

Sibling-Mediated Social Interaction Intervention for Young Children With Autism

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In the present study, the authors investigated the effectiveness of a sibling-mediated intervention in supporting the social behaviors of young children with autism. They used a multiple-baseline design across four sibling dyads to examine the effectiveness of the intervention. The researchers taught the typically developing siblings ways to socially engage their brothers with autism, which resulted in strong and positive changes in joint attention and modest changes in social behavior for the latter. Social validity ratings by observers who were naïve to the study parameters documented the social importance of the intervention effects for three of the four children; however, the results did not provide strong evidence for generalization of increased social interactions to different settings. The authors also discuss the practical implications of their findings.

The Autism Information Center (2005) has estimated the prevalence of autism to be 2 to 6 individuals per 1,000 persons, and that number is increasing. For children with autism, a primary concern is the development of social competence. Because these children typically have difficulties in establishing and maintaining social relationships with other children and adults, interventions to improve social competence are important. Most interventions that focus on social competence have occurred in classroom settings. Children with autism, however, spend the majority of their time in the home and community environments. Siblings in the latter two settings might well be able to support the social development of children with autism. Little research has examined social interventions involving children with autism and their typically developing siblings. In this study, we investigated the effectiveness of a sibling-mediated intervention for promoting the social competence of children with autism.

Several researchers have advocated peer-mediated social interventions as an effective approach for children with autism (Harrower & Dunlap, 2001; McConnell, 2002). In this type of intervention, typically developing peers have been regarded as the most powerful agents of behavioral change in social settings (Utley, Mortweet, & Greenwood, 1997), so classroom teachers often have selected socially competent classmates as social interveners

for children with disabilities. These nondisabled peers are taught simple behavioral strategies that elicit or support the interactions of children with disabilities, such as asking a child to play, sharing a toy, or suggesting play activities (Brown, Odom, & Conroy, 2001; English, Goldstein, Shafer, & Kaczmarek, 1997; Kohler & Strain, 1999; Odom & Strain, 1986). After the training sessions, researchers have one or more trained peers act as the social interaction agents for the study participants with disabilities. These peers model, reinforce, and/or prompt appropriate social behaviors in classroom settings (Goldstein, Kaczmarek, Pennington, & Shafer, 1992; Strain & Odom, 1986). Peer-mediated interventions have produced positive effects for children with disabilities in classroom settings (Odom et al., 2003). It may be possible to extend this intervention approach to the home by placing siblings in the roles filled by peers in classroom-based peer-mediated interventions.

Several researchers have examined the feasibility of using typically developing siblings to promote the skills, development, and participation of children with autism, with siblings most often filling a “teacher” role. Cash and Evans (1975) first investigated the possibility of using young children as behavior modifiers for their young siblings with disabilities. The researchers taught three sisters how to teach their younger siblings with disabilities to complete an experimental task (i.e., dropping chips

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into holes). Building on this research, Colletti and Harris (1977) trained an older sister to modify the behaviors of her younger sibling with autism through delivering contingent reinforcement for increased bead stringing. The results of these fairly basic research studies indicated that siblings might be effective in helping children with autism learn functional skills in natural settings.

In 1983, Schreibman, O'Neill, and Koegel examined the effectiveness of a program designed to teach behavior modification procedures to the siblings of children with autism. They found that the siblings were able to master some behavioral modification skills, such as reinforcement or shaping, and their brothers or sisters with autism improved in terms of correct responding. They also found that the siblings generalized the use of their skills to a different environment after the training sessions. Lobato and Tlaker (1985) provided training for a 21-year-old sister to teach her 13-year-old brother with Down syndrome to perform independent tooth-brushing and bed-making skills. Extending this research, Swenson-Pierce, Kohl, and Egel (1987) taught three siblings how to teach domestic tasks to their brother or sister with mental retardation. These early sibling-intervention studies, however, did not focus on promoting social behaviors for children with autism.

Celiberti and Harris (1993) first assessed the effectiveness of a program to teach siblings to (a) elicit play or play-related language from a child with autism, (b) praise cooperative play responses, and (c) follow through on requests and overtures. The researchers found that siblings were able to apply these strategies (e.g., elicit play or play-related language) during play with their brother or sister with autism and also generalized their use of these skills to a novel toy. Although other studies have evaluated social interactions or play behaviors between children with disabilities and their siblings, researchers often used the parents (e.g., Celiberti & Harris, 1993) or caregivers (e.g., Strain & Danko, 1995) as the primary intervention agents, rather than a sibling.

Increasingly, joint attention has become important in autism research because it is one of the earliest emerging social behaviors in typical social development (Mundy, Sigman, & Kasari, 1994; Whalen & Schreibman, 2003). Joint attention is also regarded as an early developing social communication skill in which two people use gestures or gaze to share attention with respect to an object or event (Leekam, Lopez, & Moore, 2000; Schertz & Odom, 2004; Whalen & Schreibman, 2003). Young children with autism spectrum disorders (ASD) are limited in their abilities to share attention with other individuals for any purpose other than to obtain something they want (Sigman & Kasari, 1995). They look at adults, alternate gaze, point, and follow points much less than do typically developing children matched on mental age. Mundy, Sigman, and Kasari (1990) found a significant

positive relationship between gestural joint attention of preschool children with ASD and language development 1 year later. Similarly, Woods and Wetherby (2003) found joint attention to be a significant predictor of language outcomes. Because of the importance of joint attention to the development of children with autism, many researchers have suggested that early intervention should focus directly on this as an outcome variable (e.g., Jones & Carr, 2004; Whalen & Schreibman, 2003). To date, researchers who have investigated peer-mediated and sibling-mediated interventions designed to affect social participation have focused on social interaction, rather than joint attention, as the primary outcome measure. It may well be that interventions designed to promote the social engagement of children with ASD may have a collateral effect on joint attention.

In this study, we investigated (a) whether typically developing children can learn and use social skills strategies for interacting with their siblings with ASD and (b) whether such strategy use would result in increased social participation by the children with ASD. Specifically, the study addressed the following research questions:

1. Would the sibling-mediated social intervention change the typically developing children's social behaviors when playing with their siblings with ASD?
2. Would the sibling-mediated social intervention produce increases in the social interactions of the children with ASD?
3. Would the sibling-mediated intervention have a collateral effect on joint attention (a behavior category of child orientation) between children with ASD and their siblings?
4. If the intervention produced an increase in overall interactions, would the increased interactions generalize to a setting outside of the home?
5. Were the outcomes of the intervention socially valid?

METHOD

Participants

Four sibling dyads (i.e., four children with autism and four typically developing siblings) participated in this study. All of the children with autism had been diagnosed with autism or another autistic spectrum disorder (i.e., Pervasive Developmental Disorder, Not Otherwise Specified) by a physician, psychologist, or diagnostic clinic staff member using the criteria from the *Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition (DSM-IV)*; American Psychiatric Association, 1994). The target children were between 3 years and 6 years of

age. The nondisabled siblings ranged in age from 4 years to 11 years at the beginning of the study and had typical intellectual and social development, according to parents' reports. All of the parent participants were married couples in which at least one parent worked outside of the home, and all were of middle to upper middle socioeconomic status.

The first sibling dyad was composed of Allen and his sister, Emily. Allen was 3 years 10 months old when the study began. He had been diagnosed with autism at 2 years of age by an interdisciplinary team at an autism clinic. Allen had received local home-based early intervention services and moved to a half-day public early childhood special education program after he turned 3. Allen did not talk, instead relying on gestures (e.g., pointing, leading people, shaking his head) as a primary means of communication. He seldom made eye contact or initiated interactions with others. Allen did enjoy watching his sister play video games. Emily, Allen's sister, was 11 year 2 months old. Allen's parents were Caucasian, both had graduated from college, and both worked full time. Allen's parents sometimes asked Emily to play with Allen during weekends.

The second dyad consisted of Bobby, a 3-year 5-month-old boy with autism and his 4-year 8-month-old brother, Roger. Bobby spoke in single-word utterances, rarely played with toys, and sometimes engaged in stereotypic behaviors, such as waving his fingers in front of his eyes. He did not play with Roger or with other children. Bobby attended a public half-day inclusive preschool classroom with assistance from a paraprofessional for 100% of the school day. Bobby's parents were Caucasian and had some college-level education. Bobby's mother stayed at home after Bobby was diagnosed at the age of 2, and his father worked full time.

Sibling Dyad 3 was made up of Caleb, who had Asperger syndrome and was age 6 years 7 months old, his brother, Jacob, who was 4 years 6 months old. Caleb attended the kindergarten at a public school. He liked to play with the kitchen toy set and pretend to be a great chef. He liked a specific play routine (e.g., get order from the customer, cook, fire begins in kitchen, and everyone leaves the playroom), which could not be changed or interrupted by a different scenario. Jacob liked to talk and play. Sometimes, both boys would play together when their mother was present and mediated their play in the same room. Caleb's parents were Caucasian and held college degrees.

Dyad 4 was composed of David and Sophia. David was 7 years 6 months old. He was enrolled in a general education classroom with the assistance of a special education teacher in resource rooms. His sister, Sophia, was 4 years 9 months old. She was a self-occupied girl who liked to be in charge at home. Most of the time, Sophia would get David to do things she wanted, and David

usually would follow her directions without complaint. David did not play with Sophia; instead, he spent his time at home playing either with his toy train set or with computer programs. David's parents were originally from Asia, and both had doctoral degrees. David's mother quit her job when David began having troubles at school (at about 3 years of age).

Setting

The study primarily took place in the family room of the participants' homes. We selected play materials based on the interests of the children with autism and their siblings and availability. Family members chose the generalization setting, which was outside of the children's home (e.g., school playground, neighborhood, park). For instance, Allen and his sister played in the children's room at church, Bobby and his brother played in the playground at school and in the park, and Caleb and his brother played in the backyard with neighborhood children; David and his sibling also played in the children's room at church. All sessions occurred during a day that was convenient for the family.

Experimental Design

We implemented a single-subject, multiple-baseline design across dyads to evaluate the effects of the sibling intervention. The study consisted of three phases: baseline, intervention, and maintenance. Following several baseline sessions across all four dyads, we began the training for the first sibling dyad while the second, third, and fourth dyads remained in baseline. Once the first dyad demonstrated increased rates of social interactions, we began training for the second dyad, with the third and fourth dyads remaining in baseline. When levels of social interactions increased for the second dyad, we commenced the intervention for the third dyad, with the fourth dyad staying in baseline until changes were seen for the third dyad. At that point, we initiated training for the last dyad. For all participants, sessions occurred 2 days each week.

Baseline. During the baseline condition, we observed the social interactions between the target children with autism and their typically developing siblings for 10 min without providing any specific instructions, feedback, or prompts. We told the nondisabled siblings that the purpose of this period of time was to see how their brothers played, so they should play with their brother with autism in a typical manner. If the target child left the play area and his sibling could not get him back within 1 minute or the target child acted aggressively toward his sibling, we would pause the videotaping and intervene to (a) bring the target child back to the play area or (b) prevent harm to the sibling or the target child.

Intervention. As in baseline, the target child and his typically developing sibling played together for 10 minutes. Before this play activity started, the sibling participated in a 10-minute social skills lesson. These lessons taught the nondisabled siblings several common behavioral strategies for facilitating social interactions with their brothers with autism, such as establishing eye contact, suggesting play activities, initiating conversations, offering or asking for help, or expanding the content of the target child’s speech (Utley, et al., 1997). We modified elements of several effective peer-mediated intervention programs (Buddy Skills Training/Stay-Play-Talk [English, Shafer, Goldstein, & Kaczmarek, 1997], Play Time/Social Time [Odom & McConnell, 1997], and Getting Along with Others [Jackson, Jackson, & Monroe, 1983]) and incorporated them into the intervention procedures (see Note).

We based the framework for the training on the three steps of Stay-Play-Talk (Goldstein & English, 1997). This framework was a sequential behavior chain to assist the nondisabled children in facilitating social interactions with their siblings with ASD. After the two initial lessons that taught the nondisabled children how to consistently use the three steps, we provided eight subsequent lessons that focused on more specific strategies for involving the siblings with ASD in play or social interactions. For example, we taught the typically developing siblings to move in proximity to the focal child with ASD while calling his name and to maintain this proximity while talking or playing. We also told the nondisabled children to expect some rejections from their siblings with ASD so they would not get discouraged and to keep trying the initiation strategies (Strain, Hoyson, & Jamieson, 1985). The target social skills taught in the intervention are presented in Table 1.

The training followed a standard protocol. The researcher (the first author) first reviewed the previous day’s lesson, introduced the new skill, and read a story illustrating the use of the skill. He then modeled examples of new behaviors and had the nondisabled child practice them. If the child could not understand the story well, the researcher demonstrated the behavior in an appropriate way and asked the parent(s) to help explain the story to the child to ensure that he or she fully understood the new behavior. We used these procedures to train three of the nondisabled children. Because Allen’s sibling, Emily, was old enough to read the story herself, the researcher would let her read the story and then follow the rest of procedures.

After the training sessions, we encouraged the nondisabled children to use the new strategies when playing with their siblings with autism. When necessary during the play sessions, the researcher (the first author) prompted the nondisabled siblings to use the social strategies they had learned or to praise the target child for any social re-

TABLE 1. Sibling-Mediated Social Intervention Lesson Outlines

Topic	Siblings will learn to
Stay and Play	Stay in physical proximity
Stay, Play, and Talk	Get child’s attention
Starting a conversation and keep it going	Find conversation topics
Sharing and persisting	Create chances to exchange objects, toys
Requesting to share	Create opportunities for turn-taking
Organizing play	Give ideas concerning what to play
Compromising	Negotiate play ideas
Offering to help and requesting assistance	Ask questions related to play theme
Asking for clear directions	Understand what the child with ASD wants
Giving/receiving a suggestion for improvement	Provide verbal feedback/comments

sponses. Adults’ verbal prompts were provided if typically developing siblings did not make an initiation to their brothers with ASD within 1 minute. David and his nondisabled sibling, Sophia, had only eight data points in the intervention phase because Sophia did not want to participate in the training sessions after the eighth lesson, preferring to show the researcher how she played with David. We therefore moved this dyad directly into the maintenance phase of the study.

Maintenance. This phase resembled the baseline phase in that we asked the nondisabled children to play with their siblings with autism for 10 minutes but did not provide prior training sessions or prompts. Bobby did not participate in the maintenance phase of the intervention because he became interested in the video camera and wanted to play with the camera whenever he saw it. We thus were unable to collect any data for Bobby and his sibling in the maintenance phase of the study.

Generalization. We used generalization probes throughout the experiment. We would take the children out to play in an unstructured environment (e.g., park, playground, neighborhood) during the 10-minute sessions. We asked them to play as usual but did not provide any lessons (if the probe occurred during the intervention), and we did not prompt the participants. We randomly administered these probes during the intervention session based on the families’ schedules.

Parental Role. The parents would stay with their children throughout the experiment. During the baseline, we asked them to act as they usually did with their children. In the intervention phases, the parents watched how the researcher taught a lesson to the nondisabled child and could offer suggestions that might help the child understand the lesson. The parents could also offer verbal prompts to both of the children in the dyad during the intervention and maintenance phases. At the end of each play session in intervention, we asked the parents to offer feedback on the lesson plan.

Dependent Measures

We employed a focal child system in which we collected a 10-minute observational sample of the child with autism (i.e., as the focal child) and his sibling on videotape during each session and across all conditions. We used a whole-interval sampling system. Scoring of the videotapes consisted of using 10-second intervals from the entire 10-minute observational sample (i.e., 60 intervals). We assessed three superordinate variables: child orientation, social behavior exhibited by the child with autism toward his sibling, and social behavior exhibited by the nondisabled sibling toward the child with autism. We grouped mutually exclusive behavioral categories within variables.

We grouped a major dependent variable, joint attention, within the “child orientation” set of variables. The joint attention variable addressed a major research question, whereas the other variables monitored potential “secondary” effects of the intervention. In this set, operational definitions for the behavior categories were as follows:

- joint attention (i.e., the child with ASD and sibling were actively coordinating or sharing attention to the same toy or activity),
- attending to the sibling/onlooking (i.e., the child with ASD passively watched the activities of his sibling),
- stereotypical behavior (i.e., hand flipping, body rocking, or moving hand between eyes and lights), and
- no engagement (i.e., child was idle and did not exhibit any of the other behaviors in this category).

During the play sessions, we coded two variables related to social behaviors, that is, behaviors that the focal child directed to the sibling or the sibling directed to the focal child. The social behavior categories for siblings and children with autism were as follows:

- social initiation,
- negative social initiation,

- social response,
- negative social response, and
- no social behavior.

We defined *social initiations* as any verbal or motor behaviors clearly directed toward a sibling/focal child to evoke a response, such as greetings, asking and answering questions, commenting, sharing materials, or helping behaviors. We did not consider a smile or a look as an initiation if there was no additional verbal or physical contact. We defined *social responses* as a reply within 5 seconds, such as looking when the name was called, following a direction or request, answering a question, or nodding his head. We defined *negative social initiations/response* as harmful or disruptive verbal/motor behavior, such as hitting, pushing, kicking, or biting that was clearly directed toward a sibling/focal child.

Interobserver Agreement. A research assistant who was naïve to the experimental condition of the study coded the videotapes. We trained this coder to a criterion level of agreement (i.e., $\kappa = .80$ on each behavioral category) before the study began. Two observers (i.e., the researcher as the criteria person and the research assistant as the primary coder) independently and simultaneously collected data on the same focal child to calculate the interobserver agreement for 20% of the entire sample. We computed point-by-point interobserver agreement on occurrence by taking the total agreements between two observers, dividing by the total numbers of agreements plus disagreements, and multiplying by 100. We also calculated Cohen’s kappa coefficients.

The agreement across four sibling dyads in the areas of child orientation, child social behavior, and sibling social behavior was 91%, 96%, and 92%, respectively. Mean kappa coefficients were .71 for child orientation, .70 for child social behavior, and .73 for sibling social behavior. Mean agreement for each of the categories is provided in Table 2.

Social Validation. Social validity is designed to assess the social importance of the effects of the treatment (Wolf, 1978). To assess social validity, we systematically selected -minute segments of videotape from each phase of the intervention (i.e., the 2nd minute of each tape from a randomly chosen day of the intervention). We then randomly ordered the baseline, intervention, and maintenance segments for each child. Twenty graduate students taking a single-subject design methods class coded all 11 segments. These coders used a three-item rating scale in which they chose a rating from a 5-point Likert scale (1 = *lowest rating*, 5 = *highest rating*) for each of the following questions:

1. Was the child having fun?
2. Was the child involved in social play?

3. What was the quality of the interaction between the two children?

Fidelity of Treatment. To determine the success of an intervention, we needed to assess whether the training was implemented with precision and consistency across participants (Detrich, 1999). We designed a five-item checklist (see Appendix A) for the parents to complete after the intervention training sessions. This checklist consisted of five questions that identified whether the researcher followed the protocol in each training session. By the end of the study, the parents had completed approximately 80% of the checklist forms, and all of them responded “yes” to the five items across the intervention sessions.

RESULTS

Sibling Social Behavior

Because one feature of the fidelity of treatment in this intervention is an increase in social interaction with the children with ASD on the part of the nondisabled siblings (i.e., we designed the intervention to modify the siblings’ behavior so as to affect the behavior of the children with autism), we are presenting the data on the nondisabled siblings first. The social behaviors exhibited by the nondisabled siblings toward the children with ASD are depicted in Figures 1 and 2. In these figures, trend lines are drawn to assist in visual inspection; we calculated the trend lines by using the split-middle, quarter-interaction method (White & Haring, 1980). We defined *social behavior* as an aggregate of positive social initiations and positive social responses. Figure 1 depicts the total percentages of intervals that the nondisabled siblings socially initiated and responded to their brothers with ASD during play sessions; Figure 2 displays the percentage of social behaviors that occurred naturally or was prompted by adults. Three siblings (i.e., Bobby’s sibling, Caleb’s sibling, and David’s sibling) increased the number of their social behaviors toward their brother with ASD in the intervention sessions. The number of social behaviors slightly decreased during the maintenance sessions but was still higher than in baseline. Allen’s sibling did not increase her number of social behaviors toward Allen during the intervention, although the results showed she did increase this number in the maintenance sessions.

Allen’s sibling, Emily, socially interacted with Allen an average of 43.9% of observed time during baseline; however, she spent only an average of 32.8% of observed time during the social interaction intervention and then slightly increased this percentage to an average of 38.3% of observed time during the maintenance phase. Bobby’s sibling, Roger, directed almost twice as many social behaviors toward Bobby during intervention as

TABLE 2. Mean Percentage for Interobserver Agreement and Kappa Coefficients

Behavioral category	% agreement	κ coefficient
Child orientation		
Joint attention	81	0.75
On-looking	42	0.51
Stereotypic behavior	100	1.00
Nonengagement	81	0.76
Average	91	0.71
Child social behavior–Focal child		
Social initiation	79	0.84
Negative social initiation	90	0.93
Social response	67	0.74
Negative social response	94	0.96
No social behavior	96	0.71
Average	96	0.70
Child social behavior–Sibling		
Social initiation	69	0.75
Negative social initiation	100	1.00
Social response	94	0.44
Negative social response	94	0.96
No social behavior	91	0.74
Average	92	0.73

during baseline. Although Roger increased his number of social initiations and responses during the intervention, more than half of his social behaviors were prompted by adults (see Figure 2). Caleb’s sibling, Jacob, spent 6.5% of observed time socially interacting with Caleb in baseline, 16.8% in intervention, and 12.1% in maintenance. Jacob displayed more social responses than social initiations during baseline; by the end of the study, he engaged in more social initiations than social responses. David’s sibling, Sophia, increased her social initiations from the average of 3.6% of observed time in baseline to 13.1% of observed time in intervention and then slightly dropped to 10.3% of observed time in maintenance.

Social Orientation

The percentage of time the children spent in different types of social orientation is summarized by phase in Table 3. The onlooking behavior occurred for a relatively small percentage of the time, but it did increase slightly for each child from baseline to intervention. The children rarely engaged in stereotypic behavior. The overall percentage of nonengagement (i.e., inattention to siblings) increased from baseline to intervention for all of

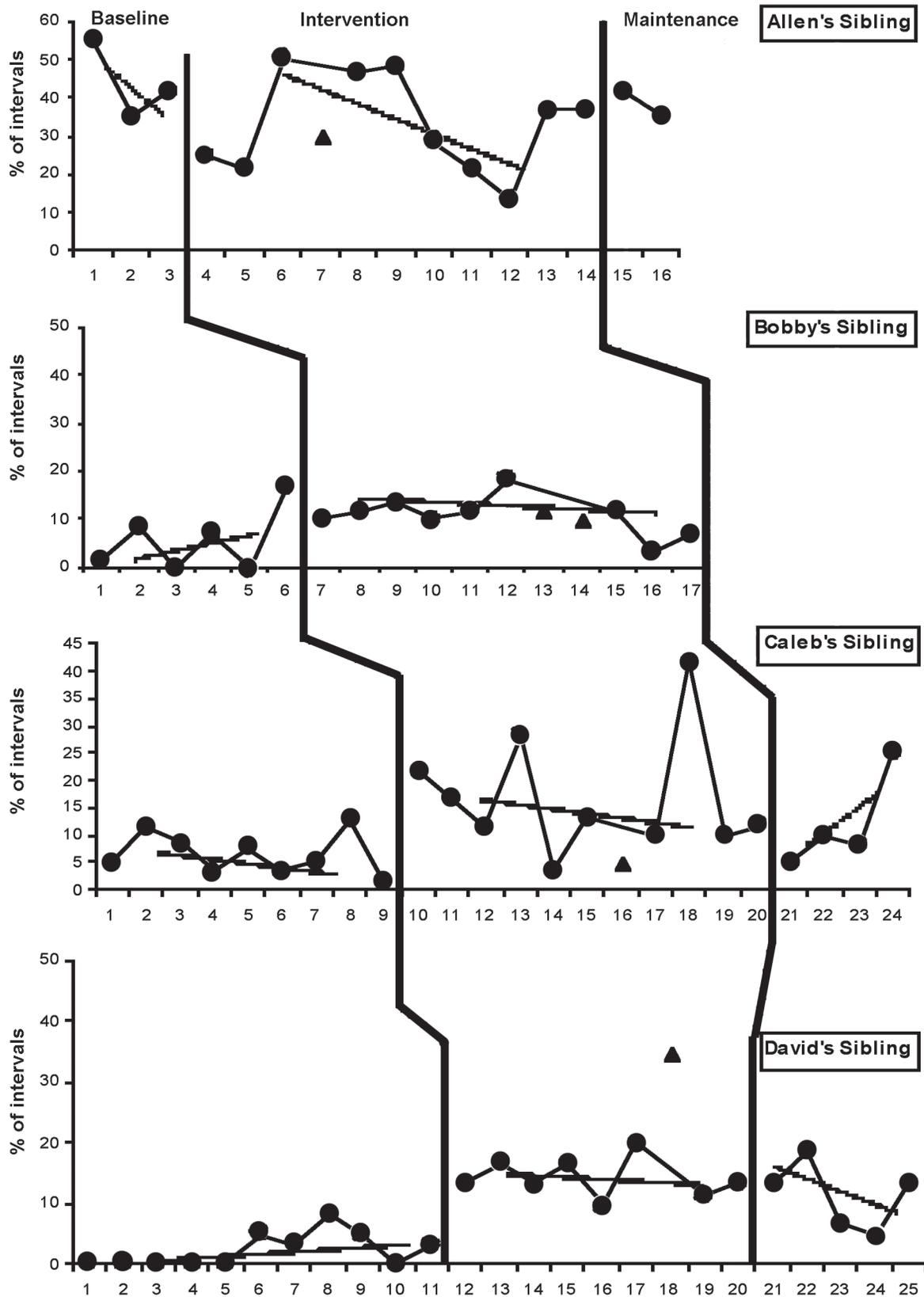


FIGURE 1. Percentage of intervals that nondisabled siblings engaged in social behaviors.
 Note. ▲ = Generalization.

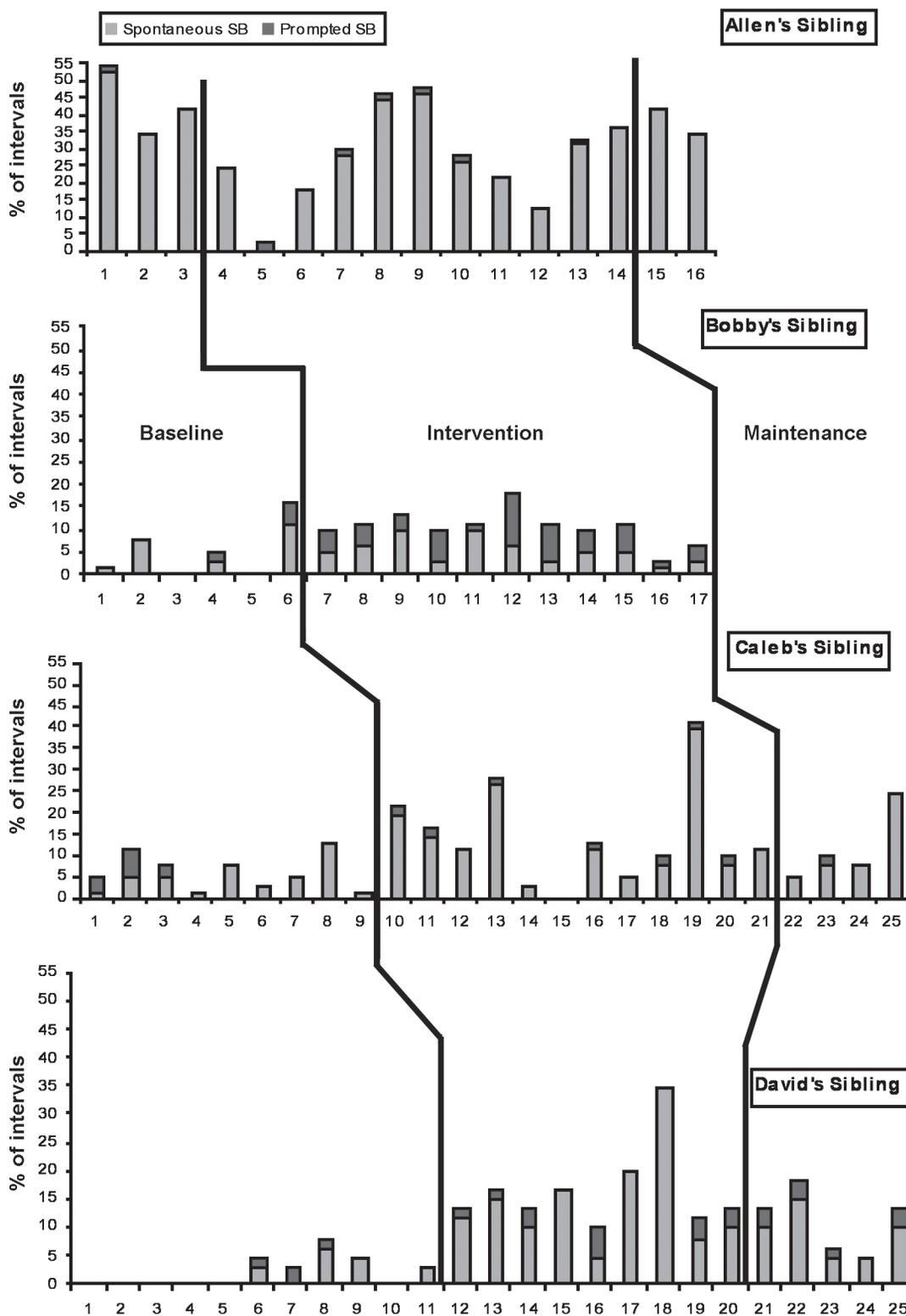


FIGURE 2. Percentage of intervals that nondisabled siblings engaged in spontaneous and prompted social behaviors. Note. SB = social behavior.

TABLE 3. Percentage of Observations in Which Each Behavioral Category Occurred

Behavioral category	Baseline (%)	Intervention (%)	Maintenance (%)
Focal child: Allen			
Child orientation			
Joint attention	57.78	77.67	79.17
Onlooking	5.56	6.67	5.00
Stereotypic behavior	0.00	0.00	0.00
Nonengagement	36.67	15.67	15.83
Child social behavior–Focal child			
Social initiation	1.11	1.17	2.50
Social response	1.67	11.67	20.00
Social behaviors	2.78	12.84	22.50
Negative social initiation	0.00	0.00	0.00
Negative social response	0.00	0.00	0.00
No social behavior	97.22	87.17	77.50
Child social behavior–Sibling			
Social initiation	42.78	30.50	35.83
Social response	1.11	2.33	2.50
Social behaviors	43.89	32.83	38.33
Negative social initiation	0.00	0.00	0.00
Negative social response	0.00	0.00	0.00
No social behavior	56.11	67.17	61.67
Focal child: Bobby			
Child orientation			
Joint attention	7.33	47.04	na
Onlooking	5.33	6.30	na
Stereotypic behavior	0.33	0.19	na
Nonengagement	87.00	47.48	na
Child social behavior–Focal child			
Social initiation	0.67	1.11	na
Social response	1.00	2.22	na
Social behaviors	1.67	3.33	na
Negative social initiation	0.33	0.00	na
Negative social response	0.00	0.00	na
No social behavior	98.00	96.67	na
Child social behavior–Sibling			
Social initiation	6.33	9.63	na
Social response	0.33	1.11	na
Social behaviors	6.66	10.74	na
Negative social initiation	0.33	0.19	na
Negative social response	0.00	0.00	na
No social behavior	93.00	89.07	na

(Table 3, continued)

Behavioral category	Baseline (%)	Intervention (%)	Maintenance (%)
Focal child: Caleb			
Child orientation			
Joint attention	63.10	64.50	72.08
Onlooking	2.14	2.50	4.17
Stereotypic behavior	0.00	0.00	0.00
Nonengagement	34.76	33.00	23.75
Child social behavior–Focal child			
Social initiation	5.95	12.00	5.83
Social response	2.38	7.67	3.75
Social behaviors	8.33	19.67	9.68
Negative social initiation	0.48	0.83	0.00
Negative social response	0.00	0.67	0.83
No social behavior	91.19	78.83	89.58
Child social behavior–Sibling			
Social initiation	2.64	7.00	6.67
Social response	3.81	9.83	5.42
Social behaviors	6.45	16.83	12.09
Negative social initiation	0.24	0.17	0.00
Negative social response	0.00	0.67	0.00
No social behavior	93.31	82.33	87.92
Focal child: David			
Child orientation			
Joint attention	25.83	67.08	74.67
Onlooking	0.28	2.50	1.33
Stereotypic behavior	0.00	0.00	0.00
Nonengagement	73.89	30.42	24.00
Child social behavior–Focal child			
Social initiation	1.67	1.04	2.33
Social response	1.67	8.13	7.33
Social behaviors	3.34	9.17	9.66
Negative social initiation	0.00	0.00	0.00
Negative social response	0.00	0.00	0.00
No social behavior	96.67	90.83	90.33
Child social behavior–Sibling			
Social initiation	3.61	13.13	10.33
Social response	0.58	1.25	1.00
Social behaviors	4.19	14.38	11.33
Negative social initiation	0.28	0.42	0.00
Negative social response	0.00	0.00	0.00
No social behavior	95.56	85.21	87.67

(Table continues)

the children and into maintenance for three children. Most of this change was due to changes in joint attention.

Child Joint Attention. The joint attention results appear in Figure 3. Generally, all four children with ASD increased their frequency of joint attention with their siblings during the play sessions, with trends in the intervention phase positive for three of the four children and levels remaining substantially above baseline for two of the three children who had a maintenance phase.

Allen's joint attention increased from an average percentage of 57.8% of observed time in baseline to 77.7% in intervention and remained high at maintenance ($M = 79.2\%$ of observed time). Bobby displayed a greater increase in the percentage of joint attention, from 7.3% of observed time in baseline to 47% of observed time in intervention. Caleb barely showed any increase in the rate of joint attention: He went from 63.1% of observed time in baseline to 64.5% of observed time in intervention. However, his joint attention trend line, which was negative in baseline, reversed in intervention, which suggested an intervention effect. David also increased his joint attention rates, from 25.8% of observed time to 67.1% of observed time in intervention, and he maintained a fair rate during maintenance (i.e., 74.6% of observed time). The change in trend lines was from positive in baseline to negative in intervention; however, David showed a marked level change, which was a positive effect from the social intervention.

Child Social Behavior

Figures 4 and 5 show the social behaviors (i.e., positive social initiations and positive social responses) displayed by the children with autism toward their nondisabled siblings. Figure 4 indicates that all of the target children increased the number of social behaviors directed toward their siblings during play sessions. Most of these social behaviors occurred spontaneously, as can be seen in Figure 5. Allen exhibited very low percentages of social behavior at baseline ($M = 2.8\%$), increased his social behavior in intervention ($M = 12.8\%$), and increased it again in the maintenance phase ($M = 22.5\%$). At baseline, Bobby rarely interacted socially with his sibling in baseline. During the intervention phase, his social behaviors toward his sibling increased slightly but remained at a low rate ($M = 3.3\%$). Caleb displayed few social behaviors during baseline ($M = 8.3\%$) but increased them as the intervention went on ($M = 19.7\%$). After the intervention, a drop in the percentages of social behaviors occurred during the maintenance phase ($M = 9.6\%$), although there was still a positive trend in these data. David rarely engaged in social behaviors with his sibling during baseline ($M = 3.3\%$) but exhibited more frequent social behavior ($M = 8.1\%$) during intervention.

Generalization Probes

We also observed the target children and their siblings in intervention generalization sessions. (These generalization probes are indicated by triangles on each figure.) For Allen, the generalization setting was the church often attended by the family. Allen demonstrated less joint attention in the generalization probe than in *most* of the intervention play sessions (generalization $M = 50\%$, intervention $M = 77.7\%$). Although Emily directed a similar amount of social behavior toward Allen during the generalization probe (generalization $M = 30\%$ vs. intervention $M = 32.8\%$), Allen still decreased his social behaviors (generalization $M = 8.3\%$, intervention $M = 12.8\%$). The data indicated that Emily was likely to apply her learned skills in a new setting, but Allen seemed to interact with Emily less often in a setting where they usually did not play together.

During the intervention phase, two of the generalization probes for Bobby and his sibling, Roger, were conducted at Bobby's school, the first during an inside free-play time and the second on the school playground. The data indicated that Roger was able to maintain similar levels of social behaviors toward Bobby during the generalization probe ($M = 10.8\%$) versus intervention ($M = 10.7\%$), but Bobby neither initiated nor responded to his sibling's social behaviors.

Caleb and his sibling, Jacob, spent one play session in their backyard with one neighborhood child during the intervention phase. Both Caleb and Jacob directed fewer social behaviors toward each other in the generalized probe in intervention. Interestingly, Caleb's joint attention actually increased during the generalization probe ($M = 80\%$ vs. intervention $M = 64.5\%$). It appeared that the presence of another child somehow affected the level of social interactions between Caleb and Jacob.

During the generalization probe, David showed a higher occurrence of joint attention ($M = 90\%$ vs. intervention $M = 67\%$) but lower rates of social behaviors ($M = 6.7\%$ vs. $M = 9.2\%$). On the other hand, David's sibling, Sophia, directed more social behaviors toward David during the generalization probe ($M = 35\%$ vs. intervention $M = 14.4\%$).

In essence, the four siblings appeared to direct their social behavior toward their brothers with autism in the generalization probes. The four children with autism, however, had difficulty playing with their siblings in the generalization settings.

Social Validation

To compare the mean ratings across phases of the intervention, we conducted one-way ANOVAs with repeated measures across phases for each child and each question. To identify the nature of the significant differences, we

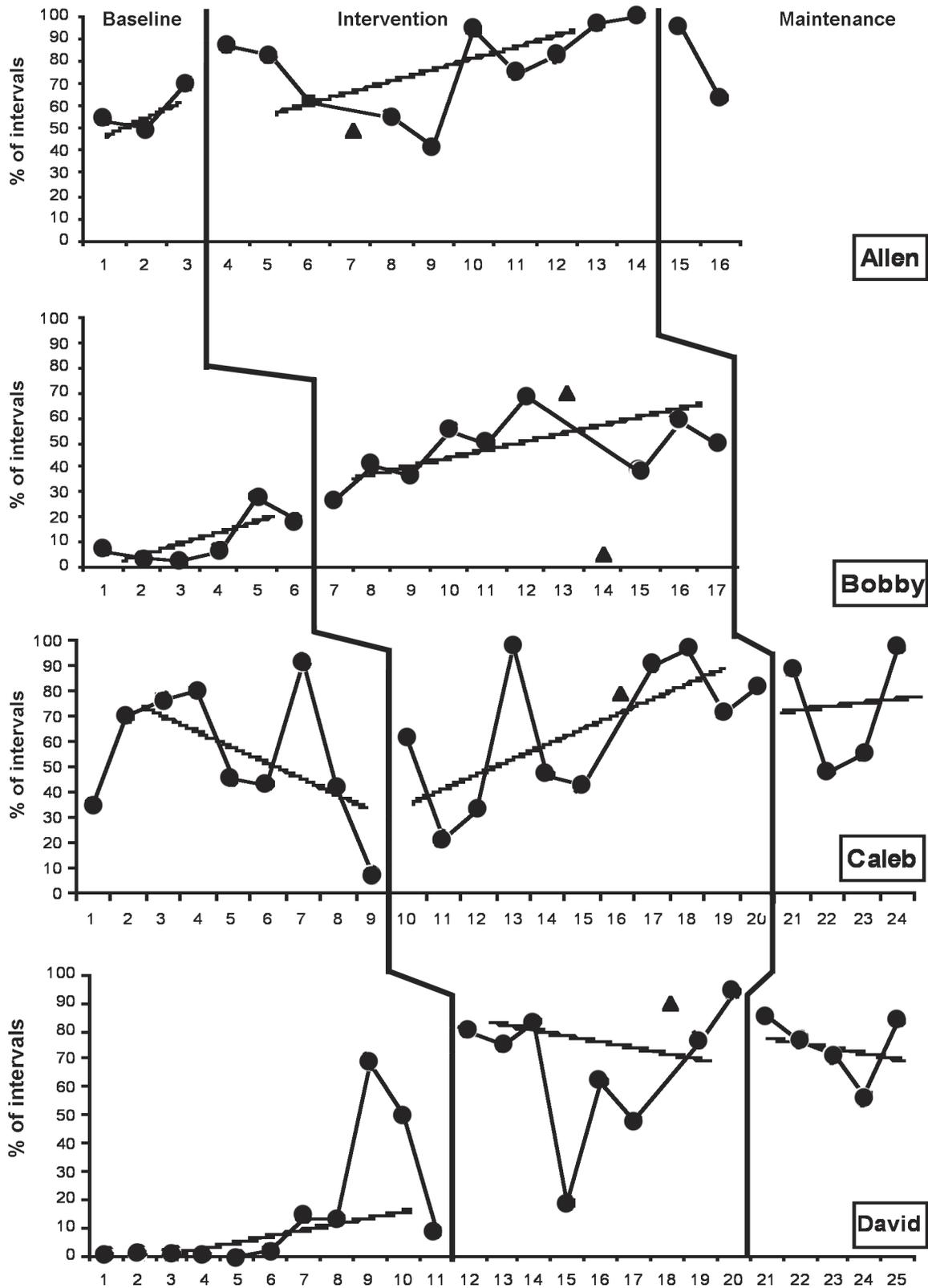


FIGURE 3. Percentage of intervals that children with ASD engaged in joint attention.
 Note. ▲ = Generalization.

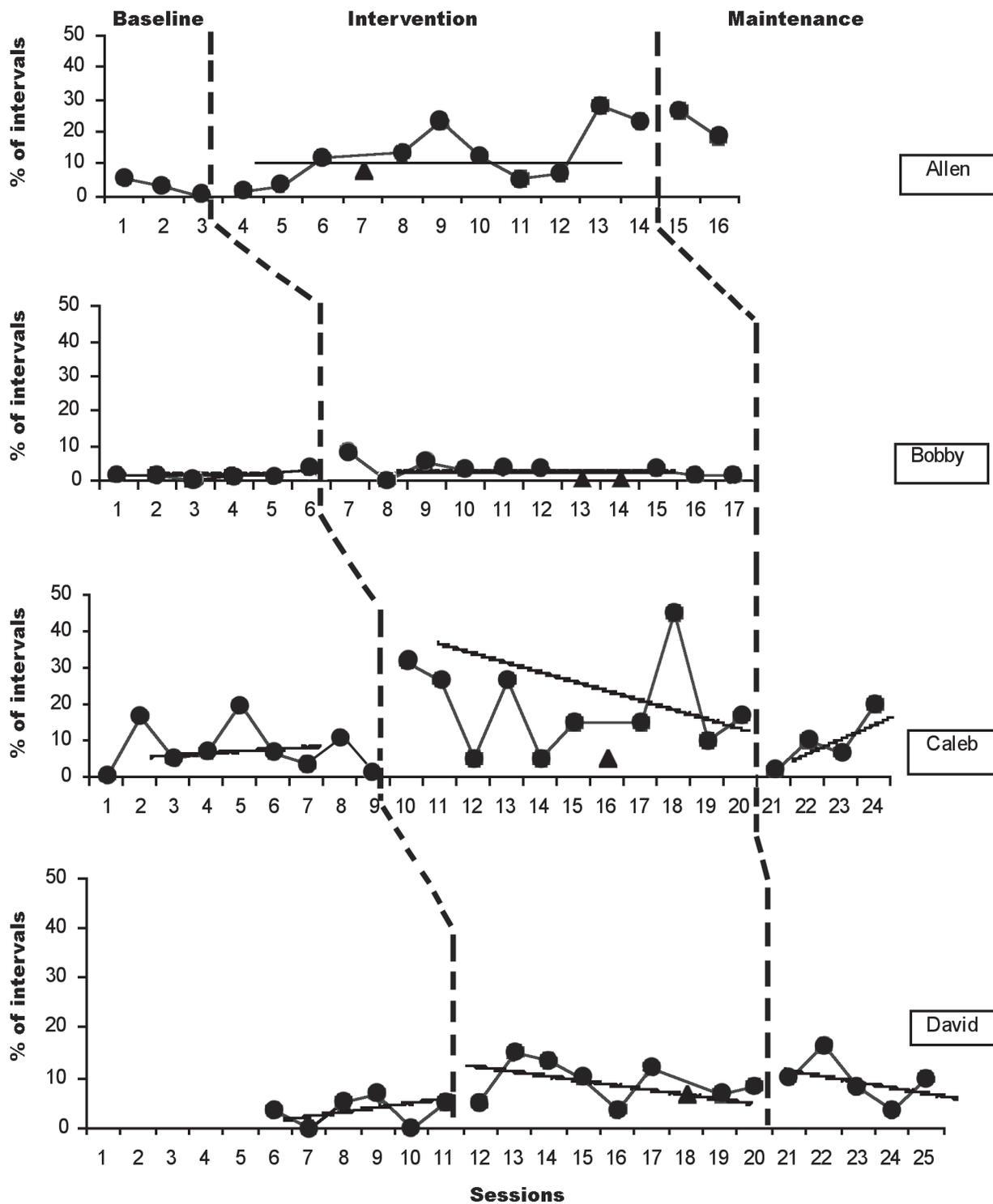


FIGURE 4. Percentage of intervals that children with ASD engaged in social behaviors.
 Note. ▲ = Generalization.

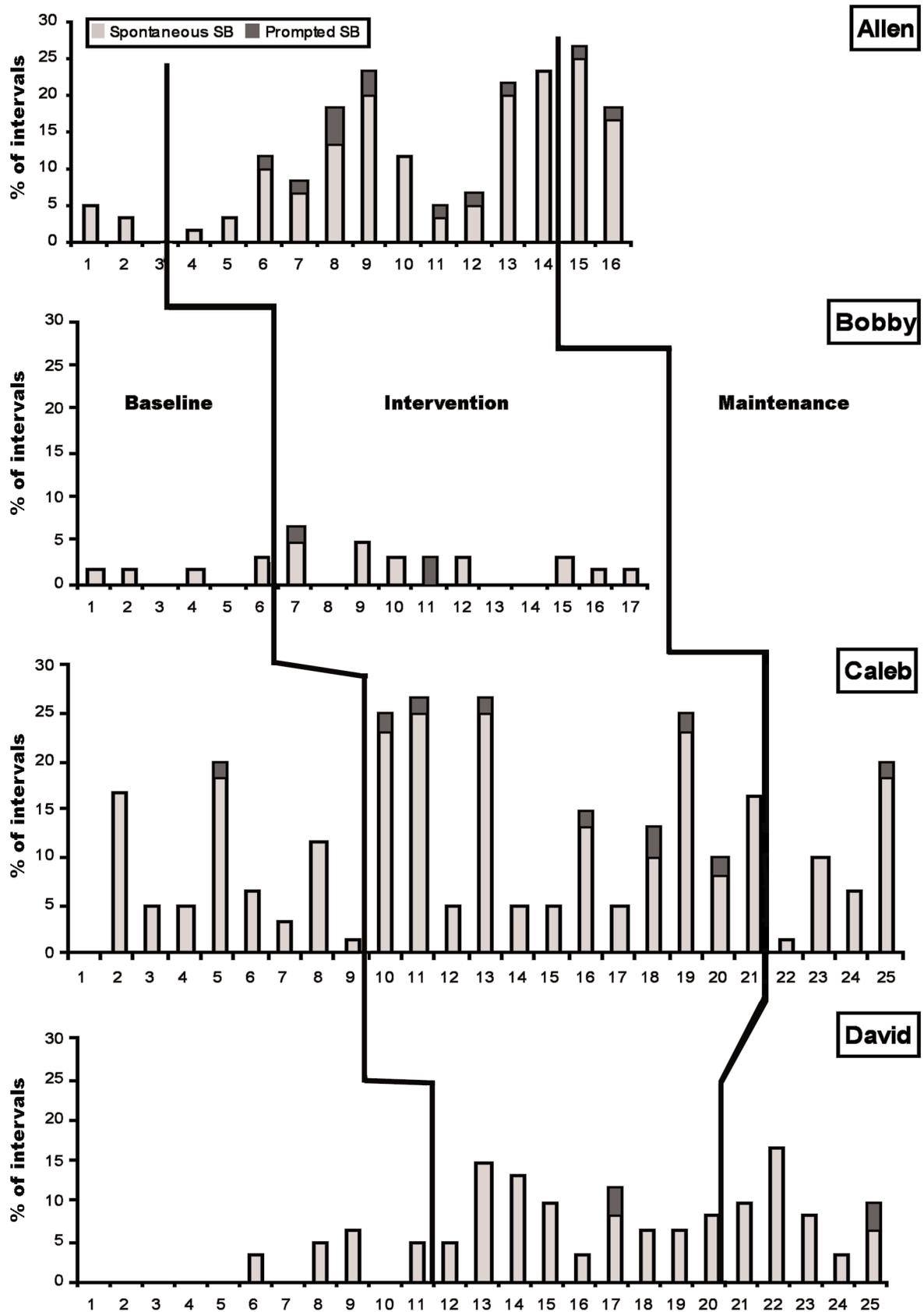


FIGURE 5. Percentage of intervals that children with ASD engaged in spontaneous and prompted social behaviors. Note. SB = social behavior.

employed post-hoc pairwise comparisons. Compared to the social performances of the children with autism at baseline, the social validity ratings for Allen, Caleb, and David were significantly higher for the intervention and maintenance phases (see Table 4). Although social behaviors displayed by Bobby were rated as improved during intervention for the first question ($p < .05$), the level of social involvement (i.e., the second question) and the quality of the interaction with Roger (i.e., the third question) were not statistically significant ($p > .05$). In addition, Bobby did not have a maintenance phase, so a comparison to baseline ratings could not be calculated.

DISCUSSION

In this study, as noted previously, we investigated the effects of an intervention in which siblings were taught to promote the social interactions of young children with autism. We sought to address five experimental questions.

Research Question 1

Would the sibling-mediated social intervention change the social behaviors of the nondisabled children when playing with their siblings with ASD? The findings of this study provided moderate support for the effectiveness of a social intervention that involved siblings as mediators of social interactions for children with autism. The intervention did encourage more social interactions between typically developing siblings and their brothers with autism. For three of the four siblings, social initia-

tions toward their brothers with autism increased during the intervention phase. For Allen’s sibling, Emily, the overall amount of social behavior (i.e., primarily initiations) toward Allen decreased from baseline to intervention, but she appeared to use social skill strategies more effectively in the intervention phase. This inferred change in her behavior was supported by the positive changes seen in Allen’s behavior, discussed subsequently. It appeared that adapting training approaches previously used in peer-mediated interventions (Goldstein et al., 1992; Odom, McConnell, & Chandler, 1994) for use with siblings was successful in most cases, with individual variations. Because Allen’s sibling was older, we paired a more literacy-based approach with traditional training. For David’s sibling, Sophia, we reduced the number of training days because she did not want to participate in the training, but she did continue to participate in the study by “showing” the researcher how she could get David to play.

Research Question 2

Would the sibling-mediated social intervention produce collateral effects on the social behaviors of the children with ASD? The sibling-mediated social intervention produced modest, positive changes in the social interactions of three children with autism. Allen, Caleb, and David engaged in more social participation after the intervention began, with each maintaining their social participation with their siblings after the intervention had ended. Bobby engaged in nearly no social interaction at baseline and infrequently engaged in interaction during the intervention. We found modest evidence for maintenance of

TABLE 4. Mean of Social Validity Rating for Each Phase of Intervention

Experimental phase	Allen	Bobby	Caleb	David
Question 1: Does the child happen to have fun with his sibling?				
Baseline	1.55	1.40	1.90	1.35
Intervention	2.89**	2.10*	3.80**	2.70**
Maintenance	3.68**	na	3.85**	2.37**
Question 2: How much is the child involved in social play with his sibling?				
Baseline	1.80	1.35	1.80	1.15
Intervention	2.67*	1.65	3.80**	2.50**
Maintenance	4.21**	na	3.45**	2.10**
Question 3: Rate the quality of the interaction between the two children.				
Baseline	1.75	1.40	1.75	1.20
Intervention	2.74**	1.80	3.50**	2.50**
Maintenance	3.47**	na	3.25**	1.89**

*Significantly different at $p < .05$ from baseline. **Significantly different at $p < .01$ from baseline.

social behavior for Allen, Caleb, and David. Again, as in other peer-mediated and sibling-mediated studies (Celiberti & Harris, 1993; English et al., 1997; Strain & Danko, 1995), when social partners were taught to engage in social interaction, the general social engagement of the young children with autism increased.

In this study, children with autism responded to their siblings when the siblings made social initiations. This finding was similar to that of the Odom and Strain (1986) study in which the peer-mediated intervention approach supported the social responding of children with autism. In the current study, the children with autism did not increase their social initiations when their siblings provided more social responses. Similarly, in a study of cooperative recreational activities, Schleien, Mustonen, and Rynders (1995) found that children with autism who received more social initiations from their peers during an art activity did not increase their social initiations toward their peers. These researchers suggested that investigations should be created to specifically promote social initiations.

In the current study, the sibling-mediated social intervention did not provide any direct training in social initiations for the children with autism. Future research on sibling-mediated interventions might include strategies for teaching social initiation that have been used in other intervention studies for children with autism (e.g., David, Brady, Hamilton, McEvoy, & Williams, 1994; Odom & Strain, 1986; Oke & Schreibman, 1990). Components of these intervention approaches might be incorporated to promote social initiations on the part of young children with autism toward their siblings in home settings.

Research Question 3

What impact does the sibling-mediated social intervention for children with ASD have on a collateral social communication skill (i.e., joint attention)? Although the current study did not provide specific strategies for promoting the joint attention skills of children with autism, we did assess joint attention as a secondary outcome. The sibling-mediated intervention appeared to have a strong impact on joint attention for most of the children. For three children, clear increases in joint attention occurred. In fact, Bobby, for whom increases in social interaction did not occur, increased his joint attention substantially in the intervention phase. Although Caleb and his sibling, Jacob, engaged in a high percentage of joint attention during the baseline phase, which obscured the treatment effects for this dyad, there had been a negative trend in the baseline phase that was followed by a positive trend in the intervention phase. It is important to note that, in most cases, joint attention is embedded in social interac-

tions; it is impossible to have a reciprocal social interaction without joint attention. Yet, even with such an overlap, one can see from Figures 2 and 3 that the number of changes in joint attention exceeded the number of changes in the social behavior of the children with autism. During the maintenance phase, when training had ended, joint attention remained at relatively high percentages for the three children still in the study.

Schertz and Odom (2004) suggested that joint attention is a precursor of social interaction. It may be that children with autism who display little joint attention or social interaction at baseline, such as Bobby and David in this study, might need to learn to focus their attention on their siblings' activities (e.g., such as toy play) before substantial changes in social interaction could occur. Promoting joint attention for children with autism may have two potential effects. First, it might result in or reflect (i.e., the causal direction is uncertain) an increased interest in their siblings' play behavior or activities. Such toleration of and orientation toward others' (i.e., siblings') activities may well be a predictor of positive intervention outcomes (Sherer & Schreibman, 2005). Second, joint attention may serve as a "setting event" for successful social interaction (Driscoll & Carter, 2004); that is, in many contexts, having the same attentional focus may provide both parties in a social exchange with the same information upon which to base their social behavior, which could in turn lead to more successful and reinforcing interactions than would have otherwise occurred.

Research Question 4

If the intervention produces increases in overall interactions, will the increased interactions generalize to a setting outside of the home? Our study did not provide evidence of a generalization of increased social interactions from the home setting to a different setting. Although three of the nondisabled siblings were able to generalize their social strategies from home settings to other places, the social behavior responses of the children with autism in the generalization settings were limited. Other studies have also found that siblings could learn social skills or behavioral modification strategies and use those skills in different settings (e.g., Celiberti & Harris, 1993; Colletti & Harris, 1977; James & Egel, 1986; Schreibman et al., 1983). Moreover, this finding is consistent with the results of previous studies, illustrating the problematic issue of the generalization of social skills for young children with autism (Strain, Danko, & Kohler, 1995). Increasing the number of settings in which children participate in an intervention (e.g., from homes to community settings) may well promote cross-setting generalization (Billingsley, Liberty, & White, 1994; National Research Council, 2001).

Research Question 5

Are the outcomes of the intervention socially valid? Kazdin (1977) and Wolf (1978) first proposed the need to document the social importance of intervention effects outside of the precise documentation of experimental control that occurred through primary dependent variables. In addition, Horner et al. (2005) identified the assessment of social validity as one feature of high-quality single-subject design studies. In the current study, raters naïve to the specific phase of the study they were observing rated the affective quality, quality of the social interactions, and quantity of the social engagement as significantly higher in the intervention and maintenance phases as compared to the baseline phases. The average ratings changed from the lower end of the scale in baseline to the middle range of the scale in intervention and maintenance, indicating significant positive changes for the participating children. Also, the mean ratings paralleled the findings from the primary dependent variables in that significant outcomes occurred for three of the four children, with only Bobby's ratings not indicating significant changes. In earlier studies, Celiberti (1993) and Sullivan (1999) both documented the social validity of treatment effects of sibling-mediated interventions, with Celiberti finding that ratings by independent raters were consistently lower than ratings by family members who observed the intervention. The social validity assessment in this study thus may be a conservative assessment of treatment outcomes.

Limitations

Several limitations exist for this study. As with most single-subject designs, a small number of children and siblings participated in the study, so the external validity is limited. Also, the study took place over a somewhat limited time period; a more practical application of a sibling-mediated approach in the home and community might be extended across time and settings, which could possibly enhance the magnitude and cross-setting generalization of treatment effects. The magnitude of the treatment effects on social interaction, as captured by the observational coding system, was modest and occurred for only three of the four children. The social validity data, however, did document the social importance of this modest change, and the joint attention measure appeared to be more sensitive to the effects of the treatment.

Conclusion

The present study contributed to a growing body of evidence concerning the effectiveness of siblings in support-

ing the learning and development of young children with autism. In this study, we adapted the technology developed through peer-mediated interventions to teach siblings to support social interactions with their brothers. The results of this study also have implications for future research. It would be valuable to examine systematically how the characteristics of the siblings (e.g., age, gender) are related to intervention effectiveness of intervention. In addition, involving children with autism directly in the training to increase their social initiations would be an important feature to examine. Finally, the effects of social interventions for children with autism and other disabilities often do not spontaneously generalize across settings unless systematic programming for generalization is designed as part of the intervention (Brown et al., 2001). In future studies, researchers should include multiple exemplars and settings to investigate the generalization in social behaviors of children with autism across family and community members and settings. ♦

NOTE

The manual is available from the first author upon request.

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APPENDIX A: PARENT CHECKLIST

Lesson One

Do I make a clear definition of “stay and play”?

Yes No

Suggestions: _____

Do I give clear examples of “stay and play”?

Yes No

Suggestions: _____

Do I give enough examples of “stay and play”?

Yes No

Suggestions: _____

Do I correctly show the sibling what I mean by “stay and play”?

Yes No

Suggestions: _____

Does the sibling understand what I mean by “stay and play”?

Yes No

Suggestions: _____

Any thoughts:
