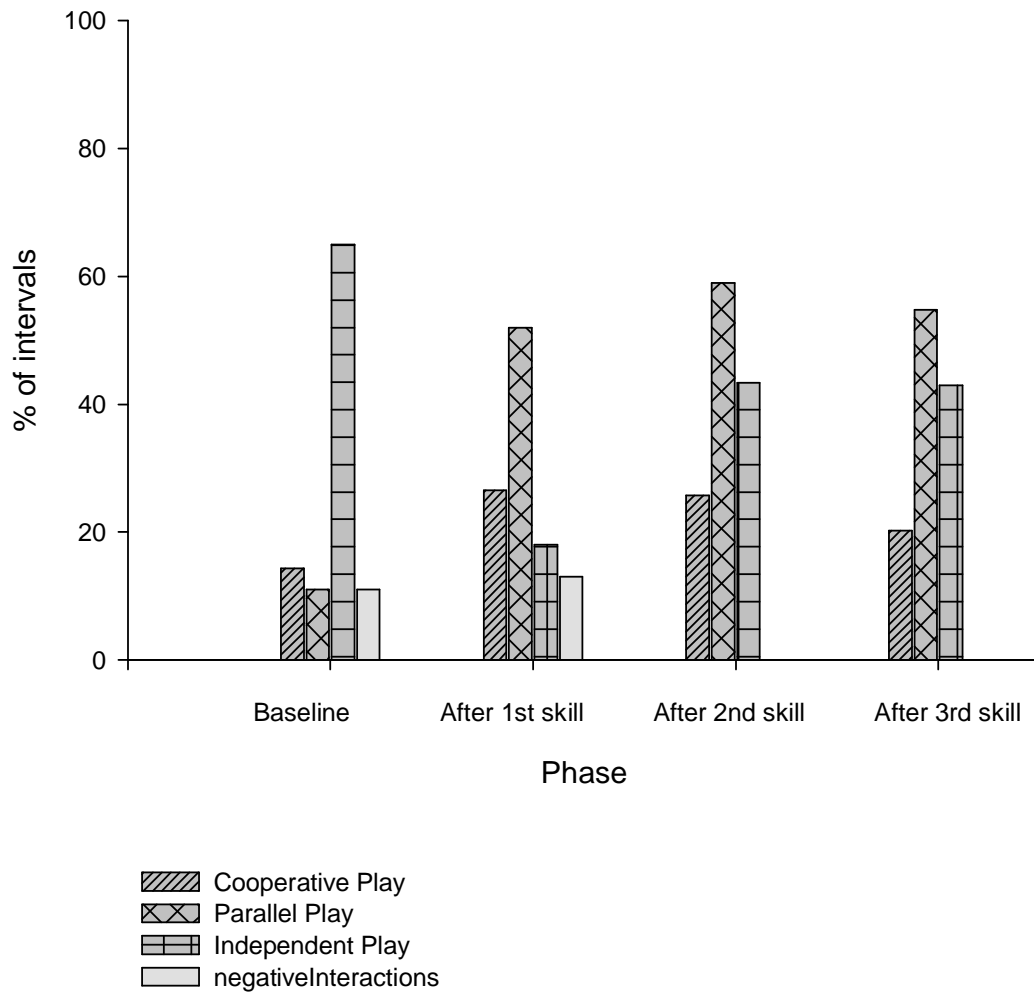


Figure 10. Average percent of intervals that Jared and Eric engaged in cooperative play, parallel play, independent play, and negative interactions during each phase of the study (i.e., during baseline, following teaching of first skill, following teaching of second skill, and following teaching of third skill).

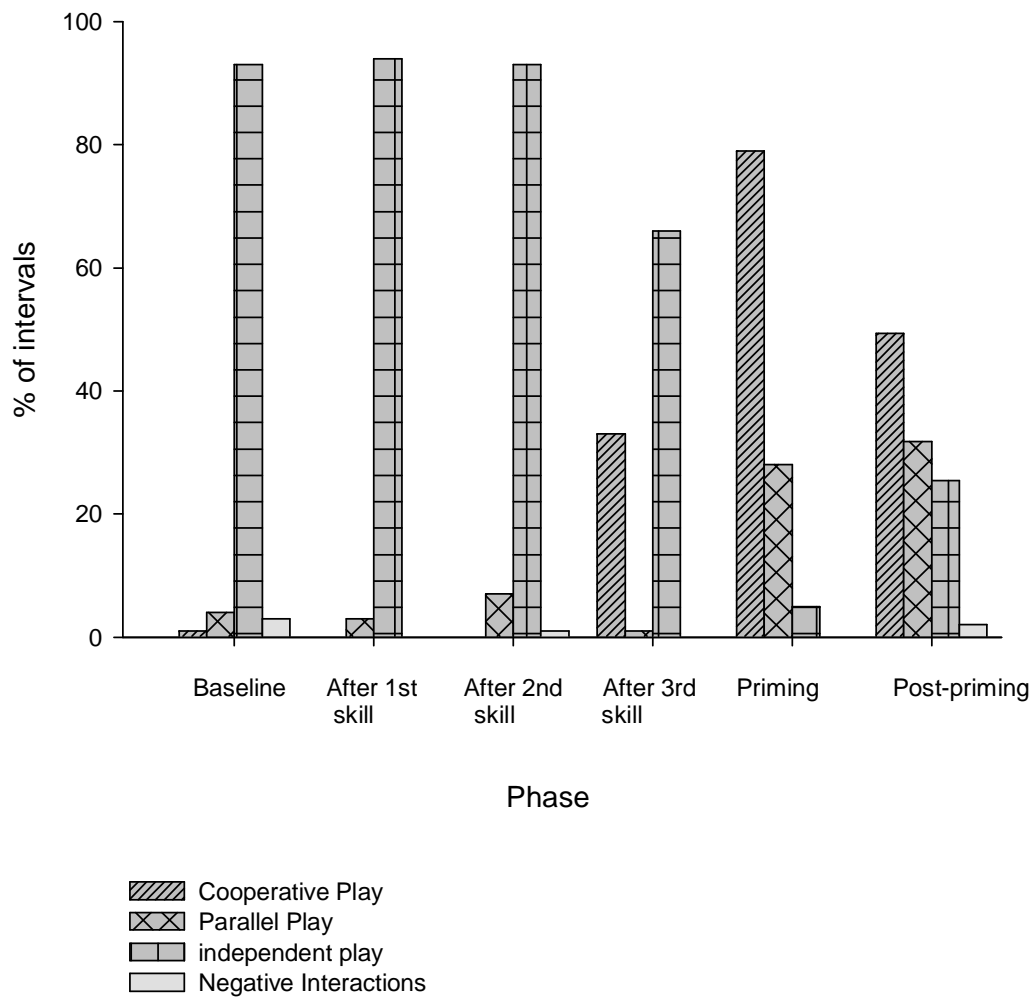


Figure 11. Average percent of intervals that Amanda and Lonny engaged in cooperative play, parallel play, independent play, and negative interactions during each phase of the study (i.e., during baseline, following teaching of first skill, following teaching of second skill, and following teaching of third skill).

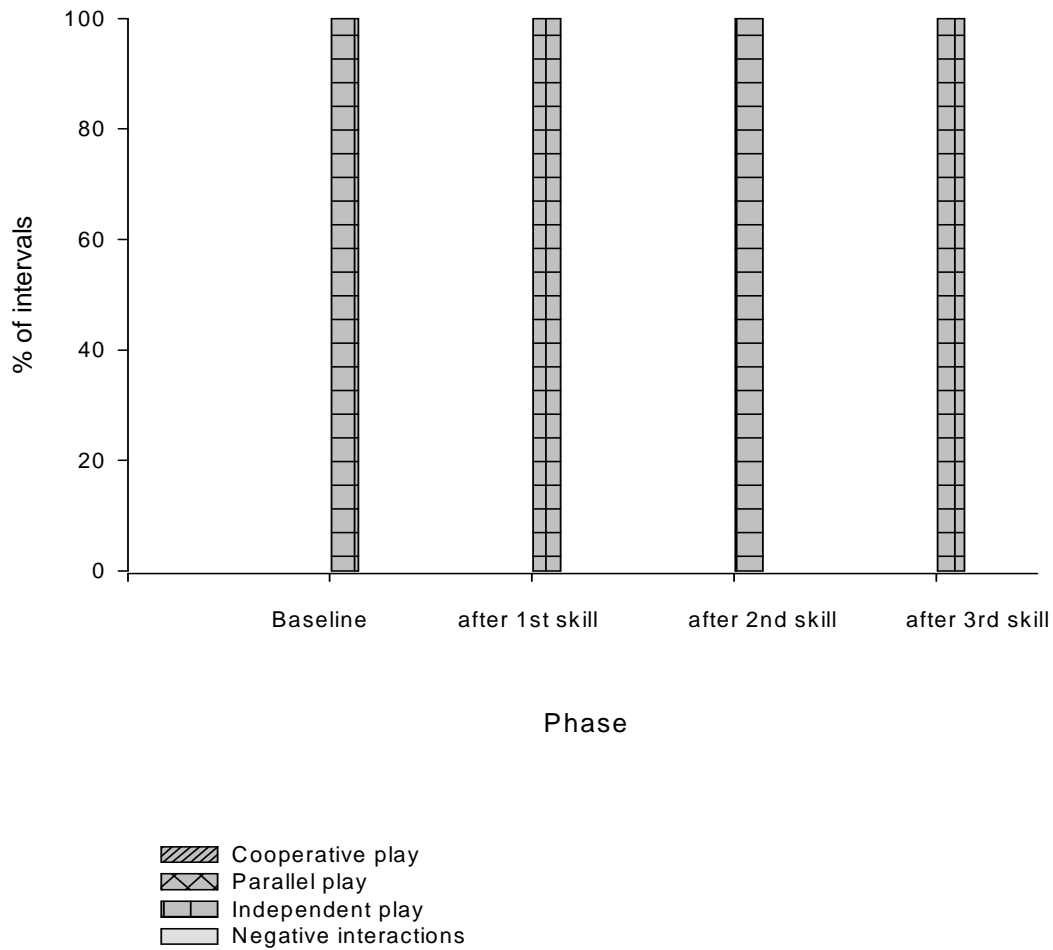


Figure 12. Average percent of intervals that Evan and Tanner engaged in cooperative play, parallel play, independent play, and negative interactions during each phase of the study (i.e., during baseline, following teaching of first skill, following teaching of second skill, and following teaching of third skill).

for Jared and Eric during that phase. Sibling dyad two, Amanda and Lonny, engaged almost exclusively in independent play during baseline and following intervention. Only after a priming phase was implemented did the siblings begin to engage in high levels of cooperative and parallel play; these increases in engagement maintained once the priming was removed. Sibling dyad three, Evan and Tanner, engaged in independent play 100% of intervals across all phases of the study. At no time during the study did Evan and Tanner engage in cooperative play, parallel play, nor negative interactions. Unfortunately, due to time constraints, Evan had to withdraw participation from the study before the priming condition could be implemented.

#### *Social Validity*

*Parent survey.* Only two of the three parents returned the social validity questionnaire. Results are shown in Table 5. Overall, Parents were very satisfied with the changes in their children's behavior following intervention; average satisfaction for both parents was a 4.71 on a five-point likert scale. Both parents reported that, since beginning participation in the study, they noticed their children playing more together and playing better together. In addition, anecdotal reports by the participant's mothers were very positive. Jared's mother reported that she had noticed Jared and his older brother, Tommy, including Eric more in their play activities; Amanda's mother reported that Amanda was spending a lot more time not only trying to include Lonny in her play activities, but also trying to teach him how to play appropriately.

Table 5

## Parental Social Validity Results

Question Asked of Parent	Parent 1 Score	Parent 2 Score
Children playing more together since beginning participation in study	4	5
Children playing better together since beginning participation in study	4	5
Children sharing toys better since beginning participation in study	5	4
Less negative interactions between children	5	5
Target sibling providing more help and assistance to sibling with autism	5	5
Satisfaction with skills taught to target sibling	5	4.5
Satisfaction with overall changes in play behaviors of children	5	4.5
Average satisfaction	4.71	4.71



*Free-play videos.* Free-play videos were scored by 10 teachers for Jared and Amanda and by 5 teachers for Evan. Results are in Table 6. We found mixed results on the free-play surveys. Using a 5 point Likert scale, teacher ratings of behaviors during free-play probes slightly decreased from pre-intervention to post-intervention for sibling dyad one, Jared and Eric, increased from pre-intervention to post-intervention for sibling dyad two, Amanda and Lonny, and remained stable from pre-intervention to post-intervention for sibling dyad three, Evan and Tanner.

### Discussion

In this study, three target children were taught skills to try to encourage their siblings with autism to engage in specific social behaviors (e.g., sharing). Following implementation of the teaching interaction procedure, each target child was able to demonstrate all skills taught with both a teacher and with his or her brother with autism. Additionally, the performance of the target children during generalization probes suggests that the target children were fairly effective at encouraging their siblings with autism to engage in the targeted social behaviors. Thus, prior to intervention, the siblings with autism rarely had the opportunity to engage in appropriate social behaviors and rarely engaged in social behaviors when they did have the opportunity to do so; following intervention, the siblings with autism frequently engaged in the targeted social behaviors, either independently or following a prompt from the target child. Additionally, for two participants, play interactions between the target child and his or her sibling with autism increased during free-play situations. Generalization of training to the free-play situation, however, was

Table 6

## Free-play Social Validity Results

Question	Jared Pre	Jared Post	Amanda Pre	Amanda Post	Evan Pre	Evan Post
Ability to play together	2.13	1.67	1.46	2.56	1	1
Happiness/Having fun	2.1	2.23	1.53	2.36	1.13	1.53
Interest in each other	2.21	1.46	1.23	2.13	1	1
Cooperation with each other	2	1.6	1.33	2.3	1	1
How typical do their interactions seem?	1.68	1.35	1.2	2.0	1	1

idiosyncratic in that one sibling dyad demonstrated increased interactions following the teaching intervention, one sibling dyad demonstrated increased interactions only following the teaching intervention plus a priming phase, and one sibling dyad demonstrated no increases in interactions.

Although numerous studies have been conducted on adult-mediated and peer-mediated interventions to increase appropriate social behaviors of children diagnosed with autism, few studies have been conducted in which siblings were taught to increase social skills of their brother or sister with autism. Siblings are a unique type of peer in that they are readily available playmates, share experiences, and spend large amounts of time together in early childhood. Additionally, some research suggests that how siblings play together affects how they play with peers (Abramovitch, Pepler, & Corter, 1982). Given the potential importance of the sibling relationship and the often reported negative impact of having a sibling diagnosed with autism, a common suggestion to address any possible negative effects is to involve the typically developing sibling in the intervention process (El-ghoroury & Romanczyk, 1999; Howlin, 1988; Lobato, 1983; Mascha & Boucher, 2006; (Senel & AkkÅk, 1995; Verté, Roeyers, & Buysse, 2003). The results of this study add to the literature and further suggest the potential importance of using young siblings as a part of intervention for children with autism.

The target children were taught how to give instructions, prompt, and reinforce behavior. This teaching, however, was done in the absence of the sibling with autism. This procedure has at least one possible disadvantage and several

possible advantages. The possible disadvantage was that the usage of skills taught to target children was less complete than might have been the case if the target children had been directly taught instructions, prompting, and reinforcement skills with their sibling with autism. One advantage is that if the sibling with autism engages in frequent noncompliant or maladaptive behaviors (e.g., tantrums, aggression), involving them in the training sessions may be counterproductive to the purpose of the training sessions and lead to further negative interactions between the siblings (Celiberti & Harris, 1993). A second advantage is that training the target child in role-play situations allows the teacher to gradually increase the difficulty of the situation for the target child (e.g., the teacher engaging in more and more non-compliant behaviors during role-plays) as well as design situations that the target child may encounter with his or her sibling with autism. Third, if the target child is more confident and competent in the strategies being taught to him/her prior to implementation with his or her sibling with autism, he or she may be more likely to encounter initial success and continue to use the strategies. Finally, providing isolated instruction to the target child allows the target child a time for individualized attention, which is often difficult to give when a child in the household has a disability (Howlin, 1988). Overall, though, the skills displayed by the target children in the generalization probes were quite promising in that these children displayed good amounts of the skills taught when they were asked to play with their siblings with autism.

Target children were also able to use the skills taught to them to increase the likelihood that their siblings with autism would demonstrate appropriate social behaviors with them. Due to the low frequency of opportunities to engage in social behaviors provided by the target children during baseline probes, we are unable to determine whether or not the siblings with autism already knew how to demonstrate the social behaviors that the target children were taught to promote from them. The high level of prompts provided by the target children following intervention, however, suggests that the siblings with autism did not consistently and independently engage in the targeted social behaviors. Following intervention, the target children began engaging in behaviors that increased the likelihood that their brothers with autism would engage in appropriate social behaviors with them.

While the target children generalized target skills to their brothers with autism during more structured probes, the children showed idiosyncratic effects of training during free-play interactions. We do not know why some sibling dyads demonstrated more effects of training on free-play interactions than other sibling dyads. One possible reason is that the children started to come into contact with natural reinforcement for playing with each other. In order for the children to come into contact with those natural reinforcers, however, some level of interaction is required. This may be why changes in free-play behaviors were more evident for sibling pair Jared and Eric, who engaged in relatively higher levels of play during baseline, and maintained at high levels for sibling pair Amanda and Lonny after they began interacting more during the priming phase.

A second factor that may affect changes to free-play behaviors following training is the functioning level and initial abilities of the child with autism. It is possible that we did not observe any changes in free-play behaviors of sibling pair Evan and Tanner because Tanner had more limited skills than the other children with autism (e.g., Tanner had no language, no appropriate play skills, and high levels of stereotypy). These skill deficits may have made it more difficult for Evan to engage Tanner and Evan may have been less likely to receive reinforcement for his efforts. Despite Tanner's low functioning level, however, Evan still generalized skills to the generalization probes and was effective at promoting the targeted social behaviors from Evan. This suggests that while this type of intervention may not be effective at increasing general interactions for some sibling dyads, the typically developing sibling may still be useful in promoting social behaviors from their siblings with autism in more structured settings (e.g., under direction of therapists or parents).

There were several limitations to this study that might be addressed by future research. First, there are a few limitations that have to do with the free-play results. For one, the effects of intervention on children's free-play behaviors are correlational only. The specific behaviors taught to target children were not measured during free-play probes. Since adult involvement during free-play probes was limited, we were unable to ensure that those specific situations would occur. Instead, a more global measure of play was scored. An additional limitation is that some limited and idiosyncratic effects of training on free-play interactions were observed. Future researchers may want to examine possible factors (e.g., history of children,

functioning level of the child with autism, level of negative interactions) that increase or decrease the effectiveness of sibling training interventions. Future researchers may also want to examine possible ways to increase interactions between sibling dyads during free-play periods following sibling training, such as finding ways to increase the reinforcing value of playing with the sibling with autism or using activities that are mutually reinforcing to both children or require an additional participant to enjoy (e.g., a turn-taking game).

A second limitation of the study was the limited maintenance data collected. Due to time constraints, we were unable to collect more long-term maintenance data to determine if skills taught to target children would maintain over longer periods of time. In addition, we were not able to observe the more long-term effects of training on the siblings with autism. While the data showed that the typically developing children were able to learn how to prompt and reinforce social behaviors of the children with autism, it is still unknown if these strategies by the typically developing children would lead to acquisition of new social behaviors and more independent responding by the child with autism.

There are also several questions in the area of sibling training that need to be examined that were not addressed by this study. It is still unknown whether sibling training would lead to an increase in appropriate social behaviors demonstrated by the children with autism when they play with children other than their sibling. It has been suggested that one possible advantage of using siblings to promote social behaviors in children with autism is that the similarity between sibling interactions and

interactions with other peers may better foster generalization of skills (better than, for example, adult-mediated interventions). Hopefully, if the children with autism begin to engage in appropriate social behaviors with their typically developing siblings, and receive reinforcement for doing so, they will generalize those behaviors to interactions with non-sibling peers. This generalization may be especially likely when the siblings are close in age, as the sibling dyads in this study were. In this study, however, we did not observe the children with autism interacting with non-sibling peers and future research is needed to evaluate this issue.

It is also still unknown whether sibling training would have an effect on the quality of the sibling relationship. Some previous research has shown that quality of the sibling relationship may be negatively impacted when one sibling has autism (e.g., El Ghoroury & Romanczyk, 1999; Howlin, 1988). While this study did not directly measure the quality of the relationship between the siblings, it did look at some behaviors that have been associated in the literature with the quality of sibling relationships, such as levels of play interactions (El Ghoroury & Romanczyk, 1999; Knott et al., 2007; Knott et al., 1995) and levels of negative interactions (Kennedy & Kramer, 2008). Some authors, for example, have suggested that involving typically developing siblings in interventions for children with autism may increase the typically developing child's self esteem (Howlin, 1988), ameliorate negative feelings toward the child with autism (Mascha & Boucher, 2006), and help him or her better understand the child with autism (Verte et al., 2003). These suggestions, however, also need to be evaluated empirically in future research.



While there are still many questions to be answered, involving typically developing children in intervention for their siblings with autism may have advantages for the typically developing children, the siblings with autism, and the sibling relationship. Results from this study suggest that typically developing children are able to learn how to use behavioral instructional skills such as the ones taught in this study to promote social behaviors in their siblings with autism. In addition, learning these skills may increase the number of opportunities that the siblings with autism have to practice appropriate social skills, increase their use of those social skills, and increase positive interactions during the time that the children play together.

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Appendix A  
Social Validity Surveys



Parent Satisfaction Survey

1. Since beginning participation in this study, have you noticed your children playing together :

1	2	3	4	5
A lot less frequently	A little less frequently	About the same	A little more frequently	A lot more frequently

2. Since beginning participation in this study, have your children played better together?

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

3. Since beginning participation in this study, have you noticed your children sharing toys better?

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

4. Since beginning participation in this study, have you noticed less negative interactions between your children?

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

5. Since beginning participation in this study, have you noticed your typical child trying to provide help and assistance to your child with autism more frequently?

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

6. How satisfied are you with the skills your typical child was taught?

1	2	3	4	5
Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Somewhat satisfied	Very satisfied

7. How satisfied are you with the changes in the play behaviors of your children?

1	2	3	4	5
Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Somewhat satisfied	Very satisfied

Free-play Social validity scale

Video: \_\_\_\_\_

1. Please rate the children in the video on the following variables:

Ability to play together:

1	2	3	4	5
Very below average	Below average	average	Above average	Well above average

Happiness/having fun:

1	2	3	4	5
Very below average	Below average	average	Above average	Well above average

Interest in each other:

1	2	3	4	5
Very below average	Below average	average	Above average	Well above average

Cooperation with each other:

1	2	3	4	5
Very below average	Below average	average	Above average	Well above average

2. How typical or normal do these children's interactions seem?

1	2	3
Untypical	Somewhat typical	Typical

Appendix B  
Treatment Integrity

### Treatment Integrity: Teaching protocol

1. The teacher should state and describe the skill to be worked on.
2. The teacher should provide a rationale for why the target child should engage in the skill.
3. The teacher should provide cues and characteristics for when the target child should engage in the skill.
4. The teacher should describe each step of the task analysis
5. The teacher should role-play the skill incorrectly (e.g., leaving out one or more steps)
6. The teacher should have the target child evaluate her performance (e.g., good job vs. bad job)
7. The teacher should role-play the skill correctly
8. The teacher should have the target child evaluate her performance (e.g., good job vs. bad job)
9. The teacher should have the target child role-play the skill without any prompts from the teacher
10. The teacher should provide reinforcement and corrective feedback based on the target child's performance
11. The teacher should have the target child continue to role-play the skill until all skill steps are performed at 100% accuracy.
12. The teacher should provide the target child with the correct number of stickers based on his or her performance on role-plays